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NAVSARI AGRICULTURAL UNIVERSITY

Book of PG Thesis Abstracts

(2016-2020)

A Compilation of Students' Research

ASPEE College of Horticulture & Forestry

Navsari Agricultural University

Navsari (Gujarat) - 396450


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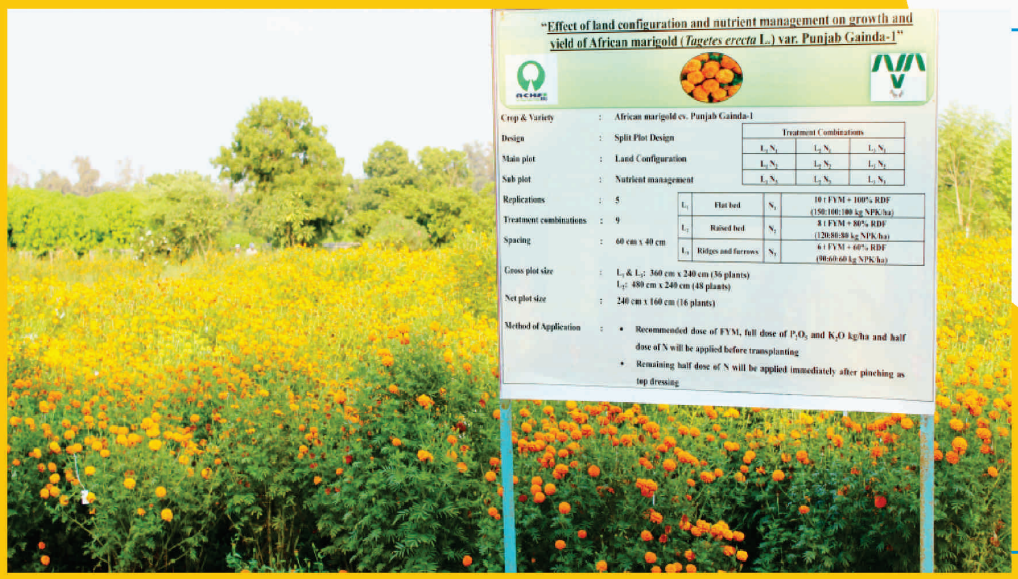
"Effect of land configuration and nutrient management on growth and yield of African marigold (Tagetes erecta L.) var. Punjab Gainda-1"
Crop & Variety : African marigold cv. Punjab Gainda-1
Design : Split Plot Design
Main plot : Land Configuration
Sub plot : Nutrient management
Replications : 5
Treatment combinations : 9
Spacing : 60 cm x 40 cm
Gross plot size : L1 & L2: 360 cm x 240 cm (36 plants)
L3: 480 cm x 240 cm (48 plants)
Net plot size : 240 cm x 160 cm (16 plants)
Method of Application :
Recommended dose of FYM, full dose of P2O5 and K2O kg/ha and half dose of N will be applied before transplanting
Remaining half dose of N will be applied immediately after pinching as top dressing
Treatment Combinations
L1 N1 L2 N1 L3 N1
L1 N2 L2 N2 L3 N2
L1 N3 L2 N3 L3 N3
L1 Flat bed N1 10 t FYM + 100% RDF (150:100:100 kg NPK/ha)
L2 Raised bed N2 8 t FYM + 80% RDF (120:80:80 kg NPK/ha)
L3 Ridges and furrows N3 6 t FYM + 60% RDF (90:60:60 kg NPK/ha)

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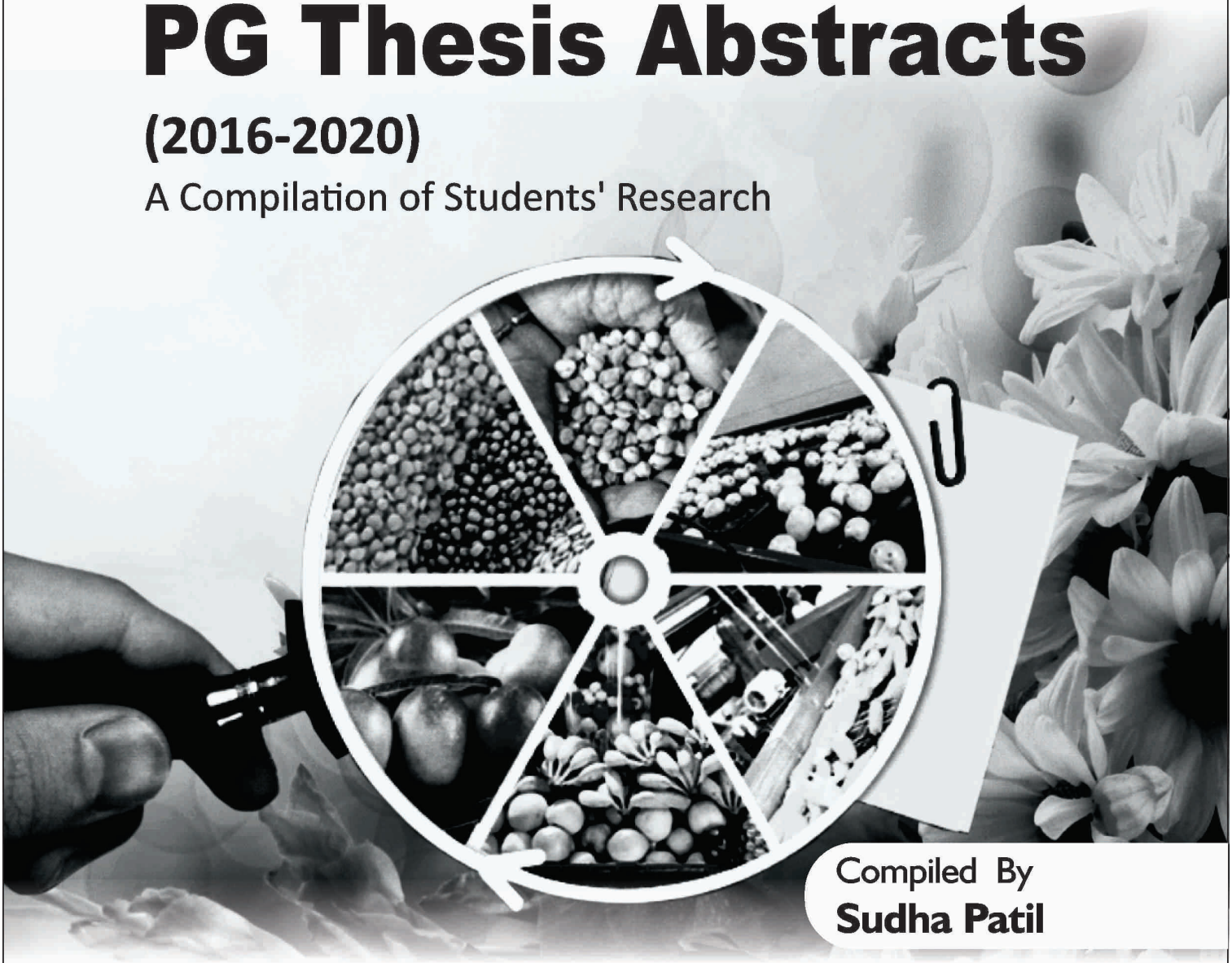

Compiled By
Sudha Patil

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PREFACE

Ever since the first mention and origin from two Latin words '*Hortus*' and '*Culture*' meaning garden and cultivation respectively, horticulture has gone through many developmental changes to expand its scope and limit. Horticulture has emerged as an economically viable diversification option in the Indian agri-business and has captured the interests of many new entrepreneurs into agricultural sector. Cultivation of horticultural crops has been practiced in India since times immemorial but it is only in the recent decades that horticulture has blossomed into a viable business sector that encompasses productions of fruits, vegetables, ornamentals, plantation, spices, medicinal and aromatic plants along with post harvest management and plant protection measures. The improvement in the general level of well-being in the country and increased affluence, particularly among the middle class, has led to transformation of the activity of horticultural crops growing into a burgeoning industry. India is bestowed with ideal climatic conditions from North to South and East to West for commercial horticulture throughout the year in some or the other part.

Keeping in view the growing importance of the horticulture sector, the ASPEE College of Horticulture and Forestry has given appropriate topics to PG students for their dissertation that reflects the need of the hour at real field level. In line with the broader interest of the nation, students of horticulture are given various researches on different aspect like crop improvement, crop production, nutrients and irrigation, weed management, precision farming, protected cultivation, post harvest management, value addition and plant protection of different horticultural crops.

The compilation of abstracts of post graduate and doctoral students of this college will enable scientists and students working in other sectors of horticulture, a quick understanding of the issues with respect to their discipline. Also, it is useful document of the college regarding research previously done for scientists as well as students for future research.

Acknowledgements

- I am highly grateful to Dr. P. K. Shrivastava, Principal and Dean, ASPEE College of Horticulture & Forestry, NAU, Navsari, for his special interest, his affirmative approach and provision of the facilities to accomplish this Book of Abstracts.
- I am also thankful to all major guides of various departments for their co-operation.

Disclaimer

This book contains the compiled panorama of PG thesis abstracts and every precaution has been taken to ensure that information published is as accurate as it is submitted by respective guides, difference in opinion may exist. The views, opinions and conclusions expressed here are of authors/ guides and don't necessarily reflect the prospects and outlook of compiler. The compiler cannot be held responsible for errors or consequences arising from the information provided in this book.

Dr. Sudha Patil

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Ph. D. THESIS ABSTRACTS

FRUIT SCIENCE

1. Name of the student : Gohil Jigarkumar Hemrajbhai (04-1332-2012)
   Year of completion of degree : 2015
   Name of the major advisor : Dr. T. R. Ahlawat
   Title of thesis : Effect of maturity levels and spermine on low temperature storage in papaya cv. Red Lady Taiwan

Abstract

An experiment to assess the "Effect of maturity levels and spermine on low temperature storage in papaya cv. Red Lady Taiwan" was conducted at the Department of Fruit Science and Department of Post Harvest Technology of ASPEE College of Horticulture and Forestry, Navsari Agriculture University, Navsari during December 2014 and April 2015. The experiment comprised of harvesting papaya cv. Red Lady Taiwan at three different maturity stages (Colour break stage, 50 % yellow and 75 % yellow stage), dipping them in aqueous solutions of spermine (0.0, 1.0 and 2.0 mM) and storing them at ambient as well as 12 + 1 ^{o}C temperature. The eighteen treatments were evaluated in a Completely Randomized with Factorial Concept (FCRD) and replicated three times. Results indicated a significant impact of maturity levels on all parameters included in the study. When considered individually, twenty five percent mature fruits had the minimum physiological loss in weight, respiration rate and disease incidence. It also recorded the maximum fruit weight, peel weight, pulp weight, peel to pulp ratio, fruit firmness, titrable acidity and ascorbic acid content. Whereas, total soluble solids, total sugar, reducing sugar and non reducing sugar were found maximum in fruits harvested at seventy five percent maturity. Postharvest application of spermine had a significant influence on all traits studied in this investigation. The minimum physiological loss in weight, respiration rate and disease incidence were observed in fruits treated with spermine @ 2.0 mM. The highest values of fruit weight, peel weight, pulp weight, pulp to peel ratio, fruit firmness, TSS, total sugars, reducing sugars, non reducing sugars, titrable acidity and ascorbic acid content were found in the same treatment. Significant differences were observed in physiological parameters, physical parameters, biochemical parameters and disease incidence due to storage temperature. Between the two temperatures, storage at 12 + 1 ^{o}C temperature resulted in higher fruit weight, peel weight, pulp weight, pulp to peel ratio, fruit firmness, titrable acidity and ascorbic acid content. Physiological loss in weight, respiration rate and disease incidence were lower at 12 + 1 ^{o}C temperature. The best eating quality in reference to colour, flavor, texture and taste was observed in papaya cv. Red Lady Taiwan when harvested at 50 % change in skin colour and dipped in spermine @ 2.0 mM solution and kept at ambient temperature ($M_2S_2T_1$) after 8 days of storage and kept at 12 + 1 ^{o}C ($M_2S_2T_2$) after 16 days of storage. Seventy five percent mature fruits of papaya cv. Red Lady Taiwan when dipped in 2.0 mM spermine and stored at low temperature ($M_3S_2T_2$) had the highest TSS and sugars after 16 days of storage. The above investigation throws light on the possibility of extending the shelf life (8 days under ambient conditions and 16 days under low temperature) in papaya cv. Red Lady Taiwan without sacrificing organoleptic quality by manipulating the time of harvesting, storage conditions and application of spermine.

2. Name of the student : Ghadage N. J. (1020213002)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. S. J. Patil

Title of thesis : Effect of time and width of girdling on flowering, yield and quality of mango (*Mangifera indica* L.) cv. Alphonso

Abstract

The present investigation "Effect of time and width of girdling on flowering, yield and quality of mango (*Mangifera indica* L.) cv. Alphonso" was carried out at two different locations one at Agriculture Experimental Station, Navsari Agricultural University, Paria, Valsad and another at Regional Horticultural Research Station, Navsari Agricultural University, Navsari. The experiment was laid out in Randomized Block Design with factorial concept comparising four levels of girdling width *viz.*, 0.75 cm (W_1), 1.00 cm (W_2), 1.25 cm (W_3) and 1.50 cm (W_4) and three levels of girdling time *i.e.* 15th July (T_1), 15th August (T_2) and 15th September (T_3) along with control and replicated thrice.

Results of present investigation revealed that percentage of fruit at harvest stage, fruit weight (g), volume of pulp (ml), number of fruits per shoot, yield (kg/plant), yield (t/ha), TSS (^{0}Brix), reducing sugars (%), total sugar (%) and lowest titrable acidity (%) content of fruit with carbohydrate content (%) in leaf tissues during 15th January and maximum net realization along with B: C ratio were obtained by 1.50 cm of girdled width (W_4) treatment.

Girdling during 15th July (T_1) levels produced significantly the highest percentage fruit at harvest stage, maximum fruit weight (g), volume of pulp (ml), number of fruits per shoot, yield (kg/plant), yield (t/ha), TSS (^{0}Brix), carbohydrate content (%) during 15th October and 15th January and maximum C: N ratio in leaves during 15th Janunary with maximum net realization and higher B: C ratio.

In control *vs* rest of the treatment analysis, treated treatments gave significantly higher fruit set percentage at harvest stage, fruit weight (g), volume of pulp (ml), number of fruit per shoot, yield (kg/plant) and yield (t/ha), TSS (^{0}Brix), total sugar (%), lowest acidity (%), carbohydrate content (%) in 15th January with maximum net realization and higher B: C ratio as compared to control (un-girdled).

From present study it can be inferred that the girdling during 15th July with 1.50 cm width were proved beneficial for improving flowering, fruiting and quality parameters of fruit as well as promoting carbohydrate content, C: N ratio in leaf tissues for maximum net realization and higher B: C ratio of mango cv. Alphonso.

3. Name of the student : Bijalkumar Bharatbhai Patel (1020213007)

Year of completion of degree : 2016

Name of the major advisor : Dr. T. R. Ahlawat

Title of thesis : Comparative efficacy of potash fertilizers and magnesium on growth, yield and quality of banana (*Musa paradisiaca* L.) cv. Grand Naine

Abstract

A field experiment was carried out during 2013-14 and 2014-15 at RHRS, ACHF, NAU, Navsari with a view to study the comparative efficacy of potash fertilizers and magnesium on growth, yield and quality of banana (*Musa paradisiaca* L.) cv. 'Grand Naine'. The investigation comprised of nine treatments, each replicated thrice in RBD. The treatments vis. Control (RDF) (T_1), 100 % RDK through MOP in three equal splits (4, 5 and 6 MAP) (T_2), 100 % RDK through MOP in three equal splits (4, 5 and 6 MAP) + 30 g $MgSO_4$ per plant (T_3), 100 % RDK through SOP in three equal splits (4, 5 and 6 MAP) (T_4), 100 % RDK through SOP in three equal splits (4, 5 and 6 MAP) + 30 g $MgSO_4$ per plant

(T_5), 150 % RDK through MOP in four equal splits (4, 5, 6 and 7 MAP) (T_6), 150 % RDK through MOP in four equal splits (4, 5, 6 and 7 MAP) + 30 g $MgSO_4$/plant (T_7), 150 % RDK through SOP in four equal splits 4, 5, 6 and 7 MAP (T_8) and 150 % RDK through SOP in four equal splits (4, 5, 6 and 7 MAP) + 30 g $MgSO_4$ per plant (T_9) were imposed on banana plants of cultivar 'Grand Naine' with the objective to know the effect of SOP and MOP with and without $MgSO_4$ on growth, crop duration, fruit yield, leaf nutrient content and quality of banana fruits. There was a significant impact of potassic fertilizers and magnesium on almost all characters chosen for this experiment except number of fingers per third hand and leaf phosphorus content. The maximum plant height, pseudostem girth, number of leaves per plant were recorded with the application of 100 % RDK through SOP in three equal splits with 30 g $MgSO_4$ per plant (T_5) in pooled data, seven months after planting and at the time of harvesting, whereas, leaf area and leaf area index was maximum under 100 % RDK through SOP in three equal splits (T_4) throughout the trial for 2014-15 and in pooled data. Earliest flowering and shortest crop duration was observed in banana plants treated with 100 % RDK through SOP in three equal splits with 30 g $MgSO_4$ per plant (T_5) during 2013-14 and in pooled data. However, the minimum days required for harvesting after initiation of flowering was noticed in the treatment comprising 100 % RDK through SOP in three equal splits (T_4) for 2013-14 and pooled data. Both the treatments *viz.*, T_4 and T_5 were at par with each other. Banana plants treated with 100 % RDK through SOP in three equal splits with 30 g $MgSO_4$ per plant (T_5) registered the highest bunch weight and fruit yield in pooled data, whereas, application of 100 % RDK through SOP in three equal splits (T_4) resulted in the highest number of hands per bunch, number of fingers per bunch, weight of third hand, finger length, girth and weight in pooled results. There was a marked improvement in fruit quality of banana cv. 'Grand Naine' under 100 % RDK through SOP in three equal splits (T_4) as reflected by the maximum values recorded for pulp: peel ratio, ascorbic acid, reducing sugar, total sugar, sugar: acid ratio, shelf life and the lowest value for titrable acidity in pooled data. The treatment T_4 (100 % of RDK through SOP in three equal splits - 4, 5 and 6 MAP) was at par with the application of 100 % RDK through SOP in three equal splits with 30 g $MgSO_4$ per plant (T_5) for all the quality traits. Treatment T_5 recorded the highest TSS in pooled data. Incorporation of 100 % RDK through SOP in three equal splits with 30 g $MgSO_4$ per plant (T_5) recorded the maximum leaf nitrogen content, potash content, iron content, zinc content, manganese content and copper content in individual years and in pooled analysis. This was at par with 100 % RDK through SOP in three equal splits (T_4) for all the nutrient contents mentioned in the above statement. With regard to sulphur content, treatment T_4 recorded the highest values during the course of this study and this was at par with treatment T_5. The maximum net realization (Rs. 7,63,789) was obtained with treatment T_4 (100 % RDK through SOP in three equal splits) followed by T_5 treatment (100 % RDK through SOP in three equal splits with 30 g $MgSO_4$ per plant) with Rs. 7,63,051.Thus, it can be concluded that between the two sources of potassium, SOP fared better in improving the growth, shortening the duration and enhancing the production and quality of banana cv. 'Grand Naine' when applied with or without $MgSO_4$ in three equal splits after 3, 5 and 6 months of planting in South Gujarat.

4. Name of the student : Barkule Santosh Rakhamji (1020214001)
   Year of completion of degree : 2017
   Name of the major advisor : Dr. B. N. Patel
   Title of thesis : Influence of different chemical substances on yield, quality and shelf life of sapota (*Manilkara achras* (Mill.) Fosberg) cv. Kalipatti

Abstract

The present investigation was conducted simultaneously at Agriculture Experimental Station (AES), Paria, Dist. Valsad under Navsari Agricultural University, Navsari and in farmer's field at Umarsadi Dist. Valsad during the year 2014-15.

The present experiment was laid out in Randomized Block Design including eight treatments comprising of T_1 - 28-Homobrassinolide 0.50 ppm, T_2- 28-Homobrassinolide 0.75 ppm, T_3 - CPPU 4 ppm, T_4 - CPPU 6 ppm, T_5 -Humic acid 1 %, T_6 - Humic acid 2 %, T_7 - GA_3 100 ppm and T_8 - control replicated thrice. The foliar spray of 28-Homobrassinolide, CPPU and Humic acid were applied twice *i.e.* in October and December, while foliar spray of gibberellic acid was applied thrice *i.e.* in October, November and December, 2014. The observations on growth parameters, yield, physical, chemical and physiological parameters were recorded and analyzed Matistically.

Growth parameters like incremental tree height and canopy spread in both direction were influenced by different chemical substances. The application of 100 ppm GA_3 (T_7) was found better for highest incremental tree height (57.75 cm), incremental spread of canopy in East-West (58.17 w) and in North-South (58.31 cm) direction.

Yield parameters like number of fruit per tree and yield on weight basis were influenced by chemicals. Number of fruit per tree and yield on weight basis (1860.71, 153.19 kg/tree, 15.32 t/ha) were found highest with treatment T_4 (CPPU @ 6 ppm).

The physical parameters like fruit weight of sapota was noticed highest with application CPPU @ 6 ppm (T_4). The fruit firmness of sapota at 4th day of storage was found maximum (5.20 kg/cm^2) in treatment T_3 (CPPU @ 4 ppm) in month of February while in May, August and November it was higher (3.41, 4.56 and 5.45 kg/cm^2) with application of CPPU @ 6 ppm (T_4). Whereas, minimum fruit firmness (3.77, 2.49, 3.31 and 3.94 kg/cm^2) was exhibited with treatment T_2 (28-Homobrassinolide @ 0.75 ppm) in all recorded months. The fruits of sapota reported highest pulp content and pulp to peel ratio and lowest peel content with application of GA_3 @ 100 ppm (T_7) were obtained in four observed month.

With respect to chemical parameters, the maximum total soluble solids (23.28 $^{\circ}$Brix) content of sapota fruit found with treatment T_3 (CPPU @ 4 ppm) in February month. While it was higher (27.04, 20.24 and 23.94 ^{0}Brix) in May, August and November, respectively with treatment T_4 (CPPU @ 6 ppm). Reducing and total sugars content (10.17 % and 18.82 %) of sapota fruits were found highest in treatment T_3 (CPPU @ 4 ppm) in February while in rest of month, highest reducing sugars (11.30, 8.93 and 10.42 %) and total sugars (21.34, 15.96 and 19.14 %) was observed with application of CPPU @ 6 ppm (T_4). Titratable acidity was found minimum (0.0480 %) with CPPU @ 4 ppm in February and (0.0314, 0.0420 and 0.0525 %) in rest of months with T_4 (CPPU @ 6 ppm). Ascorbic acid content of fruit was found to be highest with treatment T_4 (CPPU @ 6 ppm) in four months of study.

Physiological parameters, the shelf life (12.23 days) of sapota fruits observed was maximum with application of CPPU @ 4 ppm (T_3) in month of February but it was (9.45, 10.04 and 13.38 days) in treatment T_4 CPPU @ 6 ppm) in rest preceding months observed, respectively. The physiological loss in weight was lowest (6.31 %) with treatment T_3 (CPPU @ 4 ppm) in February and (7.19, 6.96 and 5.58 %) in rest of months respectively in T_4 (CPPU @ 6 ppm). As compared to treatments, minimum shelf life and maximum physiological loss in weight was noticed with treatment T_2 (28-Homobrassinolide @ 0.75 ppm) in all observation conducted months.

From economic point of view, higher net realization of 1,78,894 with maximum benefit cost ratio (3.11) was obtained with application of CPPU @ 4 ppm (T_3).

On the basis of result, it can be concluded that higher net realization with

maximum benefit cost ratio can be obtained with application of CPPU 4 ppm. This treatment also provided better yield (14.78 tons/ha) and quality fruits with longer shelf life (13.15 days) which is very important in sapota cv. Kalipatti.

5. Name of the student : Gurjar Tulsi D. (1020214008)
   Year of completion of degree : 2017
   Name of the major advisor : Dr. S. J. Patil
   Title of thesis : Response of novel organic liquid fertilizer with micronutrient application on growth and yield of banana cv. Grand Nain

Abstract

The present experiment entitled "Response of novel organic liquid fertilizer with micronutrient application on growth and yield of banana cv. Grand Nain" was conducted during 2014-15 and 2015-16 at Instructional Farm of ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat).

The experiment was laid out in Randomized Block Design with Factorial Concept comparising two factors *viz.*, different level of novel organic liquid fertilizer (0, 1 and 2 %) and Combi – F, Grade – IV micronutrient (0, 1, 1.5 and 2 %). The treatments were replicated thrice.

The individual effects of foliar applications at 3rd, 5th and 7th month after planting of different level of novel organic liquid fertilizer and micronutrient treatment as well as their interaction on growth, yield and quality of banana cv. Grand Nain were recorded.

The result indicated that novel organic liquid fertilizer treatment was significantly superior over the control. The foliar application of 1 % novel organic liquid fertilizer recorded significantly the maximum growth characters at various stages of growth of banana *i.e.* number of leaves, leaf area, pseudostem girth and height of banana plant at 5th and 7th MAP. The same treatment was found better with respect to yield characteristics like, maximum finger girth, length and girth of bunch, weight of 3rd hand, fingers per bunch, number of hands per bunch, bunch weight and yield. Similarly, this treatment increased quality parameters like, fruit firmness, TSS, non-reducing sugar, total sugar and minimum acidity. While, foliar application of 2 % novel organic liquid fertilizer recorded maximum leaf nutrient content *viz.*, Fe and Zn, finger length, reducing sugar and shelf life. Whereas, number of days from planting to inflorescence emergence, period of fruit maturity, ascorbic acid (mg/100g) and organoleptic taste were found non- significant.

The foliar application of 1.5 % Combi – F, Grade – IV micronutrient at 3rd, 5th and 7th month after planting (F_3) gave maximum number of leaves at 7th MAP, leaf area, pseudostem girth and pseudostem height at 5th and 7th MAP, consequently this treatment increased finger length, finger girth, length and girth of bunch, weight of 3rd hand, fingers per bunch, number of hands per bunch, weight of bunch and yield. It also produced favorable effect on fruit quality in terms of fruit firmness, TSS, shelf life and minimum acidity. The higher level of leaf Fe and Zn and maximum reducing sugar, non-reducing sugar and total sugar were reported in 2 % Combi – F, Grade – IV micronutrient. There was no significant effect on number of leaves at 5th MAP, number of days to initiation of inflorescence, period of fruit maturity, ascorbic acid (mg/100g) and organoleptic taste with respect to micronutrient treatment.

From the economic point of view, the highest benefit cost ratio and net realization were obtained in foliar application of 1 % novel organic liquid fertilizer with 1.5 % Combi – F, Grade – IV micronutrient.

6. Name of the student : Patel Ashishkumar Hasmukhbhai (1020215009)

Year of completion of degree : 2018

Name of the major advisor : Dr. Virendra Singh

Title of thesis : Response of pre harvest chemicals spray on post harvest life of mango (*Mangifera indica* L.) cv. Kesar

Abstract

The present investigation on "Response of pre harvest chemicals spray on post harvest life of mango (*Mangifera indica* L.) cv. Kesar" was carried out on 22 years old mango orchard at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during 2015-2016 and 2016-2017. The post harvest storage and laboratory work was done at Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari with a view to extend the shelf life of fruits with better quality attributes in fruits by different treatments.

The experiment was framed and splited in to two different statistical designs *i.e.* experiment – 1 and experiment – 2. The experiment - 1 was laid out in Randomised Block Design (RBD) with eleven treatments and experiment - 2 was laid out in Completely Randomised Design with Factorial concept of two factors *i.e*. foliar spray and storage condition up to 21 days and thereafter simple CRD design was applied. Foliar spray consist eleven level obtained from experiment-1 that were stored in two different conditions *i.e*. ambient (S_0) and cold storage @ 12 ± 1 °C (S_1) which was storage factor. All the treatments were replicated thrice and a single tree served as a unit. The experiment was repeated for two years. Eleven treatments, involving; Control (T_0), CPPU 5 ppm (T_1), CPPU 10 ppm (T_2), GA_3 25 ppm (T_3), GA_3 50 ppm (T_4), NAA 30 ppm (T_5), NAA 60 ppm (T_6), $CaCl_2$ 1.0 % (T_7), $CaCl_2$ 2.0 % (T_8), $ZnSO_4$ 0.5 % (T_9) and $ZnSO_4$ 1.0 % (T_{10}) were tried. The spray of chemicals was done by making volume solution of 15 litres on the appearance of inflorescence and pea stage of fruit, respectively. The observations on yield and quality parameters of fruits were recorded and statistically analyzed.

Among all the treatments, foliar application of NAA 60 ppm (T_6) increased the total number of fruits and yield in mango cv. Kesar. Treatment T_5 (NAA 30 ppm) was equally effective in this regard. The results on average weight of fruit, diameter and length did not reach the level of significance in both the years. However, fruit size (diameter and length) was noted higher in treatment T_4 (GA_3 50 ppm). Fruit volume and specific gravity was not significant.

The tree sprayed with NAA 60 ppm (T_6) proved to be the best with respect to lowering incidence of chilling injury, maintain marketability of fruits and getting higher score on organoleptic evaluation. These treatments also helped to retain optimum quality parameters *i.e.*, increase in TSS, reducing sugar, non-reducing sugar, total sugars and vitamin A and slow decrease in ascorbic acid and acidity of fruits. The fruits stored in cold storage condition (12 ± 1 °C) retarded the ripening process and slowed down the changes in all quality parameter of fruits. Apart from this, the maximum shelf life was recorded in foliar application of $CaCl_2$ 2.0 % (T_8). None of the spraying treatments gave significantly outcome on PLW.

Looking to economics of various chemical treatments, foliar spray of NAA 30 ppm (T_5) had computed highest BCR ratio in both of the storage conditions followed by treatment T_6.

On the basis of results obtained in the present investigation, it can be summarized that foliar application of 30 ppm NAA on the appearance of inflorescence followed by pea stage of fruit resulted in higher fruit retention and yield of mango cv. Kesar and monetary returns without affecting quality over control. The quality parameters were maintained for

longer period of time by reducing the rate of bio-chemical changes in cold storage at 12 ± 1 °C without adverse effects on fruits.

7. Name of the student : Patel Ronakbhai Jayantilal (1020215012)
   Year of completion of degree : 2018
   Name of the major advisor : Dr. S. J. Patil
   Title of thesis : Response of micronutrients and banana pseudostem sap at different pH levels of foliar spray solution on yield and quality of mango (*Mangifera indica* L.) cv. Kesar

Abstract

The present experiment entitled "Response of micronutrients and banana pseudostem sap at different pH levels of foliar spray solution on yield and quality of mango (*Mangifera indica* L.) cv. Kesar" was conducted during 2015-16 and 2016-17 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, (Gujarat).

The experiment was laid out in Randomized Block Design with Factorial Concept comprising two factors *viz.*, different pH levels of foliar spray solution (4.5, 5.5 pH and best available water) and banana pseudostem sap (5 %), novel organic liquid fertilizer (1 and 2 %), mixture Grade IV (1 %), boric acid (0.2 %). The treatments were replicated thrice.

The individual effects of foliar applications at induction of flowering and full bloom stage of different pH levels of spray solutions and banana pseudostem sap and micronutrients treatment as well as their interactions on yield and quality of mango cv. Kesar were recorded.

The foliar spray solution at pH 4.5 level gave maximum fruiting characters of mango *i.e*. number of fruits at pea stage, fruit set (%) at marble stage, fruit set (%) at harvest stage and fruit retention. The same treatment was found better with respect to physical characteristics like, maximum fruit weight (g), fruit length (cm), fruit breadth (cm), fruit volume (cm^3), specific gravity (g/cm^3), firmness of fruit (kg/cm^2), pulp: stone ratio and minimum peel percentage and yield characters *viz.*, number of fruits/panicle, numbers of fruits/tree and fruit yield (kg/tree and t/ha). Similarly, this treatment increased quality parameters like, organoleptic evaluation, TSS, total sugars, reducing sugars, non-reducing sugars, ascorbic acid content, shelf life and lower acidity. However, foliar spray solution at pH 4.5 level recorded maximum leaf nutrient content *viz.*, Cu, Fe, Mn and Zn after 15 days of spraying.

In the present investigation, foliar application of 2 % novel organic liquid fertilizer recorded significantly the maximum fruiting characters of mango *i.e*. number of fruits at pea stage, fruit set (%) at marble stage, fruit set (%) at harvest stage and fruit retention. The same treatment was found better with respect to physical characteristics like, maximum fruit weight (g), fruit length (cm), fruit breadth (cm), fruit volume (cm^3), specific gravity (g/cm^3), firmness of fruit (kg/cm^2), pulp: stone ratio and minimum peel percentage and yield characters *viz.*, number of fruits/panicle, numbers of fruits/tree and fruit yield (kg/tree and t/ha). Similarly, this treatment increased quality parameters like, organoleptic evaluation, TSS, total sugars, reducing sugars, non-reducing sugars, ascorbic acid content, shelf life and lower acidity. While, foliar application of 2 % novel organic liquid fertilizer recorded maximum leaf nutrient content *viz.*, Cu, Fe, Mn and Zn after 15 days of spraying.

Interaction of different pH levels with banana pseudostem sap and micronutrients was found significant in case of fruit set (%) at marble stage, fruit set (%) at harvest stage, fruit retention, number of fruits per panicle, fruit yield kg/tree and fruit yield t/ha of mango

during investigation, which were the maximum when mango cv. Kesar tree treated at induction of flowering and full bloom stage with 2 % novel organic liquid fertilizer at 4.5 pH level. This treatment also gave maximum net return as compared to other treatment combinations.

8. Name of the student : Kachhadia Palak Arvindbhai (1020216005)
   Year of completion of degree : 2020
   Name of the major advisor : Dr. B. N. Patel
   Title of thesis : Effect of foliar spray of silicon and boron on fruiting, nutritional status of leaves and fruit qualityof rejuvenated mango (*Mangifera indica* L.) cv. Sonpari

Abstract

The present investigation entitled "Effect of foliar spray of silicon and boron on fruiting, nutritional status of leaves and fruit quality of rejuvenated mango (*Mangifera indica* L.) cv. Sonpari" was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, during two continuous years 2017-18 and 2018-19.

The experiment was laid out in a Completely Randomized Design with factorial concept having ten treatment combinations comprising five levels of silicon *viz*., S_1: nosilicon, S_2: potassium silicate @ 1.0 %, S_3: potassium silicate @ 1.5 %, S_4: silicic acid @ 1.0 %, S_5: silicic acid @ 1.5 % and two levels of boron *viz.*, B_1: no boric acid and B_2: boric acid @ 1.2 g L^{-1} which were repeated thrice. The first foliar spray was given at full bloom stage and second at pea stage of mango fruits.

Result of present investigation revealed that foliar spray of potassium silicate @ 1.5 % (S_3) was found better with respect to maximum fruit retention (4.14 %), higher number of fruits at pea (30.21), marble (11.05) and harvest (1.91) stage per panicle, higher number of fruits per tree (182.00), maximum fruit weight (372.51 g) and yield (64.62 kg/tree and 17.90 t/ha). Regarding quality of fruits, higher value of fruit firmness (4.88 kg/cm^2), TSS (21.62 ºBrix), reducing sugars (5.70 %), non-reducing sugars (9.99 %), total sugars (15.69 %), shelf life of fruit (17.33 days), potassium content (1.54 %) in mango leaves and minimum acidity content of fruit (0.146 %) were also noted in same treatment *i.e*. potassium silicate @ 1.5 % (S_3) during pooled analysis.

Physiological parameters, *viz*., maximum value of photosynthetic rate (18.87 µmol $CO_2/m^2/s$) and the minimum value of transpiration rate (0.94 mmol $H_2O/m^2/s$) with lower value of stomatal conductance (0.026 mmol $CO_2/m^2/s$) were recorded in foliar spray of silicic acid @ 1.5 % (S_5). Considering the effect on nutrients content in mango leaves, N (1.94 %), Ca (1.47 %), Mg (0.599 %), S (0.431 %), Si (2.74 %) and B (87.72 ppm) were also recorded the highest value with foliar application of silicic acid @ 1.5 % (S_5).

Foliar spray of boric acid @ 1.2 g L^{-1} (B_2) gave maximum fruit retention (4.08 %), number of fruits at pea (28.95), marble (10.56) and harvest (1.78) stage per panicle, number of fruits per tree (172.80), fruit weight (359.39 g) and yield (60.94 kg/tree and 16.88 t/ha). Regarding fruit characters, maximum fruit length (12.23 cm), fruit girth (25.92 cm), fruit volume (334.78 ml), fruit firmness (5.13 kg/cm^2) and minimum PLW (8.60 %) were also recorded in same treatment (boric acid @ 1.2 g L^{-1}). Fruit qualities *viz*., TSS, reducing sugars, non-reducing sugars, total sugars, ascorbic acid, shelf life and total carotenoid content of fruit were improved by foliar spray application of boric acid @ 1.2 g L^{-1} at full bloom stage and pea stage of fruit. This treatment also increased photosynthetic rate with lower transpiration rateand stomatal conductance of mango tree. The maximum value of nutrients *viz*., N, P, K, Mg, S, Si and B content in mango leaves at harvest was also noted in

boric acid @ 1.2 g L^{-1} (B_2).

Combined spray of potassium silicate @ 1.5 % + boric acid @ 1.2 g L^{-1} (S_3B_2) gave maximum number of fruits per panicle at marble and harvest stage, improved reducing sugars and total sugars with minimum acidity. Higher nutrients (N and B) content in mango leaves and lower transpiration rate and stomatal conductance were recorded with combined application of silicic acid @ 1.5 % + boric acid @ 1.2 g L^{-1} (S_5B_2). From the economic point of view, higher net realization (768684 Rs.) was obtained in combined spray of potassium silicate @ 1.5 % + boric acid @ 1.2 g L^{-1} (S_3B_2).

9. Name of the student : Dharmishthaben Mukeshbhai Patel (1020216007)
   Year of completion of degree : 2019
   Name of the major advisor : Dr. T. R. Ahlawat
   Title of thesis : Effect of silicon and seaweed extract on growth and fruiting of papaya cv. Red Lady

Abstract

A field experiment was carried out during 2016-17 and 2017-18 at Instructional Farm, ACHF, NAU, Navsari with a view to study the effect of silicon and seaweed extract on growth and fruiting of papaya cv. 'Red Lady'. The investigation comprised of eleven treatments, each replicated thrice in RBD. The treatments *viz.* control (T_1), potassium silicate @ 0.2 % (T_2), potassium silicate @ 0.4 % (T_3), ortho silicic acid @ 0.2 % (T_4), ortho silicic acid @ 0.4 % (T_5), seaweed extract @ 2 % (T_6), seaweed extract @ 4 % (T_7), potassium silicate @ 0.2 % + seaweed extract @ 2 % (T_8), potassium silicate @ 0.4 % + seaweed extract @ 4 % (T_9), ortho silicic acid @ 0.2 % + seaweed extract @ 2 % (T_{10}) and ortho silicic acid @ 0.2 % + seaweed extract @ 2 % (T_{11}) were imposed to papaya plants of cultivar 'Red Lady' at 3, 4, 5 and 6 months after planting to assess the effect of silicon and seaweed extract on growth, flowering days, fruit yield, physical parameters, leaf nutrient content and quality of papaya fruits when applied alone or in combination. There was a significant impact of silicon and seaweed extract on almost all characters chosen for this experiment except plant height at first flowering and phytotoxic effect. The maximum plant height, stem girth, number of leaves per plant and leaf area in papaya cv. Red Lady were recorded with the foliar application of potassium silicate @ 0.4 % with seaweed extract @ 4 % during 2017, 2018 and in pooled data.Papaya plants sprayed with potassium silicate @ 0.4 % with seaweed extract @ 4 % had the maximum number of fruits, fruit weight, fruit yield and fruit diameter during both the years and in pooled study. The lowest days for initiation of flowering were observed in potassium silicate @ 0.4 % with seaweed extract @ 4 % in pooled data. The least value for physiological loss in weight as well as maximum shelf life were recorded by potassium silicate @ 0.4 % with seaweed extract @ 4 % during both the years of investigation and in pooled study. However, the maximum fruit firmness was noticed in the treatment comprising of ortho silicic acid @ 0.2 % with seaweed extract @ 2 %, which was at par with application of potassium silicate @ 0.4 % with seaweed extract @ 4 % during 2017, 2018 and in pooled estimation. There was a marked improvement in fruit quality of papaya cv. 'Red Lady' under ortho silicic acid @ 0.2 % with seaweed extract @ 2 % as reflected by the maximum values recorded for total soluble solids, reducing sugars, total sugars, ascorbic acid and the lowest value for non reducing sugar during 2017, 2018 and in pooled results. The above treatment was at par with the application of potassium silicate @ 0.4 % with seaweed extract @ 4 % for all the quality traits in individual years as well as pooled study. The highest values for organoleptic parameters *i.e.* color, texture, flavor, taste, general appearance and overall acceptability of papaya fruits were recorded under ortho silicic acid @ 0.2 % with seaweed extract @ 2 %. However, it was found at par with potassium silicate @ 0.4 % with seaweed extract @ 4 %

during 2017, 2018 and in pooled results. Foliar application of potassium silicate @ 0.4 % with seaweed extract @ 4 % resulted in the maximum leaf nutrient content *i.e.* nitrogen, phosphorus and potassium in individual years and in pooled analysis. Pest and disease incidence *i.e.* papaya ring spot virus and number of aphids per plant was significantly lowest when papaya plants were sprayed with potassium silicate @ 0.4 % with seaweed extract @ 4 % (T_9) in pooled estimation. The maximum net realization (Rs. 12,16,468) was obtained by the application of potassium silicate @ 0.4 % with seaweed extract at 4 % followed ortho silicic acid @ 0.2 % with seaweed extract at 2 % with Rs. 11,01,798. Thus, it can be concluded that foliar application of potassium silicate (0.4 %) and seaweed extract (4 %) at 3, 4, 5 and 6 months of planting improved growth, induced early flowering, enhanced the production, improved quality and reduced pest and disease incidence in papaya cv. 'Red Lady'.

10. Name of the student : Chaudhary Abhijit D. (04-01326-2012)
Year of completion of degree : 2020
Name of the major advisor : Dr. T. R. Ahlawat
Title of thesis : Effect of de-blossoming on different mango (*Mangifera indica* L.) varieties for the induction of off season flowering

Abstract

The experiment entitled, "Effect of de-blossoming on different mango (*Mangifera indica* L.) varieties for the induction of off season flowering" was conducted at Agriculture Experimental Station, Navsari Agriculture University (NAU), Paria, Gujarat during 2013-14 and 2014-15. A field experiment comprising of two factors *viz*. three de-blossoming treatments *i.e.* foliar application of NAA 400 ppm (T_1), NAA 800 ppm (T_2), manual de-blossoming (T_3) as well as control (T_4) and six varieties *i.e.* Amrapali (V_1), Baramasi (V_2), Neelphonso (V_3), Neelum (V_4), Ratna (V_5) and Totapuri (V_6) were evaluated for their off-season flowering and fruiting characteristics in FRBD with three replications.For the sake of brevity, results are stated on pooled basis. Results indicated that hand de-blossoming registered significantly higher values for number of flowering shoots per tree, hermaphrodite and male flower ratio, number of fruits at pea stage, number of fruits retained at marble stage and minimum days to 50 % flowering as compared to chemical de-blossoming. Yield parameter like number of fruits harvested at mature stage twig, number of fruits per tree, seasonal yield and marketable yield were significantly higher in hand de-blossoming (T_3). Similarly, fruit weight, fruit volume and TSS were also significantly higher under hand de-blossoming (T_3). Moreover, de-blossoming failed to exert significant influence on maturity days, biochemical parameters of fruit quality, organoleptic parameters, pest and disease incidence and physiological disorders. Amrapali (V_1) and Totapuri (V_1) varieties failed to flower in off-season and the remaining varieties flowered in between the second and fourth week of May. Among those varieties which flowered in the off-season, Neelum (V_4) recorded significantly maximum values for number of flowering shoots per tree and hermaphrodite and male flower ratio. The same varieties were found significantly the best with respect to yield parameters *viz.* number of fruits per tree, seasonal yield (kg/tree) and marketable yield (kg/tree) during the off-season. Similarly, the variety Neelphonso (V_3) recorded significantly the highest Total Soluble Solids and sensory characters *i.e.* taste, flavour, texture, acceptance and appearance with minimum acidity content in fruits. Moreover, varieties failed to exert any significant effect on pest and disease incidence and physiological disorders during off-season. Hand de-blossoming in Neelum (T_3V_4) proved to be significantly superior over all other combinations for number of flowering shoots per tree, number of fruits per tree, seasonal yield and marketable yield (kg/tree) during off-season. From the economic view

point, higher net realization and benefit cost ratio was observed in hand de-blossoming in Neelum (T_3V_4). The second best treatment was de-blossoming in Neelphonso.

VEGETABLE SCIENCE

11. Name of the student : More Sanket Jijabrao (04-1340-2012)
Year of completion of degree : 2016
Name of the major advisor : Dr. K. N. Chaudhari
Title of thesis : Line x tester analysis over environments in okra (*Abelmoschus esculentus* (L.) Moench)

Abstract

In the present investigation, information on the magnitude of heterosis, combining ability and its interactions with locations, G x E interactions and stability parameters was obtained for fruit yield per plant and its related components following line x tester mating design involving 14 diverse varieties/strains of okra (*Abelmoschus esculentus* L. Moench). The 14 parents and their 40 resultant F_1s with one standard check (Sonakshi) were tested for nineteen traits under three environments *viz*; Summer – 2014 (E_1), *Kharif* 2014 – 15 (E_2) and *Rabi* 2014 – 15 (E_3) at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari in a Randomized Block Design with three replications.

Significant difference existed among the parents and hybrids, indicating considerable genetic variation among these genotypes for fruit yield and its components.

Highly significant and desirable heterosis over standard check for fruit yield and its component traits suggested that there is an ample scope of exploiting heterosis commercially and possibility of isolating desirable segregants. The cross VIO 47672 x GJO – 3 manifested the highest heterosis (33.33 %) over standard check with high fruit yield per plant followed by IC – 045796 x GJO – 3 (22.83 %) and IC – 111493 x GJO – 3 (22.27 %). Heterotic effect for fruit yield per plant was found to be associated with heterosis for its related traits in majority of the crosses.

Combining ability analysis revealed that non-additive variances were significant for fruit yield per plant and its related traits indicated their involvement in the expression of various traits. The magnitude of non-additive variance was higher for fruit yield per plant and its contributing traits indicated predominant role of non-additive gene action in the inheritance of the traits.

None of the parents was good general combiner for all the traits under study. Out of 14 parents, among females, IC – 111493 (13.56), IC – 045796 (16.45) and VIO 47672 (33.91) while, among males, GJO – 3 (11.58) and GAO – 5 (4.58) were good general combiners for fruit yield per plant and related traits. The hybrids, VIO 47672 x GJO – 3 (1.77), IC – 045796 x GJO – 3 (2.10), IC – 111493 x GJO – 3 (2.10) and IC – 045796 x GAO – 5 (1.68) having high *SCA* effects for fruit yield per plant also registered high and desirable *SCA* effects for number of branches per plant, number of fruits per plant, fruit length, fruit diameter and fruit weight. Expression of heterosis for fruit yield and its components was related to *GCA* effect of parents. High heterotic crosses for various traits involved at least one parent with high *GCA* effect. A fairly close and positive association between *per se* performance and combining ability in both parents and hybrids was observed for fruit yield per plant. The crosses which depicted high *SCA* effects for fruit yield and its attributes were in general result of combinations of parents with good x good combiners.

Highly significant G x E interaction for majority of the traits indicated differential response of genotype to varied environments. Both linear and non-linear components were

found important in building up total G x E interactions. The parents IC – 111493, IC – 045796, VIO 47672, GJO – 3 and GAO – 5 were found to be average stable with good (high) *GCA* effect for fruit yield per plant and its attributes. Among 55 genotypes 9 crosses were found to be stable for fruit yield per plant owing to high mean, regression coefficient near unity and least deviation from regression. Among hybrids, IC – 045796 x GAO – 5 (249.26 g) had high mean fruit yield per plant with regression coefficient near unity and non-significant deviation from regression. It also manifested average stability for days to first flowering, number of fruits per plant, number of pickings and total fruit yield followed by the cross VIO 47672 x GAO – 5 (241.57 g), manifested average stability for days to first flowering, number of pickings and fruit weight.

Non additive effect played significant role in the inheritance of fruit yield and its components. Therefore, it is suggested that bi-parental mating system could be followed for accumulation of additive gene effect and breaking up desirable linkage in order to exploit both additive and non additive gene effects.

12. Name of the student : Wakhare Avinash Ramdas (04-0884-2010)

Year of completion of degree : 2016

Name of the major advisor : Dr. D. T. Desai

Title of thesis : Effect of different levels of potassium and sulphur on growth, yield, quality and storage life of garlic (*Allium sativum* L.) cv. G-41

Abstract

A field experiment was conducted for study the effect of different levels of potassium and sulphur on growth, yield, quality and storage life of garlic (*Allium sativum* L.) cv. 'G-41' , which was grown during the *rabi* season of two consecutive years *i.e*. 2011-12 and 2012-13 at the Directorate of Onion and Garlic Research (DOGR), Rajgurunagar, Pune, (Maharashtra). There were four levels of potassium *viz*. K_0 (0 kg K_2O ha^{-1}, control), K_1 (50 kg K_2O ha^{-1}), K_2 (75 kg K_2O ha^{-1}) and K_3 (100 kgK_2O ha^{-1}) and four levels sulphur S_0 (0 kg S h^{-1}a, control), S_1 (20 kg S ha^{-1}), S_2 (40 kg S ha^{-1}) and S_3 (60 kg S ha^{-1}) and their combinations (16 Nos.) were employed in this study. The experiment was laid out in factorial randomized block design with three replications. The experimental soil was clayey in nature, low in available nitrogen (186 and 168 kg ha^{-1}), low in available in phosphorus (13 and 12kg ha^{-1}), fairly rich in available potash (455 and 435 kg ha^{-1}) and medium in available sulphur (13 and 11 mg kg^{-1}) and pH (8 and 8.1) respectively in both years of experiment. The data on various growth characters were observed at 30 days interval from 30 to 90 days after planting. The yield and yield contributing traits were recorded at the time of harvest. The biochemical parameters were also studied after harvest. The contents of major, secondary and minor nutrients were analysed and the uptake was calculated.

Growth, yield, quality and storage life of the garlic was influenced by different levels of potassium and sulphur.

The results revealed that, fertilizing the garlic crop with potassium at 100 kg K_2O ha^{-1} showed its superiority with respect to all growth parameters, yield attributes, quality parameters, storage life and highest plant and soil nutrient uptake of garlic crop. The same treatment K_3 (100 kg K_2O ha^{-1}) had recorded the highest marketable yield (85.11 q ha^{-1}), with net profit (Rs. 2,16396.56 ha^{-1}) and B: C ratio (2.59).

Among four levels of sulphur fertilizer, application of sulphur at 60 kg S ha^{-1} (S_3) recorded significantly the higher values of almost all the growth, quality, storage parameters and higher plant and soil nutrient uptake of garlic crop. Further, this sulphur level (60 kg S

ha^{-1}) also produced higher marketable bulb yield (78.60 q ha^{-1}), with net profit (Rs. 1,89, 366.57 ha^{-1}) and B: C ratio (2.39).

Based on the last two years results, it was found that combination of potassium 100 kg ha^{-1} plus sulphur 60 kg ha^{-1} recorded higher marketable yield (90.21q ha^{-1}) with net profit (Rs. 2,42,448.48 ha^{-1}) and B: C ratio (2.72).

13. Name of the student : Chaudhari Bhaveshkumar Natvarlal (04-1324-2012)
Year of completion of degree : 2016
Name of the major advisor : Dr. A. I. Patel
Title of thesis : Line x tester analysis over environments in brinjal (*Solanum melongena* L.)

Abstract

In the present investigation, information on magnitude of heterosis, combining ability and stability parameters were obtained for fruit yield and its related components in brinjal adopting Line x Tester analysis involving twelve females, three males and their resultant 36 hybrids of brinjal, tested at three research stations of the university during late *Kharif* 2014-15 in a randomized block design with three replications.

The analysis of variance for all the traits revealed presence of considerable genetic variability in the material studied. Appreciable influence of environment was also noticed. Females contributed the maximum to the parental variation as compared to males for majority of the traits. The interactions of hybrids x environments were significant for all the traits except days to 50 per cent flowering which revealed that the hybrids were sensitive to environments.

Highly significant positive standard heterosis for fruit yield and its component characters in the crosses involving elite lines as the parents suggested good scope of exploiting heterosis commercially and also possibility of isolating desirable segregants. The cross combinations, *viz.*, JBL-08-08 x NSR-1 (33.47 per cent), AB-09-1 x NBB-1 (28.20 per cent), GBL-1 x NSR-1 (23.52 per cent) and GBL-1 x NBB-1 (17.25 per cent) showed highly significant standard heterosis in positive direction for fruit yield in brinjal.

Combining ability analysis revealed that both additive and non- additive variances were significant for days to 50 per cent flowering and average fruit weight. The magnitude of variance for *SCA* was higher then variance for *GCA* for fruit yield per plant and its contributing traits indicating predominance role of non-additive gene action in the inheritance of the traits. Hence, in such cases heterosis breeding or any other breeding programmes which utilizes combining ability information could be used. The combining ability studies indicated that parents *viz.*, JBL-08-08, JBL-10-4, GBL-1 and AB-09-1 were good general combiners since they had high *GCA* effects for yield and other related characters. High *SCA* effects for fruit yield per plant were shown by JBl-08-08 x NSR-1 and AB-09-1 x NBB-1 with high *per se* performance. The frequency and magnitude of heterotic hybrids was the maximum in combination of good x average (g x a) hybrids.

Analysis of variance for stability parameters revealed that the differences among genotypes and environments were highly significant for all the characters when tested against pooled error and pooled deviation. The differences due to genotype x environment were highly significant when tested against pooled deviation for plant height, days to 50 per cent flowering, average fruit weight, number of fruits per plant, fruit yield per plant and ascorbic acid. The analysis further revealed that component of G x E (linear) had important contribution for all the characters indicating significant differences among the genotypes for their regression on environmental indices. In present experiment, none of the parent showed average stability for fruit yield per plant and its component characters, while, only one

cross, JBL-08-08 x NSR-1 had high mean value with average stability performance for fruit yield per plant. Parents as a group yielding slightly higher mean value as compared to hybrids.

14. Name of the student : Nanavare Prashant Ragunath (1020213005)
Year of completion of degree : 2016
Name of the major advisor : Dr. S. N. Saravaiya
Title of thesis : Genetic architecture of fruit yield and its contributing quantitative traits in okra (*Abelmoschus esculentus* (L.) Moench)

Abstract

The present investigation was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during late kharif- 2015 with a view to study the genetic parameters viz., gene action, heterosis, inbreeding depression, heritability and expected genetic advance of four crosses (each having P_1, P_2, F_1, F_2, BC_1 and BC_2 generations) in a Compact family Block Design with three replications. The analysis of variance for fruit yield per plant and its component traits revealed significant differences among generations in all the characters studied in all the four crosses. The significance of scaling tests (A, B, C and D) indicated appreciable amount of epistasis present in different characters of four crosses under study, indicated the failure of a simple genetic model to explain the genetic system controlling the traits studied in all the four crosses. The estimates for gene effects with cross I (Arka Abhay × GAO-5) revealed the importance of additive, dominance, additive × additive and dominance × dominance gene effects for days to 50 % flowering, plant height, stem diameter, number of node at which 1st flower appear, number of branches per plant and fruit yield per plant; additive for fruit length and 100 seed weight; additive and dominance × dominance gene effects for number of seeds per fruit; dominance, additive × additive and dominance × dominance gene effects for number of fruits per plant; additive, dominance and additive × additive gene effects in fruit diameter. In cross II (GJO-3 × VRO-6) inheritance of the traits *viz.*, days to 50 % flowering, fruit yield per plant and fruit length was influenced by additive, dominance, additive × additive and dominance × dominance gene effects; additive, additive × additive and dominance × dominance gene effects for plant height; dominance, additive × additive and dominance × dominance gene effects were observed for number of node at which 1st flower appear, fruit diameter, number of fruits per plant, number of seeds per fruit and 100 seed weight; additive, dominance and additive × additive gene effects in stem diameter; additive in internodal length and number of branches per plant. In cross III (Phule Utkarsha × GAO-5) the estimates of gene effects revealed additive, dominance, additive × additive and dominance × dominance gene effects for fruit yield per plant and number of fruits per plant; additive, dominance and additive × additive gene effects for number of branches per plant; dominance, additive × additive and dominance × dominance gene effects for productive plant height, internodal length, number of seeds per fruit and 100 seed weight; additive × additive and dominance × dominance gene effect for number of node at which 1st flower appear; additive, along with dominance × dominance epistasis for fruit length; additive and dominance gene effects for fruit diameter; dominance × dominance for days to 50 % flowering and only additive gene effect for stem diameter. The estimates of gene effects revealed importance of different gene effects with different characters in cross IV (P-8 × VRO-6) as; only dominance gene effect was reported for node at which 1st flower appear and only additive gene effect for number of seeds per fruit; additive, dominance, additive × additive and dominance × dominance gene effects for plant height; additive, dominance and additive × additive gene effects for fruit yield per

plant; additive, dominance and dominance × dominance gene effects for stem diameter; dominance and additive × additive as well as dominance × dominance gene effects for days to 50 % flowering and 100 seed weight; dominance and additive × additive gene effects for internodal length and number of fruits per plant; additive and dominance × dominance gene effects for number of branches per plant and number of fruits per plant. Highly significant and positive heterosis over mid parent and better parent was recorded for days to 50 per cent flowering, number of nodes at which first flower appear, fruit yield per plant, fruit length, fruit diameter, number of fruits per plant and number of seeds per fruit by Arka Abhay × GAO-5, GJO-3 × VRO-6 and Phule Utkarsha × GAO-5. Crosses which depicted significant and positive heterosis for fruit yield per plant also exhibited significant and positive heterosis for its component traits which indicated that heterotic effect for fruit yield per plant was mainly due to manifestation of heterosis in yield components. The crosses which exhibited heterosis for fruit yield per plant and yield contributing traits also depicted significant inbreeding depression which revealed association between heterotic effects and inbreeding depression. The estimates of broad sense heritability for fruit yield per plant and its attributes were in general high in all crosses. The high, moderate to low estimates of narrow sense heritability was observed for fruit yield per plant and its components. The high narrow sense heritability was recorded by the cross Phule Utkarsha × GAO-5 and GJO-3 × VRO-6 whereas the crosses Arka Abhay × GAO-5 and P-8 × VRO-6 had moderate to low estimate for fruit yield per plant and its attributes. In general, crosses which expressed moderate narrow sense heritability for fruit yield per plant also had high to moderate estimates for yield contributing traits. The higher estimates of heritability indicates that these traits were comparatively less affected by environment and their phenotype is good reflection of genotype and thus possessed paramount importance in making selection of superior genotype on the basis of phenotypic performance of these matric traits but in case of lower heritability, pedigree, sib or progeny test can be employed to improve it. The high genetic advance was reported in crosses viz., Arka Abhay × GAO-5 and Phule Utkarsha × GAO-5 for fruit yield per plant. Moderate to low magnitude of genetic advance was recorded for majority of traits under study. In general, involvement of both additive and non-additive gene effects, moderate magnitude of desirable relative heterosis and heterobeltiosis, moderate to high heritability coupled with moderate/high expected genetic advance for most of the characters suggested that it would be desirable to follow cyclic method of breeding involving conventional breeding approach of selection of superior recombinants and their inter se mating for the development of elite homozygous recombinants having high quality and high yielding potentiality.

15. Name of the student : Savale Sandeep (1020213010)
Year of completion of degree : 2016
Name of the major advisor : Dr. A. I. Patel
Title of thesis : Studies on heterosis, combining ability and stability for yield and quality traits in tomato (*Solanum lycopersicum* L.)

Abstract

In the present investigation, information on magnitude of heterosis, combining ability and stability parameters were obtained for fruit yield and its related components in tomato adopting line x tester analysis involving eight females and four males. Their resultant 32 hybrids along with 12 parents and one commercial check ‘Abhinav’ were tested at three research stations of the university (Navsari, Surat and Hansot) during late *Kharif*-2014-15 in a randomized block design with three replications.

The analysis of variance for all the traits revealed presence of considerable genetic

variability in the material studied. Appreciable influence of environments was also noticed. Males contributed maximum to the parental variation as compared to females for majority of the traits. The interactions of hybrids x environments were significant for all the traits except quality traits revealing that the hybrids were sensitive to environments for most of the traits.

Significant to highly significant and positive standard heterosis for fruit yield and its component characters in the crosses involving elite lines as the parents suggested that there is a good scope of exploiting heterosis commercially and also possibility of isolating desirable segregants. The cross combinations, *viz.,* AVTO-5 x GT-2 (19.69 per cent), AVTO-7 x GT-2 (13.53 per cent), AVTO-5 x JT-3 (13.04 per cent), JTL-12-12 x GT-2 (12.76 per cent) and JTL-12-12 x JT-3 (11.63 per cent) showed highly significant standard heterosis in positive direction for fruit yield and its one or more important component traits.

Combining ability analysis revealed that both additive and non additive gene actions were important for fruit yield and its related traits. However, magnitude of additive gene action was comparatively larger than that of non-additive gene action for fruit yield and its component traits. The estimates of *GCA* effects indicated that the parents *viz.,* AVTO-7, AVTO-5, JTL-12-12, GT-2 and JT-3 were good general combiners for fruit yield and its contributing characters. The cross AVTO-5 x GT-2 having the maximum *SCA* effect, *per se* performance, and standard heterosis for fruit yield and its component traits.

Analysis of variance for stability revealed that the differences among genotypes and environments were highly significant for all the characters when tested against pooled error and pooled deviation. The differences due to genotypes x environments were significant when tested against pooled deviation for all the characters (except days to 50 per cent flowering, titrable acidity, total sugar and non reducing sugar) indicated that genotypes were not responded consistently over the environments. The analysis further revealed that component of G x E (linear) had important contribution for all the characters (except days to 50 per cent flowering and titrable acidity) indicating significant differences among the genotypes for their regression on environmental indices. In present experiment, the parent AVTO-4 and cross, AVTO-6 x GT-2 exhibited high mean along with b_i value approaching unity together with low S^2d_i value for fruit yield.

16. Name of the student : Patel Krishna Dhirajlal (1020214011)
Year of completion of degree : 2017
Name of the major advisor : Dr. A. I. Patel
Title of thesis : Study of heterosis, combining ability and stability for yield and quality traits in tomato (*Solanum lycopersicum* L.)

Abstract

In the present investigation, information on magnitude of heterosis, combining ability and its interactions and stability parameters were obtain from fruit yield and its related components as well as quality parameters adopting half diallel analysis. The experimental materials consisting of nine genotypes and their resultant 36 F_1 hybrids with one commercial check (Abhinav) were tested in three different environments created using three different planting dates at R.H.R.S., ASPEE College of Horticulture and Forestry, N.A.U., Navsari during late *kharif*– 2015 to *summer*- 2016 in a randomized block design with three replications.

The analysis of variance for all the traits revealed presence of considerable genetic variability in the material studied. Appreciable influence of environment was also noticed. Both parents and hybrids interacted significantly with change in environments however

higher magnitude of variance due to hybrids x environments interactions for days to 50 per cent flowering, number of fruits per plant, fruit yield per plant, reducing sugar, total sugar and lycopene content revealed that hybrids were more sensitive to environmental fluctuations compared to their parents.

None of the hybrid exhibited significant standard heterosis for fruit yield. Cross combinations *viz*., AVTO-7 x JTL-12-08 and JTL-12-11 x AT-3 exhibited high standard heterosis in positive direction for fruit yield in all three environments. Higher positive heterosis for fruit yield and its component characters in the crosses involving elite lines as the parents suggested that there is a good scope of exploiting heterosis and also possibility of isolating desirable segregants.

Combining ability analysis revealed that both additive and non-additive gene actions were important for fruit yield and its related traits. However, magnitude of non-additive type of variances was high for fruit yield and its contributing traits indicating predominance role of non-additive gene action in the inheritance of the traits. The estimates of GCA effects indicated that parents *viz.,* JTL-12-08, JTL-08-16 and Arka Abha were good general combiners for fruit yield and its contributing characters. The cross JTL-12-11 x AT-3 had higher *per se* performance, SCA effects and standard heterosis for fruit yield.

Analysis of variance for stability revealed that the differences among genotypes and environments were highly significant for all the characters when tested against pooled error and pooled deviation. The differences due to genotype x environment interaction were significant to highly significant when tested against pooled error for most of the characters. The analysis further revealed that component of G x E (linear) had important contribution for most of the characters indicating significant differences among the genotypes for their regression on environmental indices. Parent AVTO -7 and hybrids AVTO-7 x JTL-12-08 followed by JTL-13-20 x AVTO-6 and AT-3 x Arka Abha exhibited average stability over the environments for fruit yield.

Looking to the resistance level against pest and disease, none of the genotype found to be resistant against fruit borer while, three parents and 16 hybrids found moderately resistant against ToLCV.

17. Name of the student : Kalariya Vijaysinh Dhanjibhai (1020215004)
Year of completion of degree : 2018
Name of the major advisor : Dr. D. R. Bhanderi
Title of thesis : Response of foliar application of micronutrients, novel organic liquid fertilizer and sea weed extract on okra [*Abelmoschus esculentus* L. (Moench)]

Abstract

The experiment entitled “Response of foliar application of micronutrients, Novel organic liquid fertilizer and sea weed extract on okra [*Abelmoschus esculentus* L. (Moench)]” was carried out during *kharif* season of 2016-17 and 2017-18 at the Vegetable Research Scheme, Regional Horticultural Research Station, Navsari Agricultural University, Navsari, Gujarat. The experiment was conducted on fixed plot site with a set of nine treatments *viz*., the treatments comprising of two level of micronutrient mixture (Grade - I) (T_1: Micronutrient mixture (Grade I) 1 % and T_2: micronutrient mixture (Grade I) 2 %); three level of Novel organic liquid fertilizer (T_3: Novel organic liquid fertilizer 0.5 %, T_4: Novel organic liquid fertilizer 1 % and T_5: Novel organic liquid fertilizer 1.5 %); three level of Sea weed extract (T_6: Sea weed extract 2 %, T_7: Sea weed extract 4 % and T_8: Sea weed extract 6 %) and control (T_9). The experiment was evaluated in Randomized Block Design (RBD).

Foliar treatment had a significant impact on almost all parameters included in the study. Among the different foliar treatments, Novel organic liquid fertilizer 1.5 % had significantly the higher values of growth parameters and yield attributes *viz*., plant height at 25, 50 and 75 DAS *i.e.* 41.13, 90.66 and 123.45 cm respectively, number of flowering nodes (18.10) on main stem at final harvest, number of primary branches per plant at 25, 50 and 75 DAS (2.78, 3.29 and 4.10 respectively), length of internodes at final harvest (6.92 cm), days to 50 % flowering (44.63 days), leaf area index (1.44), pod length (8.64 cm), pod diameter (1.43 cm), number of pods per plant (24.35), pod weight (11.45 g), number of pickings 20.13, marketable pod yield (kg/plant and t/ha) *i.e.* 0.280 and 15.537 respectively. Characters like 50 % flowering, pod length, and number of pickings were not significantly influenced by different foliar spray during both the year.

Significant differences were observed in the quality character of pod due to different foliar treatments. The lower crude fiber (10.15 %) recorded with the plant sprayed with novel organic liquid fertilizer 1.5 %. ascorbic acid (12.54 mg/100g) and chlorophyll (1.89 mg/g) contents of pod were significantly increased when plants were sprayed with micronutrient mixture @ 2 %. Whereas, treatment effects were found non-significant for leaf tissue analysis for nitrogen, phosphorus, and potassium content.

From, economic point of view, the highest net return with BCR value of 2.71:1 was achieved under the treatment T_5 (Novel organic liquid fertilizer 1.5 %) followed by Novel organic liquid fertilizer 1 %. Both these treatments (T_4 and T_5) were found economical, profitable and proved highly remunerative.

18. Name of the student : Patel Himani Biharilal (1020215011)
Year of completion of degree : 2018
Name of the major advisor : Dr. S. N. Saravaiya
Title of thesis : Response of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] to foliar application of PGRs

Abstract

A field experiment was carried out, with a view to study the "Response of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] to foliar application of PGRs" at Vegetable Research Scheme, Regional Horticultural Research Station of the Navsari Agricultural University, Navsari, Gujarat, India during summer 2016 and 2017 on cv. Pusa Navbahar. The experiment was conducted in a randomized block design (RBD) with 3 replications, which included 13 treatments namely, T_1: NAA 20 mg l^{-1}, T_2: NAA 40 mg l^{-1}, T_3: NAA 60 mg l^{-1}, T_4: GA_3 20 mg l^{-1}, T_5: GA_3 40 mg l^{-1}, T_6: GA_3 60 mg l^{-1}, T_7: Thiourea 250 mg l^{-1}, T_8: Thiourea 500 mg l^{-1}, T_9: Thiourea 750 mg l^{-1}, T_{10}: NAA 20 mg l^{-1} + GA_3 20 mg l^{-1}, T_{11}: NAA 20 mg l^{-1} + Thiourea 250 mg l^{-1}, T_{12}: GA_3 20 mg l^{-1} + Thiourea 250 mg l^{-1} and T_{13}: Control.

The results revealed that application of GA_3 20 mg l^{-1} recorded higher values for growth characters namely, plant height at 60 DAS (95.10 cm) and at 90 DAS (142.83 cm); number of leaves plant^{-1} at 60 DAS (18.50) and at 90 DAS (30.03); fresh weight of plant at 60 DAS (8.52 t ha^{-1}) and at 90 DAS (18.48 t ha^{-1}), dry matter content of plant at 60 DAS (1.58 t ha^{-1}) and at 90 DAS (2.90 t ha^{-1}) and stem diameter (1.79 cm) on pooled analysis basis except days to 50 % flowering.

Among pod characters; foliar application of PGR's significantly influenced different parameters. Among 13 treatments, T_4 (GA_3 20 mg l^{-1}) was found the best for number of clusters plant^{-1} (45.27), number of pods cluster^{-1} (4.63), number of pods plant^{-1} (197.57), pod length (10.91 cm), pod width (0.86 cm), pod weight (1.71 g) and number of seeds pod^{-1} (8.50) on pooled analysis basis.

On the other hand, PGR's also significantly influenced yield attributes namely: pod yield (13309.80 kg ha^{-1}) and harvest index (41.67 %) on pooled basis with the treatment of T_4 (GA_3 20 mg l^{-1}) in statistical analysis.

Results of plant growth analysis *viz.*, leaf area at 60 DAS (3402.07 cm^2 $plant^{-1}$) and at 90 DAS (4429.58 cm^2 $plant^{-1}$); leaf area index at 60 DAS (2.52) and at 90 DAS (3.28) and crop growth rate at 60-90 DAS (4.37 g m^{-2} day^{-1}) found significant on pooled basis except net assimilation rate at 60-90 DAS. Under all plant growth analysis, treatment T_4 (GA_3 20 mg l^{-1}) was found the best treatment.

Biochemical parameters like total chlorophyll content of leaves (498.41 mg 100 g^{-1}), protein content (3.93 %), carbohydrate content (13.59 %), crude fibre content (3.33 %), vitamin C content (55.17 %), dry matter content (22.67 %), moisture content (77.33 %) and ash content of cluster bean pod (1.85 %) found significant on pooled analysis basis. Treatment T_4 (GA_3 20 mg l^{-1}) found as a best treatment.

It is evident from the economics based on green pod yield, the maximum return was obtained from the foliar application of GA_3 20 mg l^{-1} with higher B: CR value of 2.1 followed by T_1 (B: CR value of 1.9).

By considering the statistical analysis, it is seen that treatment T_4 (GA_3 20 mg l^{-1}) at the time of 50 % flowering stage was found highly remunerative for growing of cluster bean cv. Pusa Navbahar for vegetable purpose.

19. Name of the student : Vashi Jimi Manharbhai (1020214017)

Year of completion of degree : 2018

Name of the major advisor : Dr. S. N. Saravaiya

Title of thesis : Response of greater yam (*Dioscorea alata* L.) to different growing conditions

Abstract

A field experiment was carried out, with a view to study the "Response of greater yam (*Dioscorea alata* L.) to different growing conditions" at Vegetable Research Scheme, Regional Horticultural Research Station of the Navsari Agricultural University, Navsari, Gujarat, India during the years 2015-2016 and 2016-2017. The experiment was conducted in Large Plot; analysis as CRD with factorial concept (FCRD) with three repetitions which included three growing conditions (G_1: Naturally Ventilated Poly house, G_2: Net house and G_3: Open field),three planting distance (D_1: 60 cm x 60 cm, D_2: 60 cm x 45 cm and D_3: 90 cm x 90 cm) and two varieties (V_1: Round type and V_2 : Long type).

The results revealed that Naturally Ventilated Poly house recorded higher values for growth characters namely, number of tillers at harvest (8.14), vine length at harvest (9.05 m), fresh weight of tuber (1678.21 g), bottom leaf chlorophyll content index (17.93), middle leaf chlorophyll content index (25.80) and top leaf chlorophyll content index (13.72). The yield characters *viz.*, tuber girth (28.28 cm), tuber length (22.02 cm), tuber yield $vine^{-1}$ (1.77 kg), tuber yield m^{-2} (2.55 kg) and tuber yield 1000 m^{-2} (2553.88 kg) and quality parameters like carbohydrate content (19.63 %), starch content (33.50 %), protein content (1.37 %), dietary fiber (2.03 %), ascorbic acid content (14.53 mg 100 g^{-1} edible portion), anthocyanin (21.45 %), and diosgenin (0.16 %) were found significant in Naturally Ventilated Poly house on pooled analysis basis.

Planting distance, D_2 (60 cm x 45 cm) significantly influenced on growth, yield and quality parameters like total number of tillers (7.32), vine length (8.04 m), fresh weight of tuber (1493.54 g), bottom leaf chlorophyll content index (16.24), middle leaf chlorophyll content index (23.21) and top leaf chlorophyll content index (12.98), tuber yield $vine^{-1}$ (1.54 kg), tuber yield m^{-2} (2.81 kg) and tuber yield 1000 m^{-2} (2810.79 kg), carbohydrate content

(18.37 %), starch content (32.24 %), protein content (1.35), ascorbic acid content (14.33 mg 100 g^{-1} edible portion) and diosgenin (0.15 %).

V_2 (Long type) exhibited significant effect on growth, yield and quality parameters in pooled analysis. Higher values for total number of tillers (6.68), vine length (7.26 m), fresh weight of tuber (1351.19 g), bottom leaf chlorophyll content index (14.95), middle leaf chlorophyll content index (21.21) and top leaf chlorophyll content index (12.42), light interception at 120 DAP (36877.63 Lux), light interception at 150 DAP (37901.35 Lux), light interception at 180 DAP (34440.00 Lux), tuber length (25.48 cm), tuber yield $vine^{-1}$ (1.36 kg), carbohydrate content (19.06 %), starch content (32.77 %), protein content (1.35), dietary fiber (2.13 %), ascorbic acid content (14.34 mg 100 g^{-1} edible portion) and diosgenin (0.14 %) were noticed on the pooled analysis basis.

Significantly higher tuber yield 1000 m^{-2} (4037.13 kg) was achieved in the treatment combination of $G_1D_2V_2$ (Naturally Ventilated Poly house x Planting distance 60 cm x 45 cm x Long type) concern to benefit : cost ratio, it was recorded highest *i.e.* 4.36 in the treatment combination of $G_3D_2V_2$ (Open field x Planting distance 60 cm x 45 cm x Long type) which was followed with $G_3D_1V_2$ (Open field x Planting distance 60 cm x 60 cm x Long type) with the benefit : cost ratio of 3.61.

Economics point of view with 65 % subsidy, highest benefit: cost ratio 4.63 was recorded in treatment combination $G_2D_2V_2$ (Net house x Planting distance 60 cm x 45 cm x Long type) which was followed by the treatment combination $G_1D_2V_2$ (Naturally Ventilated Poly house x Planting distance 60 cm x 45 cm x Long type) with benefit: cost ratio of 4.42.

Same trend was also observed in economics consider with 75 % subsidy, where treatment combination $G_2D_2V_2$ (Net house x Planting distance 60 cm x 45 cm x Long type) recorded maximum benefit: cost ratio of 5.36 which was followed by treatment combination $G_1D_2V_2$ (Naturally Ventilated Poly house x Planting distance 60 cm x 45 cm x Long type) with benefit: cost ratio of 5.24.

20. Name of the student : Ganta Koteswara Rao (1020216003)
Year of completion of degree : 2019
Name of the major advisor : Dr. N. B. Patel
Title of thesis : Morphological, biochemical and molecular characterization in greater yam (*Dioscorea alata* L.)

Abstract

The present investigation entitled "Morphological, biochemical and molecular characterization in greater yam (*Dioscorea alata* L.)" was carried out with 27 genotypes for 56 characters at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) in two seasons during *kharif* 2017-18 and 2018-19. All the genotypes were evaluated using RBD design with three replications; to find out genetic variability, correlation, path coefficients and genetic as well as molecular divergence.

The morphological characterization for nineteen characters revealed high variation among the genotypes, in terms of shape of leaf, position of leaf, distance between lobes, colour of wing, stem and leaf, pigmentation of petiole on leaf base, formation of aerial tuber, skin and flesh colour of underground tuber, shape of tuber, presence of hairiness on tuber and spines on stem.

Analysis of variance for pooled over season revealed significant genotypic differences for all the characters under study indicating presence of wide range of variation in the material for all the characters.

Higher magnitudes of PCV and GCV observed for anthocyanin followed by total

sugars, length of tuber, width of tuber, tuber yield per vine and protein % indicating the existence of wide range of genetic variability in the germplasm for these traits.

High heritability coupled with high genetic advance as per cent of mean for width of tuber followed by length of tuber, weight of tuber, days to first sprouting, days to 50 % sprouting, vine length, number of tubers per vine, tuber yield per vine, protein %, total sugars % and anthocyanin indicated that the characters were controlled by additive gene action and selection would be effective.

A highly significant and positive association was noticed between yield per vine with traits like harvesting time, length of leaf, width of leaf, length of petiole, vine length, number of tubers per vine, weight of tuber and length of tuber at both genotypic and phenotypic levels indicating that these attributes were mainly influencing the tuber yield in greater yam.

Path coefficient analysis revealed that harvesting time had the highest positive direct effect on tuber yield per vine followed by weight of tuber, days to first sprouting, days to 50 % sprouting, width of leaf, internode length, number of tubers per vine, starch and anthocyanin. Direct selection practiced on these characters will result in improvement in tuber yield. The traits like length of leaf, length of petiole, vine length, vine diameter, number of branches per vine, length of tuber, width of tuber, protein % and total sugars % had negative direct effect on tuber yield per plant.

The results of Mahalanobis's D^2 statistics revealed wider genetic diversity among 27 genotypes and were grouped into eight clusters. The cluster II contained 10 genotypes followed by cluster I (9 genotypes) and cluster IV (3 genotypes). On the other hand, the clusters III, V, VI, VII and VIII were solitary.

Molecular study revealed the existence of considerable genetic diversity amongst different genotypes of greater yam. The RAPD markers were found more informative as compared to ISSR for discriminating different greater yam genotypes; therefore, RAPD can be better exploited for identification of different genotypes of greater yam, which will be ultimately useful in the improvement of the crop.

21. Name of the student : Velamala Sravani (1020217013)
Year of completion of degree : 2020
Name of the major advisor : Dr. S. N. Saravaiya
Title of thesis : Onion [*Allium cepa* L.] response to plant bioregulators

Abstract

The investigation entitled "Onion (*Allium cepa* L.) response to plant bioregulators" was carried out with 12 treatments namely, T_1: GA_3 25 mg l^{-1}, T_2: GA_3 50 mg l^{-1}, T_3: GA_3 75 mg l^{-1}, T_4: NAA 25 mg l^{-1}, T_5: NAA 50 mg l^{-1}, T_6: NAA 75 mg l^{-1}, T_7: GA_3 25 mg l^{-1} + NAA 25 mg l^{-1}, T_8: GA_3 25 mg l^{-1} + NAA 50 mg l^{-1}, T_9: GA_3 25 mg l^{-1} + NAA 75 mg l^{-1}, T_{10}: GA_3 50mg l^{-1} + NAA 50 mg l^{-1}, T_{11}: GA_3 75 mg l^{-1} + NAA 75 mg l^{-1} and T_{12}: Control in three replications using Randomized block design at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) during *rabi* 2018 and 2019.

The number of leaves per plant at 45 DATP (7.92), 60 DATP (8.75) and 90 DATP (9.42) and days to maturity (129.17) were found significant in pooled analysis under the treatment T_1 (GA_3 25 mg l^{-1}). Foliar application of GA_3 25 mg l^{-1} showed significant influence on average weight of bulb (83.89 g), polar bulb diameter (4.39 cm), equatorial bulb diameter (5.41 cm), bulb yield per net plot (19.97 kg), total bulb yield (47.55 t ha^{-1}), marketable bulb yield (42.70 t ha^{-1}) and bulb volume (84.85 cc) during individual year as well as in pooled analysis. Treatment T_7 (GA_3 25 mg l^{-1} + NAA 25 mg l^{-1}) showed

significant effect on bulb dry matter content (21.36 %).

Among physiological parameters, treatment T_1 (GA_3 25 mg l^{-1}) found best for leaf area index at 60 DATP (2.85), as well as harvest index (93.72 %) in pooled analysis. Crop growth rate at 60-90 DATP (5.11 g m^{-2} day^{-1}) with T_3 (GA_3 75 mg l^{-1}), net assimilation rate at 60-90 DATP (0.107 g cm^{-2} day^{-1}) with T_8 (GA_3 25 mg l^{-1} + NAA 50 mg l^{-1}) and biomass duration (1287.50 g days) with T_2 (GA_3 50 mg l^{-1}) were found significant in pooled analysis.

Biochemical parameters *viz*., chlorophyll content of leaves 45 DATP (1.06 mg 100 g^{-1}), 60 DATP (2.64 mg 100 g^{-1}), 90 DATP (2.32 mg 100 g^{-1}), ascorbic acid (10.45 mg 100 g^{-1}) were found significant with treatment T_1 (GA_3 25 mg l^{-1}). Whereas, phenols (61.77 mg 100 g^{-1}) and proteins (1072.54 mg 100 g^{-1}) under T_1 (GA_3 25 mg l^{-1}**)** as well as moisture content (83.98 %) under T_6 (NAA 75 mg l^{-1}) were found significant. The less weight loss percent (4 %) was observed with the treatment of T_1 (GA_3 25 mg l^{-1}) at 30 DAS.

The interaction of year × treatment was found significant in plant height at 45, 60 and 90 DATP, incremental plant height, bolters (%) (on weight basis), jointed bulbs (%) (on weight basis), A^+ grade bulbs (%), A grade bulbs (%), B grade bulbs (%), C grade bulbs (%), unmarketable bulbs (%), TSS, reducing sugars, total sugars, non-reducing sugars, bulb pH as well as PLW at 30 days after storage. It was found non-significant for number of leaves $plant^{-1}$ at 45, 60 and 90 DATP, days to maturity, average weight of bulb (g), polar bulb diameter (cm), equatorial bulb diameter (cm), bulb yield per net plot (kg), total bulb yield (t ha^{-1}), marketable bulb yield (t ha^{-1}), neck girth of bulb (cm), bulb volume (cc), dry matter content (%), leaf area index at 60 and 90 DATP, crop growth rate at 60-90 DATP, net assimilation rate at 60-90 DATP, harvest index (%), biomass duration (g days), chlorophyll content of leaves at 45, 60 and 90 DATP, proteins (mg $100g^{-1}$), phenols (mg $100g^{-1}$), ascorbic acid content (mg $100g^{-1}$), bulb moisture content (%) and PLW at 60 days after storage.

It was evident from the economics based on marketable bulb yield, the maximum returns was obtained under the treatment of foliar application of GA_3 25 mg l^{-1} at 30, 45 and 60 DATP with higher BCR value of 2.24.

FLORICULTURE AND LANDSCAPE ARCHITECTURE

22. Name of the student : Sahare Homraj Anandrao (04-1357-2012)

Year of completion of degree : 2015

Name of the major advisor : Dr. Alka Singh

Title of thesis : Varietal assessment of anthurium in greenhouse under South Gujarat condition

Abstract

The research work entitled "Varietal assessment of anthurium in greenhouse condition under South Gujarat condition" was conducted to study the existing variation with regard to morphological, postharvest physiological and biochemical, pathological and entomological problems and molecular aspects among different varieties of anthurium. These experiments were conducted during 2013-14 and 2014-15 years in the greenhouse complex and Laboratories of Floriculture and Landscape Architecture, Plant Pathology and Plant Molecular Biology and Biotechnology, ASPEE College of Horticulture and Forestry, N.A.U., Navsari. The data on different quantitative and qualitative parameters were statistically analyzed using Completely Randomized Design.

Xavia and Sante Royal exhibited excellent vegetative parameters like plant height (cm), plant area (cm^2), plant spread in East-West and North-South direction (cm) and number of leaves. Further, flowering parameters like flower spathe width (cm), flower

spadix length (cm), flower stalk diameter (mm), spathe length (cm), stalk girth (mm) and stalk length (cm) were also maximum in Xavia and Sante Royal. With regard to spathe angle and candle position, Xavia showed higher spathe angle and moment exhibited lower candle position. Xavia and Sante Royal exhibited maximum yield with higher numbers of flowers per plant and number of flowers per meter square area.

Correlation study of vegetative and flowering parameters as well as vase life and physiological, biochemical parameters were estimated. Flowers yield was strongly and positively associated with the characters namely plant height, number of leaves per plant, leaf area, flower diameter, stalk diameter and stalk length. Furthermore, the characters *viz.*, spathe length, spathe width and spadix length also exhibited significant positive correlation among themselves. Vase life exhibited highly significant positive correlation with protein, amino acid, total soluble sugar content in spathe tissue, phenol, total dissolved solids in spathe tissue, anthocynin, carotinoid, catalase activity, glutathione reductase, lipoxygenase, phenylalanine ammonialyase, guaicol peroxidase, polyphenol oxidase and superoxide dismutase, while it had significant negative correlation with electrolyte leakage and lipid peroxidation.

Physiology and biochemical parameters were studied in different varieties of anthurium at successive vase life stages till senescence for parameters like TSS, TDS, electrolytic leakage, lipid peroxidation, free amino acids, total phenols, protein, pigments and enzymatic activities like catalase, peroxidase, SOD, LOX, GR, PAL and PPO. The varieties Sante Royal, Xavia and Peruzzi performed better with respect to post harvest physiological and biochemical behaviour that contributed to enhanced vase life. Continued and high spathe sugar and protein levels, low amino acids, maintained catalase, peroxidise and SOD activity, low LOX activity and lipid peroxidation (in spathe tissue) along with well established and stabilized membrane integrity and cellular structure as indicated by lower electrolyte leakage, ultimately delayed spathe senescence and increased the longevity of the anthurium cut flowers in these varieties.

Varietal screening against two spotted spider mite *T. urticae*, revealed resistance in Sante Royal, Fire, Saffron, Jaffira, Sharan Peruzzi and Xavia varieties with no pest incidence while, Tropical and Savana with about 4.42 to 4.82 % pest index were found moderately susceptible and Cheers and Moments with 8.47 to 9.85 % disease index were highly susceptible. Further, varietal screening against blight (*Colletotichum gloeosporioides*) exhibited minimum per cent disease index in Xavia followed by Sante Royal, while Cheers showed maximum percent disease index followed by Fire. Based on this, Cheers and Fire were found to be highly susceptible to the blight while Xavia and Sante Royal indicated moderately resistant.

Molecular variability using RAPD markers showed six decamer primers produced a total of 84 scorable bands in the eleven genotypes of anthurium out of which 62 were polymorphic and 22 were monomorphic. The percentage of polymorphism ranged from a maximum of 87.5 % by OPA-18, OPB-03, OPC-01, OPD-12, OPE-17, OPF-13 to a minimum of 40.00 % by OPE-17. Genetic similarity and clustering pattern were obtained for different varieties of Anthurium based on RAPD data. The dendrogram obtained clearly indicated two distinct major clusters I and II. It is evident from the results that the lowest genetic similarity coefficient was 0.59 between cluster I and II. An UPGMA dendrogram was generated from the Jaccard's similarity values using NTSYS-pc software. Based on this dendrogram, Sante Royal - Peruzzi, Jaffira -Sharan were found parallel to each other indicating genetic similarity.

With regard to economics, variety Sante Royal and Xavia was found more profitable with respect to the highest net return and BCR as compared to other varieties. This research endeavor would be useful to the farmers regarding the vegetative and flowering performance of different varieties along with the information on disease and pest

resistance as well as quality flower production. Further, it will also be useful to the breeders to improve yield, flower quality, vase life and minimize post harvest losses in anthurium. Further, for screening and evaluation of anthurium varieties, post harvest quality should be an important criterion, looking to the availability of large number of anthurium varieties wherein information on their post-harvest parameters is meagre.

23. Name of the student : Palagani Neelima (1020213006)
Year of completion of degree : 2016
Name of the major advisor : Dr. Alka Singh
Title of thesis : Effect of bio fertilizers, chemicals and organic growth substances on vegetative growth, flowering and post harvest quality of gerbera (*Gerbera jamesonii* Hook.) var. Alcatraz under naturally ventilated polyhouse

Abstract

The research endeavour entitled "Effect of bio fertilizers, chemicals and organic growth substances on vegetative growth, flowering and post harvest quality of gerbera (*Gerbera jamesonii* Hook.) var. Alcatraz under naturally ventilated polyhouse" was conducted in two phase *viz.*, 1. Effect of bio fertilizer and foliaer spray of chemicals and organic growth substances on vegetative growth, flowering and postharvest quality of gerbera var. Alcatraz under naturally ventilated polyhouse and 2. Effect of post-harvest application of chemical growth substances on post harvest quality and life of gerbera var. Alcatraz. These experiments were conducted during 2013-14 and 2014-15, in Greenhouse complex and Laboratory of Floriculture and Landscape Architecture, ACHF, NAU, Navsari. Data regarding quantitative and qualitative parameters were analysed and the abstract of results are outlined under.

In experiment 1. Plants inoculated with bio fertilizers (B_1) *viz.*, Azotobacter and VAM and treated with foliar spray of spermine @ 25 ppm and vermiwash @ 4 % and their interaction recoreded higher vegetative growth *viz.*, plant height, number of leaves, number of suckers etc., improved flowering, maximised yield, improved postharvest physiological parameters *viz.*, water uptake, fresh weight and membrane stability index and biochemical parameters *viz.*, higher TSS and TDS, phenols, protein content, catalase and peroxidase enzyme activity in the petal tissue. These treatments ultimately extended the vase life of gerbera cut flowers and also recorded higher nutrient status in the soil as well as in the plant, higher per cent root colonization, spore count and relative mycorrhizal dependency indeed of gerbera. Further the same treatments realised the maximum net returns (3,92,013.33 and 3,81,013.33) and benefit cost ratio (0.91 and 0.89).

In Experiment 2, postharvest treatment of spermine @ 10 ppm as vase solution recorded higher water uptake, retained fresh weight of the flower and higher membrane stability index of the flower which was at per with or followed by 20 ppm salicylic acid. Further, spermine @ 10 ppm retained higher sugars, lower electrolytic leakage and free amino acids, maintained protein content and antioxidative enzyme activity, minimum lipid peroxidation higher anthocyanin content in the petal tissue and lignin content in flower stalk of gerbera which was at per with or followed by salicylic acid @ 20 ppm. Whereas, salicylic acid 20 ppm showed higher phenol content in the petal tissue which was at par with spermine @ 10 ppm. Vase life was extended to 17.33 and 16.50 days with spermine @ 10 ppm, which was followed by and at par with salicylic acid @ 20 ppm (T_8) in first year and second year (16.67 and 16.63 days, respectively) as compared to control (12.00 and 12.17 days) in both the year.

24. Name of the student : Tatte Sumathi (1020213011)

Year of completion of degree : 2016

Name of the major advisor : Dr. S. L. Chawla

Title of thesis : Effect of different media and foliar spray of primary nutrients on anthurium (*Anthurium andreanum*) var. Tropical under fan and pad type greenhouse

Abstract

The present investigation entitled "Effect of different media and foliar spray of primary nutrients on anthurium (*Anthurium andreanum*) var. Tropical under fan and pad type greenhouse" was conducted at Greenhouse Complex, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, during 2013-14 to 2014-15. The experiment was laid out in split plot design having five main plots of media *viz.*, cocopeat (M_1), cocopeat + perlite + vermiculite (8:1:1) (M_2), coconut fiber (M_3), coconut husk (M_4) and coconut husk + charcoal (3:1) (M_5) and five sub plots of primary nutrients (NPK) *viz.*, 30:10:10 (F_1), 12:61:40 (F_2), 13:40:13 (F_3), 19:19:19 (F_4) and 16:8:24 (F_5) NPK @ 0.2 % weekly application. Twenty five combinations of media and primary nutrients were replicated thrice. Influence of different growing media, nutrients and their combinations on growth, flowering, quality, yield and post harvest studies of anthurium were studied. The physico-chemical properties of each medium, including bulk density, porosity, pH, EC, organic carbon, available NPK of growing media and economics of treatments were also studied.

Results revealed that the growing media and primary nutrient spray (NPK) significantly influenced the vegetative growth, flowering and flower production of anthurium.

The results obtained, indicate that among various media, coconut husk + charcoal (3:1) *i.e.* M_5 was found better for all vegetative growth attributes like plant height, number of leaves, plant spread, leaf area, length of leaf petiole and suckers per plant of anthurium.

An advance flower bud appearance and early unfolding of spathe, maximum flower stalk length, flower stalk diameter, spathe length, spathe width, spadix length, spadix diameter, *in-situ* longevity, flowers per plant, flowers per plot, chlorophyll content in leaf and anthocyanin content in spathe was recorded in coconut husk + charcoal media (3:1). Ultimately plants grown in coconut husk + charcoal (3:1) media showed higher nitrogen, phosphorous and potassium content in leaf tissue. This media having good physico-chemical properties like low bulk density, high porosity, appropriate water holding capacity, high NPK in media, maximum organic carbon, low EC and pH as required by anthurium. Finally, plants grown in M_5 media showed good post harvest life by maximum total water uptake, retaining fresh weight, maintain total soluble sugars, total dissolved sugars, per cent absolute integrity and good quality.

Among weekly once spray of primary nutrients (NPK), 30:10:10 NPK @ 0.2 % (F_1) proved significantly better in all vegetative growth parameters like plant height, number of leaves, plant spread, leaf area, leaf petiole length, chlorophyll and nitrogen content in leaf and media as compared to other treatments. Advanced flower bud appearance and spathe unfolding was obtained in 12:61:40 NPK @ 0.2 % (F_2). All flowering and yield parameters *viz.*, flower stalk length, flower stalk diameter, spathe length, spathe width, spadix length, spadix diameter, *in-situ* longevity, flowers per plant, flowers per plot, and anthocyanin content in spathe were better in 12:61:40 NPK @ 0.2 % (F_2). Ultimately plants sprayed with 12:61:40 NPK @ 0.2% shown higher phosphorous and potassium contents in leaf tissue and media. Plants sprayed with 12:61:40 NPK @ 0.2 % also recorded good post harvest life by maximum total water uptake, retaining fresh weight, maintaining total soluble sugars, total dissolved sugars, per cent absolute integrity and good quality.

The combined application of coconut husk + charcoal (3:1) as media with 30:10:10 NPK @ 0.2 % (M_5F_1) improved the all vegetative characters, except, suckers per plant. Interaction of coconut husk + charcoal (3:1) with 12:61:40 NPK @ 0.2 % (M_5F_2) enhanced flowering, yield of flowers, nitrogen and phosphorous content in leaf, improved the chemical properties of media *viz.,* organic carbon, NPK content in media and post harvest life of anthurium.

As per the economic point of view, plants grown in coconut husk + charcoal media sprayed with 12:61:40 NPK @ 0.2 % (M_5F_2) recorded maximum BCR (1.33) and net realization (Rs. 505147.00 /- 560 m^2).

25. Name of the student : Kapadiya Dhruv Bhailal (1020214009)
Year of completion of degree : 2017
Name of the major advisor : Dr. Alka Singh
Title of thesis : Plant architecture and *in vivo* plant propagation protocol in *Euphorbia milii* for pot culture

Abstract

The research endeavor entitled "Plant architecture and *in vivo* plant propagation protocol in *Euphorbia milii* for pot culture" was conducted in two separate parts for two varieties *i.e.* 'Pink Bold Beauty' and 'White Centenary' during 2015-2017 at ATC of Soilless System, Department of Floriculture and Landscape Architecture, ACHF, NAU, Navsari, Gujarat. This investigation was conducted in two parts (A & B). Part- A was aimed at development of plant architecture model in *Euphorbia milii* which comprised of ten different treatments of plant growth enhancing chemicals including control and laid out in Completely Randomized Design (CRD) with three repetitions. Part – B was for the development of *in vivo* plant propagation protocol in *Euphorbia milii* which was conducted in two experiments. Experiment – 1 was based on the effect of pinching and different plant growth retardants on branching habit of *Euphorbia* plants to obtain quality planting material for rapid multiplication. Experiment – 2 was for the standardization of rooting media and IBA concentration for efficient rooting in *Euphorbia* cuttings. Both the experiments were framed out in Completely Randomized Design with Factorial concept (FCRD) and repeated thrice. The data recorded on various aspects were analyzed and the abstract of results is outlined as under.

In Part – A, plants sprayed with different plant growth enhancing substances significantly influenced various vegetative and flowering parameters as well as on overall appearance of plant in *Euphorbia milii* in varieties 'Pink Bold Beauty' and 'White Centenary'. Foliar application of silicon at 400 µl/l and salicylic acid at 3.0 mg/l recorded significantly higher vegetative growth *viz.* plant height, plant spread, number of branches, thicker stems, leaves, leaf area and higher leaf chlorophyll content. However, earliness in flower bud initiation (22.96 and 23.64 days) and opening of flowers (9.23 and 9.46 days) with improved flowering period (161.89 and 150.90 days), as well as delay in senescence and maximum *in situ* flower longevity (20.08 and 17.69 days) was observed with application of spermine at 30 mg/l that was at par with salicylic acid at 3.0 mg/l in both the varieties 'Pink Bold Beauty' and 'White Centenary', respectively. Plants treated with 3.0 mg/l salicylic acid achieved maximum number of inflorescence per plant with highest inflorescence diameter, flowers per inflorescence with improved flower size in both the varieties. Maximum anthocyanin content in petals (2.20) was observed with application of salicylic acid which was followed by silicon at 400 µl/l in variety 'Pink Bold Beauty'. Thus, the treatment of salicylic acid at 3.0 mg/l added overall visual appeal to *Euphorbia milii* as potted plant by improving plant architecture with quality inflorescence.

In case of Part – B in reference to Experiment – 1, pinching and foliar application of plant growth retardants significantly influenced vegetative and flowering growth of *Euphorbia milii* in both the varieties 'Pink Bold Beauty' and 'White Centenary'. Reduced plant height with thickest stem, increased plant spread with maximum branches and more number of leaves with reduced leaf area was observed in pinched plants treated with Alar at 300 mg/l. Maximum number of inflorescence with reduced diameter as well as prolonged flowering period and improved flower longevity was observed in pinched *Euphorbia* plants with foliar application of Alar at 300 and 200 mg/l. However, unpinched plants sprayed with Alar at 300 mg/l showed minimum days taken for bud initiation and flower opening with maximum number of flowers per inflorescence with increased flower size. Maximum number of cuttings (7.33 and 5.61) for propagation were obtained from pinched plants with foliar application of Alar at 300 mg/l followed by 200 mg/l in varieties 'Pink Bold Beauty' and 'White Centenary', respectively.

In Experiment – 2, rooting media and IBA application to *Euphorbia* cutting significantly influenced rooting and shoot growth of both the varieties. Cuttings treated with IBA (750 mg/l) as quick deep method and stumped in cocopeat media showed higher sprouting percentage with early sprouting, maximum number of shoots with more number of leaves. Cuttings of *Euphorbia* planted in cocopeat media after treatment of 750 mg/l IBA showed higher number of roots (15.04 and 14.97), longest roots per cutting (8.63 and 8.28) and higher survival percentage (90.28 and 95.67) in varieties 'Pink Bold Beauty' and 'White Centenary', respectively.

26. Name of the student : Patel Mukeshkumar Amrutbhai (04-117-2011)
Year of completion of degree : 2017
Name of the major advisor : Dr. S. L. Chawla
Title of thesis : Assessment of genetic diversity and stability in marigold (*Tagetes* spp.) under the South Gujarat conditions

Abstract

The present study entitled "Assessment of genetic diversity and stability in marigold (*Tagetes* spp.) under the South Gujarat conditions" was carried out during *Rabi* season (November 2014- April 2015) at three different locations *viz.*, Floriculture Research Farm, Navsari (Dist.- Navsari), Regional Rice Research Station, Vyara (Dist.-Tapi), Hill Millet Research Station, Waghai (Dist.- The Dangs) of Navsari Agricultural University. Twenty six (26) genotypes collected from diverse source comprising of 4 F_1 hybrids, 15 local genotypes and 7 open pollinated varieties were grown in a randomized block design (RBD) with three replications.

The analysis of variance for all the traits revealed the presence of considerable genetic variability in the materials studied. The phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all the traits studied, which indicated appreciable influence of environment. The high magnitude for genotypic and phenotypic coefficient of variation as well as high magnitude of broad sense heritability coupled with genetic gain was observed for the characters *viz.*, plant height (cm), number of secondary branches per plant, leaf area (cm^2), leaf biomass (g), photosynthetic rate ($\mu mol/m^2/sec$), flower weight (g), numberof flowers per plant, flower yield per plant (g), seed yield per plant (g) and carotenoid content (mg/100g), which indicated wide diversity and additive gene effects. These characters were less influenced by environment and direct selection for these traits would be effective for further improvement.

Correlation and path coefficient analysis indicated that the characters *viz.*, plant

height, number of primary branches per plant, photosynthetic rate, duration of flowering, flower weight, number of flowers per plant and harvest index exhibited positive significant correlation (genotypic and phenotypic) with flower yield per plant as well as exerted high positive direct effect on flower yield per plant. Thus, these are the important characters for deciding flower yield per plant and might be considered as selection indices in marigold improvement programme.

The results of Mahalanobis's D^2 statistics revealed that the twenty six marigold genotypes were grouped into seven divergent clusters. Cluster I had large population containing 10 genotypes. The highest inter cluster D^2 value was recorded between cluster III and IV, indicated that cross may be attempted between genotypes of these clusters to obtain new desirable recombinants in marigold. Among all the characters, the most important characters contributing to divergence were carotenoid content followed by leaf area and number of flowers per plant.

Analysis of variance for stability revealed that the differences among genotypes and environments were highly significant for all the characters when tested against pooled error and pooled deviation. The analysis further revealed that component of G x E (linear) had important contribution for plant height, number of secondary branches per plant, stem diameter, leaf area, leaf biomass, photosynthetic rate, days to first flowering, flower diameter, flower weight, number of flowers per plant, flower yield per plant and shelf life of flower indicating significant differences among the genotypes for their regression on environmental indices. Genotype Local Selection 13 showed high performance and bi value approaching unity together with comparatively low S_2 di value for flower yield per plant.

The results of the molecular characterization suggested that the marigold genotypes could be effectively categorized and characterized based on PCR amplification profile and as such, these traits could be utilized as good descriptors in the identification and maintenance of marigold genotypes. Cultivars belonging to a common cluster have fallen nearer to each other and *vice-versa*, thereby confirming the results of dendrogram.

27. Name of the student : Chavan Sachin Keshav (1020214004)
Year of completion of degree : 2018
Name of the major advisor : Dr. Alka Singh
Title of thesis : Genetic improvement and DNA finger printing studies in *Adenium obesum* (forssk) Roem & Schult.

Abstract

Studies on 'Genetic improvement and DNA finger printing of *Adenium obesum*' was carried at Dept. of floriculture, ACHF, NAU, Navsari in the year 2014 to 2017. Seven heterozygous female genotypes were crossed with three heterozygous male genotypes in 'Line x Tester' fashion. Primary selection pressure was applied on the segregating populations of all crosses to identify best genotypes.

Total 32 genotypes along with 21 hybrids, 10 parents and one local check were evaluated in naturally ventilated polyhouse. Genetic variability, standard heterosis, *per se* performance, combining ability effects of parents and hybrids were calculated for various 28 traits. Technique of 'RAPD' genetic markers was used to generate primary DNA finger prints of parent genotypes to derive information on genetic distances and to identify polymorphic RAPD primers.

Significant genetic variability was observed among all genotypes. Ultimate beauty of adenium plant is dependent on the density of cyme. There is a strong positive corelation of cyme density with number of flower buds and flowers per cluster. The range of variation for this trait was observed from 3.66 buds and flowers per cluster to 18.33 buds and flowers

per cluster. The phenotypic, genotypic and environmental variances for this trait were 16.02, 15.03, and 0.99, respectively while the PCV, GCV and ECV were 37.93, 36.75 and 9.44 per cent, respectively. High heritability (94 %) along with high genetic advance (73.30 %) was observed for this parameter.

Highest *per se* performance for number of flower buds and flowers per cluster was recorded by hybrid 'Mung Siam x Deang Udam Sap' (18.33). Same cross combination also recorded the highest percentage of standard heterosis (292.86 per cent). Cv. 'Mung Siam' was found to be best combiner (2.69) followed by 'Cv. Taiwan Dwarf' (2.36). Cross 'Arrogant x Vithoon's White' (3.74) was found be superior for specific combining ability. Genetic similarity matrix showed that genotype 'Deang Udam Sap' and 'Picotte' were found to be more genetically divergent genotypes followed by genotypes 'Deang Udam Sap' and 'Mor Lok Dok'.

Cross combination of parents 'Sudarshan x Double Sweet Heart' was observed to be the only one combination for 'number of petals per flower'. This combination gave 15 number of petals per flower, which in term of percent standard heterosis was 300 per cent. This is one of the most interesting and important finding of this research on the way of genetic improvement in adenium, particularly for development of 'rosy' (multipetaloid) form of adenium, which is in great demand as a balcony planter of houses.

RAPD analysis of ten parent genotypes revealed Cv. 'Deang Udam Sap' and 'Picotte' were found to be more genetically divergent genotypes followed by Cv. 'Deang Udam Sap' and 'Mor Lok Dok'. Cv. 'Double Sweet Heart' and 'Vithoon's White' were found to be genetically closest genotypes followed by Cv. 'Mor Lok Dok' and 'Picotte'. It was concluded five hybrids namely 'Mung Siam x Deang Udam Sap', 'Taiwan Dwarf x Double Sweet Heart', 'Mung Siam x Vithoon's White', 'Arrogant x Deang Udam Sap' and 'Picotte x Deang Udam Sap' were top five important hybrids for commercial traits like flower diameter, no. of flowers blooming once, no. of petals, low stomata density and *in situ* longevity and can be released for commercial interests. It was further also concluded that cross combinations namely 'Sudarshan x Double Sweet Heart', 'Arrogant x Double Sweet Heart', 'Mung Siam x Double Sweet Heart', 'Harry Potter x Double Sweet heart', 'Mor Lok Dok x Double Sweet heart' and 'Picotte x Double Sweet Heart' are important crosses as a rosy adenium.

28. Name of the student : Shah Hardikkumar P. (04-1119-2011)
Year of completion of degree : 2018
Name of the major advisor : Dr. Alka Singh
Title of thesis : Efficacy of foliar nutrients in *Dendrobium* orchid cv. Sonia 17

Abstract

The present investigation entitled "Efficacy of foliar nutrients in *Dendrobium* orchid cv. Sonia 17" was conducted in the naturally ventilated polyhouse at the floriculture farm of ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, consecutively for two years of 2014-15 and 2015-16. The plants were cultivated in the media of a coconut husk on a raised platform made up of plastic net on metal stand. Inorganic fertilizers were sprayed @ 0.2 % once in a week while organic fertilizers were sprayed @ 2 % once in a fortnight.

The experiment was laid out in a randomized block design with factorial concept, comprising of thirty six treatment combination consisting of three levels of nitrogen (10 %, 20 % and 30 %), three levels of potassium (10 %, 20 % and 30 %) and four different organic fertilizers *viz.* water, vermiwash (2 %), enriched banana psuedostem sap (novel) (2

%) and cow urine (2 %). The treatments were replicated thrice. Effect of these treatments on growth, flowering and physiology of plant and economics were studied.

The results indicated that nitrogen fertilizer treatment was significantly superior. The foliar application of 30 % nitrogen recorded significantly maximum plant growth parameters like plant height, number of leaves, leaf area and number of shoots per plant. The same treatment was also found highest in flowering parameters like days to first flower, inflorescence length, number of inflorescence per plant, number of florets per inflorescence, inflorescence longevity and post-harvest life of inflorescence. Similar trend was also observed in anthocyanin content in flower.

The foliar application of 30 % potassium gave maximum height of plant, number of leaves, leaf area and number of shoots per plant. Consequently, this treatment expressed increased inflorescence length, number of inflorescence per plant, number of florets per inflorescence, inflorescence longevity and post-harvest life of inflorescence. The same treatment also produced favourable effect on anthocyanin content of flower.

Dendrobium plant showed significant increase in vegetative parameters like height of plant, number of leaves, leaf area and number of shoots per plant, when sprayed with 2 % enriched banana psuedostem sap (novel) followed by 2 % cow urine. The same treatment had significant effect on all the flowering parameters *viz.* inflorescence length, number of inflorescence per plant, number of florets per inflorescence, inflorescence longevity and post-harvest life of inflorescence. Leaf chlorophyll content and anthocyanin content in flower were also found higher in same treatment.

From the economic point of view, the highest benefit cost ratio and net realization were obtained in foliar application of 30 % nitrogen and 30 % potassium @ 0.2 % at weekly interval with 2 % cow urine at fortnight interval on *Dendrobium* plant.

29. Name of the student : Ahir Manishbhai P. (04-1116-2011)
Year of completion of degree : 2019
Name of the major advisor : Dr. Alka Singh
Title of thesis : Suitability of some bulbous flowering crops to different salinity levels of irrigation water

Abstract

Investigation was carried out at Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, to study the, "Suitability of some bulbous flowering crops to different salinity levels of irrigation water" during 2013-14 and 2014-15. Study was conducted as pot trial with local soil which is clayey in texture and medium in availability of N, P_2O_5 and K_2O.

The experiment was laid out in completely randomized design having seven treatment combinations, comprising of six levels of salinity treatment of irrigation water along with control *viz.*, EC_{iw} 2.0 dS m^{-1}, EC 4.0 dS m^{-1}, EC 6.0 dS m^{-1}, EC 8.0 dS m^{-1}, EC 10.0 dS m^{-1}, EC 12.0 dS m^{-1} and BAW (Best Available water) as control. Three different bulbous flowering crops *viz.* Spider lily cv. Local, Tuberose cv. Prajwal and Gladiolus Cv. American Beauty were tested. The treatments were repeated quadruple. The effect of these treatments on plant growth parameters, flowering and yield parameters, biochemical parameters, chemical parameters and soil chemical parameters were studied.

The growth parameters *viz.*, plant height, number of leaves per plant, leaf area and root length were affected significantly due to different levels of salinity of irrigation water in all three bulbous flowering crops. Necrotic area percentage (NAP) was also increased with increase in salinity level of irrigation water in all the tested crops. Spider lily exhibited significantly reduced growth with salinity, eventhough; it displayed good visual appearance

up to 10.0 dS m^{-1} salinity level of irrigation water. Tuberose plants also appear good (Visual appearance) even at 6.0 dS m^{-1} salinity level without much affecting growth. While in case of gladiolus, above 2.0 dS m^{-1} salinity level, growth was prominently decreased.

In flowering parameters *viz.* number of flowers per plant/stalk, number of stalks per plant, number of spike per plant, bulbs/corms per plant and bulblets/ cormels per plant was significantly influenced by salinity levels of irrigation water. Spider lily gave good flowers per plant up to 8.0 dS m^{-1} salinity level. In case of tuberose, it gave higher number of spike up to 4.0 dS m^{-1} salinity level. Gladiolus yield was prominently decreased above 2.0 dS m^{-1} salinity level.

Biochemical parameters *viz,* chlorophyll content anthocyanin content, antioxidative enzyme activities *viz,* catalase (CAT), peroxidase (POD), superoxide dismutase (SOD), glutathione reductase (GR) and sucrose synthase (SuS); leaf mineral content *viz,* Na, Cl, K, Mg and SO_4 were significantly affected by different salinity levels of irrigation water. In all tested crops, chlorophyll content was reduced with increase in salinity level of irrigation water. In spider lily, antioxidative enzymatic activities *viz,* CAT, POD and SOD were increased up to 8.0 dS m^{-1} salinity level and then showed down fall, while the activities of GR and SuS were found non-significant. In tuberose, different enzyme *viz,* CAT, POD, SOD and GR activities were increased up to 4.0 dS m^{-1} salinity level, and then declined. In gladiolus, CAT, POD, SOD, GR and SuS activities were increased up to 2.0 dS m^{-1} salinity level and there after showed gradual reduction. Anthocyanin content in gladiolus tepals was also significantly decreased with increase in salnity level.

Leaf chemical analysis showed significant variation in all the tested crops. Leaf Na^+, Cl^- and SO_4^- content were significantly increased with increase in salinity level in all three bulbous flowering crops. Leaf K^+ and Mg^{2+} content was also prominently decreased with increase in salinity level in all three bulbous crops.

Soil chemical analysis after experiment showed significant variation in soil N, P_2O_5 and K_2O content; soil EC_e and ESP. Soil N, P_2O_5 and K_2O content were significantly increased with increase in salinity level of irrigation water during all three experiments. Soil pH was not much affected by saline water irrigation, but gradually increased with increase in salinity. Soil EC_e and ESP were also increased with increase in salinity level.

Based on the results of the above experiments, with the data on growth and flowering parameters, antioxidative enzyme activities and yield attributes indicates level of salinity tolerance in above three crops. Spider lily cv. Local has been found to be moderate salinity tolerant crop, tuberose cv. Prajwal as moderate salinity sensitive crop and gladiolus cv. American Beauty as salt sensitive crop. Hence, it can be suggested from the study that for the large barren saline tracks and coastal plains, spider lily cv. Local can be cultivated with the hope of large scale flower production as well as beautification.

30. Name of the student : Patel Henaxiben Babubhai (1020216008)
Year of completion of degree : 2020
Name of the major advisor : Dr. Alka Singh
Title of thesis : Standardization for production technology of potted hibiscus var. Red Double

Abstract

The research endeavor entitled “Standardization for production technology of potted Hibiscus var. Red Double” was conducted during 2016- 2019 at ATC of Soilless System, Department of Floriculture and Landscape Architecture, ACHF, NAU, Navsari, Gujarat. This investigation was conducted in three different segments, *viz.* Experiment 1:

Effect of hard wood and semi hard wood cutting, media and IBA treatments in rooting of hibiscus, Experiment 2: Effect of foliar spray of plant growth regulators on growth of potted hibiscus and Experiment 3: Effect of plant growth retardants on potted hibiscus. First experiment was framed out in Completely Randomized Design with Factorial concept (FCRD) and repeated thrice. Second and third experiment was laid out in Completely Randomized Design (CRD) with three repetitions. The data recorded on various aspects were analyzed and the abstract of results is outlined as under.

In Experiment - 1, type of cutting, IBA treatment and rooting media significantly, influenced shoot and root growth for propagation in hibiscus plants. As per pooled analysis hardwood cuttings showed higher percentage of sprouted cutting (73.66 %) with maximum number of leaves (4.79) at 30 days after spraying as compared to semi hard wood cutting. With regard to rooting media, minimum number of days to new sprout (7.80 days), maximum shoot length (6.47 cm) with maximum number of leaves (4.50 and 4.60 at 30 and 45 DAP) and maximum number of roots (15.77) and length of longest root (3.96 cm) per cutting after 45 days was observed in cutting stumped in pieces of floral foam media which was at par with cutting grown in cocopeat + perlite (9:1) media. Among all IBA treatments, 3000 ppm IBA (C_3) as quick dip method showed higher sprouting percentage (70.08) with early sprouting (6.85 days), maximum number of shoots (4.85 and 5.00 at 30 and 45 DAP) with maximum number of leaves (4.92 and 5.01 at 30 and 45 DAP) as well as enhanced root parameters like number of roots (18.51) and longest root per cutting (4.22 cm).

In Experiment - 2, plants sprayed with different plant growth regulators substances significantly influenced various vegetative and flowering parameters as well as plant pigments in plants of *Hibiscus rosa-sinensis*. Foliar application of 100 ppm GA_3 recorded higher vegetative growth *viz.* plant height (24.90, 26.77 and 28.93 cm), plant spread N-S direction (21.45, 22.82 and 23.52 cm) and E-W direction (20.00, 21.77 and 23.53 cm) and leaf area (15.55, 16.17 and 16.48 cm^2) respectively at 30, 60 and 90 days after spraying. Maximum number of branches (4.63, 5.45 and 6.02) and number of leaves (26.57, 31.33 and 35.65) are reported in plants sprayed with 50 ppm GA_3, respectively at 30, 60 and 90 days after spraying. However, maximum flower diameter (6.27, 6.73 and 6.97 cm), improved flowering period (128.2 days) and maximum *in situ* flower longevity (3.87, 4.07 and 4.10 days) were observed with application of 100 ppm GA_3 respectively at 30, 60 and 90 days after spraying. Maximum anthocyanin content in flowers (17.03, 18.65 and 20.20 mg/g) and chlorophyll content in leaves (19.50, 20.37 and 20.85 mg/g) was observed with application of 100 ppm GA_3 respectively at 30, 60 and 90 days after spraying.

In case of Experiment - 3, foliar application of plant growth retardants significantly influenced vegetative and flowering growth of *Hibiscus rosa-sinensis*. Reduced plant height (14.05, 16.87 and 18.87 cm), plant spread N-S direction (14.12, 17.02 and 19.90 cm) and E-W direction (14.42, 16.53 and 18.08 cm) and minimum leaf area (2.42, 2.57 and 2.75 cm^2) was found in plants treated with 75 ppm paclobutrazol respectively at 15, 30 and 60 days after spraying. Maximum branches (2.63, 4.77 and 5.50) and more number of leaves (29.60, 33.78 and 37.48) were observed in plants treated with foliar application of 3000 ppm cycocel respectively at 15, 30 and 60 days after spraying. Maximum number of flowers per plant (6.38, 6.87 and 7.17) with maximum flower diameter (5.81, 6.25 and 6.52 cm) as well as prolonged flowering period (129.3 days) and improved flower longevity (2.40, 2.80 and 3.23 days) was observed in plants treated with foliar application of 3000 ppm cycocel respectively at 15, 30 and 60 days after spraying. However, plants sprayed with 3000 ppm cycocel showed maximum chlorophyll content in leaves (17.72, 19.77 and 21.28 mg/g) and increased anthocyanin in flower (13.58, 16.43 and 17.70 mg/g) respectively at 15, 30 and 60 days after spraying.

31. Name of the student : Mamilla Sindhuja (1020217006)

Year of completion of degree : 2020

Name of the major advisor : Dr. Alka Singh

Title of thesis : Morphological, physiological, biochemical and molecular variability study in different genotypes of *Adenium obesum* (Forssk.) Roem. & Schult.

Abstract

The present investigation entitled, "Morphological, physiological, biochemical and molecular variability study in different genotypes of *Adenium obesum* (Forssk.) Roem. & Schult." was carried out at the Department of Floriculture and Landscape Architecture and Forestry Biotechnology Laboratory, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat during 2017 to 2019. The experiment was laid out in randomized block design with three replications thirty three genotypes as treatments.

Analysis of variance for pooled over year revealed significant genotypic differences for all the characters under study indicating presence of wide range of variation in the material for all the characters.

Higher magnitude of PCV and GCV observed for total number of flowers per plant per year, number of petals per flower, weight of flower, number of branches per plant, number of flower buds and flowers per cluster, number of leaves per plant and *in-situ* longevity which indicated wider diversity for these characters and the selection for these traits would be effective as well as have a great scope for improvement in adenium. High heritability and genetic advance as percentage of mean were observed for number of petals per flower, number of leaves per plant, flower diameter, weight of flower, *in-situ* longevity, number of days from bud initiation to senescence, total number of flowers per plant per year, number of flower buds and flowers per cluster, number of branches per plant, leaf thickness, plant spread, plant height and compactness indicating that these characters were less influenced by environment and hence, direct selection for these traits would be effective for further crop improvement.

Total number of flowers per plant per year showed significant to highly significant and positive correlation (genotypic and phenotypic) with the characters *viz.*, leaf thickness, number of leaves per plant, plant spread, flower diameter, *in-situ* longevity, number of flower buds and flowers per cluster and number of days from bud initiation to senescence. Considering above, positive and highly significant relationship indicated that there was simultaneous selection for these characters might bring an improvement in total number of flowers per plant per year.

Path coefficient analysis revealed that the maximum positive direct effects towards total number of flowers per plant per year was exerted via number of leaves per plant, number of petals per flower, number of flower buds and flowers per cluster and number of days from bud initiation to senescence. Negative direct effect on total number of flowers per plant per year was found with plant height, number of branches per plant and weight of flower.

The results of Mahalanobis's D^2 statistics revealed wider genetic variability among the 33 genotypes and grouped them into eight clusters. Cluster I included 22 genotypes, followed by cluster II possessed 5 genotypes whereas, cluster III, IV, V, VI, VII and VIII contained 1 genotype in each.

Molecular study revealed the existence of considerable genetic diversity amongst different genotypes of adenium. Based on the complementary banding patterns between the hybrid and their parents, the contribution of each male and female parent was confirmed. Thus, it could be confirmed that these SSR marker alleles, AD 86 can be identified as

molecular tags for distinguishing adenium genotypes from its parental genotypes. The results of present investigation suggested that the adenium genotypes could be effectively categorized based on morphological and molecular and as such, these traits could be utilized as identification and maintenance of adenium genotypes. SSR marker, AD 86 has been identified as molecular tag for testing of hybridity. Further, these identified diverse genotypes with peculiar characteristics may be used as parents in crop improvement programme for evolving elite genotypes. On the basis of observation recorded on various morphological and genetical parameters, the genotypes that have shown outstanding characteristics for potted ornamentals have been identified as Cross 2 and Cross 23 with 15 petals and Double Sweet Heart, Cross 5, Cross 8, Cross 11, Cross 14, Cross 16, Cross 20 and Cross 21 with 10 petals per flower for multipetalous flower form. Cross 6, Taiwan Dwarf, Cross 20, Cross 14, Cross 21, Cross 4 and Cross 5 for plant compactness. Cross 7 and Cross 15 for number of flower buds and flowers per cluster. Cross 18 and Cross 22 for number of flushes per year. Cross 15 and Cross 13 for enhanced flower longevity.

POST HARVEST TECHNOLOGY

32. Name of the student : Tanveer Ahmad Qadeer Ahmad (1020214015)

Year of completion of degree : 2017

Name of the major advisor : Dr. Dev Raj

Title of thesis : Utilization of mango (*Mangifera indica* L.) processing industry waste for value addition

Abstract

The present investigation entitled “Utilization of Mango (*Mangifera indica* L.) processing industry waste for value addition” was aimed to standardize suitable pre-treatment for drying of mango peel and kernels into powder, to standardize formulation for preparation of mango peel and kernel powder based biscuits (*Nankhatai*), to optimize mango peel fibre concentration for preparation of pre-biotic mango nectar and to evaluate nutritional, sensory and microbial quality of developed products during storage. During investigation, four different experiments were laid out using completely randomized design (with and without factorial concepts). First two experiments were conducted for dehydration of mango peel (Experiment-1) and mango kernels (Experiment-2) into powder by giving sixteen different pre-treatment combinations of potassium meta-bisuphite [Control (K_1), 500 ppm (K_2), 1000 ppm (K_3) and 1500 ppm (K_4)] and ascorbic acid [Control (A_1), 100 ppm (A_2), 200 ppm (A_3) and 300 ppm (A_4)]. Third experiment was conducted for preparation of biscuits (*Nankhatai*) using sixteen different formulation combinations of mango peel powder (0, 5, 7.5 and 10 %), kernel powder (0, 5, 10 and 15 %) and wheat flour "*Maida*" [100 %-peel powder and kernel powder (%)] along with different ingredient such as wheat flour "*Rava*" (10 g), sugar (100 g), fat (50 g), milk powder (3 g), baking soda (4 g) and small cardamom (1 g). Fourth experiment was conducted for preparation of pre-biotic mango nectar using different peel fibre concentrations (0 %, 0.2 %, 0.4 %, 0.6 %, 0.8 % and 1 %). The results of present investigation indicated that mango peel dehydrated into powder by giving pre-treatment to peel with combination of 1000 ppm KMS and 200 ppm ascorbic acid (K_3A_3) found shelf stable based on nutritional as well as sensory quality upto six months storage in polypropylene bags. While, mango kernels dehydrated into powder by giving pre-treatment to kernels with combination of 1000 ppm KMS and 200 ppm ascorbic acid (K_3A_3) found shelf stable based on nutritional composition as well as sensory quality upto six months storage in polypropylene bags. Further, mango peel and kernel powder utilized for preparation of biscuits by incorporation of 5 % mango peel powder, 7.5 % kernel powder and 87.5 % maida found shelf stable based on nutritional as well as sensory

quality upto three months storage in polypropylene bags. Furthermore, mango peel fibre utilized for the preparation of pre-biotic mango nectar by the addition of 0.6 % peel fibre found acceptable on the basis of nutritional and sensory quality upto six months storage in glass bottle processed at 96 ± 1 ºC. Net profit of Rs. 1.84 with BCR of 1.20, Rs. 0.83 with BCR of 1.20, Rs 3.32 with BCR of 1.27 and Rs. 2.20 with BCR of 1.28 was observed for sale of mango peel powder, kernels powder, biscuits and pre-biotic nectar having sale price of Rs. 11.02, Rs. 4.98, 15.00 and 10.00, respectively. Thus, prepared products can commercially be explored by food processing industry ensure better returns to growers, processors and consumers as well.

33. Name of the student : Vaghashiya Jaysukhbhai Manjibhai (1020215013)
Year of completion of degree : 2018
Name of the major advisor : Dr. Dev Raj
Title of thesis : Studies on processing and value addition of *Aloe vera* (*Aloe barbadensis* Miller)

Abstract

The present investigation entitled "Studies on processing and value addition of *Aloe vera* (*Aloe barbadensis* Miller)" was aimed to standardize pre-treatment for removal of the bitter compound 'aloin' from *Aloe vera* gel, to standardize formulation for preparation of *Aloe vera* based vermicelli, to optimize suitable drying temperature for dehydration of *Aloe vera* gel and to study the storage stability of the developed products. During investigation, three different experiments were laid out using completely randomized design (with and without factorial concepts). First experiment was conducted for removal of the bitter compound 'aloin' from *Aloe vera* gel by using twenty one treatment combinations of size reduction levels [40 cm (L_1), 10 cm (L_2) and 5 cm (L_3)] and dipping pre-treatments [R.O. water for 6 hours (P_1), 2.5 % ethanol for 3 hours (P_2), 5.0 % ethanol for 3 hours (P_3), 7.5 % ethanol for 3 hours (P_4), 2.5 % ethanol for 6 hours (P_5), 5.0 % ethanol for 6 hours (P_6) and 7.5 % ethanol for 6 hours (P_7)]. Second experiment was conducted for preparation of vermicelli using seventeen treatment formulations of *Aloe vera* juice (18 %, 20 %, 22 % and 24 %), isabgol husk (0 %, 0.5 %, 1.0 % and 1.5 %) and wheat flour (100 % - % *Aloe vera* juice and % isabgol husk) along with standard formulation (Control: 18 % water and 82 % wheat flour). Third experiment was conducted fordrying of *Aloe vera* gel using nine dehydration temperature [75 °C (T_1), 70 °C (T_2), 65 °C (T_3), 60 °C (T_4), 75 °C for 2 hours and 60 °C (T_5), 75 °C for 2 hours and 65 °C (T_6), 75 °C for 2 hours, 65 °C for 3 hours and 60 °C (T_7), 75 °C for 2 hours, 70 °C for 3 hours and 60 °C (T_8) and 75 °C for 2 hours, 70 °C for 3 hours, 65 °C for 4 hours and 60 °C (T_9)]. The results of present investigation indicated that aloin free *Aloe vera* gel obtained by giving pre-treatment with 7.5 % ethanol for 3 hours to *Aloe vera* piece having preparation size of 5 cm (L_3P_4) was found superior based on minimum aloin content, maintained nutritional quality and maximum sensory quality. Further, the vermicelli prepared using 24 % *Aloe vera* juice, 1 % isabgol husk, 75 % wheat flour (F_{13}) found superior based on stability of nutritional as well as higher sensory quality during six months storage when packed in polypropylene bag of 200 gauge. Further more, drying of *Aloe vera* gel at four stage dehydration temperature of 75 °C for 2 hours, 70 °C for 3 hours, 65 °C for 4 hours and 60 °C for about 10 hours (T_9) was found superior based on stability of nutritional and higher sensory quality attributes during six months storage when packed in polypropylene bag of 200 gauge. The cost of pre-treatment per 100 kg of aloin free *Aloe vera* gel was worked out to be Rs. 10610.38, while the cost of production per liter of *Aloe vera* juice was worked out to be Rs. 132.91. Further, the cost of production for 100 g vermicelli and 10 gram dried *Aloe vera* gel was worked out to be Rs. 10.96 and Rs. 150.00, respectively. Thus, prepared products can commercially be explored by food

processing industry to ensure better returns to growers, processors and consumers as well.

34. Name of the student : Zinzala Paresh Bhikhabhai (1020216010)
Year of completion of degree : 2019
Name of the major advisor : Dr. Dev Raj
Title of thesis : Processing and value addition of bael (*Aegle marmelos* L.)

Abstract

The present investigation entitled "Processing and value addition of bael (*Aegle marmelos* L.)" was aimed to standardize the process for preparation of bael candy, to standardize the process for extraction of bael pulp, to standardize suitable formulation for preparation of bael appetizer, to standardize the process for foam mat drying of bael pulp for preparation of powder and to study the storage stability of the developed products. During investigation, four different experiments were laid out using completely randomized design. First experiment was conducted for standardize the process for preparation of bael candy using sixteen treatment combinations comprised of four levels of osmotic treatment [mixing 100 g syrup of 40 °Brix /100 g fruit pieces (O_1), mixing 100 g syrup of 50 °Brix /100 g fruit pieces (O_2), mixing 100 g syrup of 60 °Brix /100 g fruit pieces (O_3) and mixing 100 g syrup of 70 °Brix /100 g fruit pieces (O_4)] and four levels of KMS [0 ppm (K_1), 500 ppm (K_2), 1000 ppm (K_3) and 1500 ppm (K_4)]. Second experiment was conducted for extraction of bael pulp using twelve treatment combinations using four levels of pectinase (0 %, 0.05 %, 0.10 % and 0.15 %) and three levels of cellulase (0.00 %, 0.05 % and 0.10 %). Third experiment was conducted for preparation of bael appetizer using twelve treatment combinations using two levels of fruit pulp [25 % un-treated pulp (without enzyme treatment) P_1 and 25 % treated pulp (enzyme treatment) P_2], three levels of TSS (40 °B, 45 °B and 50 °B) and two levels of acidity (1.00 per cent and 1.20 per cent). Fourth experiment was conducted for foam mat drying of bael pulp using ten different treatments of foaming agents *viz.* Control (T_1), Low viscous CMC [0.50 % (T_2), 1.00 % (T_3), 1.50 % (T_4)], Medium viscous CMC [0.50 % (T_5), 1.00 % (T_6), 1.50 % (T_7)] and high viscous CMC [0.50 % (T_8), 1.00 % (T_9) and 1.50 % (T_{10})]. The results of present investigation indicated that bael candy can be prepared by dipping 100 g fruit in 100 g syrup of 60 °Brix containing 1000 ppm KMS (O_3K_3) and can remain shelf stable on the basis of nutritional as well as sensory quality upto six months storage in polypropylene bag of 400 gage. Bael fruit pulp can be extracted by using combination of 0.15 per cent pectinase and 0.05 per cent cellulase (P_4C_2) and pulp remains shelf stable on the basis of nutritional as well as sensory quality upto six months storage. Further, the bael appetizer can be prepared from 25 % pulp extracted with enzyme treatment, maintained with TSS of 50 °B and acidity of 1.20 % as citric acid ($P_2T_3A_2$) and prepared appetizer can remains shelf stable on the basis of nutritional as well as sensory quality upto six months storage. Furthermore, bael pulp powder can be prepared by mixing and whipping 0.5 per cent high viscous CMC followed by mechanical dehydration in cabinet dryer till a moisture content of 6-7 per cent (T_8) and can remains shelf stable on the basis of nutritional as well as sensory quality upto six months storage. The cost of production per 50 g pack of bael candy worked out to be Rs. 4.51, while the cost of production per 200 ml bottle of bael pulp worked out to be Rs. 13.17. Further, the cost of production for 200 ml appetizer and 50 gram dried bael powder was worked out to be Rs. 28.83 and Rs. 18.17, respectively. Thus, prepared products can commercially be explored by food processing industry to ensure better returns to growers, processors and consumers as well.

HORTICULTURAL ENTOMOLOGY

35. Name of the student : Shailesh D. Patel (1020213008)

Year of completion of degree : 2016

Name of the major advisor : Dr. H. V. Pandya

Title of thesis : Study on pest succession, varietal screening against important insect-pests and management of bud boring insects of sapota

Abstract

Investigation were carried out on succession of important insect pest of sapota, screening of sapota cultivar, estimation of avoidable loss and management of bud borers under field conditions at RHRS, Navsari Agricultural University, Navsari, during 2014-2016.

The activity of sapota bud borer was observed throughout the year wherein it remained higher (> ET = 10 per cent damaged bud) during first week of October to second week of July attaining peak status during 18th standard meteorological weeks (SMW) (30 April - 6 May). The bud borer infestation showed significant and positive correlation with maximum temperature (r= 0.381) and sunshine (r= 0.680) but it was significantly negative correlated with minimum temperature (r= -0.369), morning relative humidity (r= -0.472), evening relative humidity (r= -0.679), average relative humidity (r= -0.671), wind velocity (r= -0.455) and rainfall (r= -0.555).

The infestation of chicku moth was noticed almost throughout the year where it reached to the peak during 49th SMW *i.e.* 3-9 December. The infestation of chicku moth had significant and positive correlation with sunshine (r= 0.675) although, it was significantly negative correlated with minimum temperature (r= -0.454), average temperature (r= -0.274), morning relative humidity (r= -0.315), evening relative humidity (r= -0.656), average relative humidity (r= -0.609), wind velocity (r= -0.533) and rainfall (r= -0.351).

Incidence of leaf miner was observed during first week of October to first week of June where it reached to the peak during 11th SMW *i.e.* 12-18 March. The leaf miner damage had significantly positive correlation with maximum temperature (r= 0.375) and sunshine (r= 0.822) even though, it was significantly negative correlated with minimum temperature (r= -0.558), average temperature (r= -0.311), morning relative humidity (r= -0.578), evening relative humidity (r= -0.882), average relative humidity (r= -0.862), wind velocity (r= -0.643) and rainfall (r= -0.656).

Leaf folder damaged was observed throughout the year wherein it reached its peak during 36th SMW (3-9 Sept.). The correlation among leaf folder infestation (Y) and weather parameters was found non-significant.

The sapota seed borer damages were recorded during 1st week of May to 3rd week of June and second week of august to 3rd week of December. The seed borer infestation had significantly positive correlation with maximum temperature (r= 0.427) and average temperature (r= 0.344) while it had significantly negative correlation with wind velocity (r= -0.288).

The incidence of fruit fly was also observed throughout the year which reached to the peak during 26th SMW (25 June- 1 July). The infestation of chicku moth had significant and positive correlation with minimum temperature (r= 0.747), average temperature (r= 0.647), morning relative humidity (r= 0.334), evening relative humidity (r= 0.674), average relative humidity (r= 0.629), wind velocity (r= 0.795) and rainfall (r= 0.284) although, it was significantly negative correlated with sunshine hour (r= -0.283).

All the sapota varieties were attacked by chicku bud borer wherein highest infestation (31.24 % bud damage in pooled) was recorded in Cricket ball followed by

Kalipatti and Co-1 which were not significantly differ from it. On the other hand, lowest infestation (14.44 % bud damage) was recorded in Pilipatti. Sapota variety Pilipatti was found resistance while other varieties viz. Bhuripatti, Zumakhiya, PKM-1 and Kirthibarthi were categorized as moderately resistance (MR), whereas Co-1 had a moderately susceptibility and Kalipatti as well as Cricket ball were susceptible entries (S).

Similarly, with respect to chicku moth infestation, the lowest chicku moth infestation (8.27 % bud damage) in Pilipatti (pooled) and it was at par with Bhuripatti (9.69 %) and PKM-1 (11.79 %). Whereas, the maximum chicku moth infestation (26.17 % bud damage) was recorded in Cricket ball which were at par with Kalipatti (24.29 %) and Co-1 (22.01 %). Further, it was revealed that Bhuripatti and Pilipatti had resistance to chicku moth damage. While Zumakhiya and PKM-1 had moderately resistance to chicku moth whereas, Kirthibarthi and Co-1 was found moderately susceptible and remaining varieties viz. Cricket ball and Kalipatti were found susceptible to chicku moth damage.

Lowest leaf damage by leaf miner (5.28 % leaf damage) were recorded in cricket ball (pooled based) and it was at par with Kalipatti (7.01 %) and Bhuripatti (8.65 %). Whereas, the maximum leaf miner infestation (14.15 % leaf damage) was recorded in Zumakhiya in both years of investigation which were at par with Kirthibarthi (12.92 %), Co-1 (12.77 %), PKM-1 (11.86 %) and Pilipatti (10.70 %). On the basis of susceptibility ratings, Kalipatti and Cricket ball varieties were found resistance (R) while, Bhuripatti was categorized as moderately resistance (MR). However, Pilipatti, PKM-1, Kirthibarthi and Co-1 were recorded as moderately susceptible (MS) and Zumakhiya variety was found susceptible (S).

Lowest leaf damage (9.60 % leaf damage) by sapota leaf folder were recorded in PKM-1 and it was at par with Pilipatti (12.80 %) On the other hand, the maximum leaf folder infestation (28.43 % leaf damage) was recorded in Kalipatti in both years of investigation which were at par with Co-1 (23.58 %), Zumakhiya (21.75 %) and Kirthibarthi (20.95 %). On the basis of susceptibility ratings, Pilipatti and PKM-1 varieties were found resistance (R) while, Cricket ball was categorized as moderately resistance (MR). However, Bhuripatti, Zumakhiya, Kirthibarthi and Co-1 were recorded as moderately susceptible (MS) and Kalipatti variety was found susceptible (S).

With respect to seed borer infestation, lowest percent fruit damaged by seed borer (2.23 %) were recorded in Kalipatti which was at par with PKM-1 (2.33 %), cricket ball (2.50 %), Zumakhiya (3.27 %) and Pilipatti (3.74 %). On the other hand, the maximum fruit damage by seed borer (11.55 %) was recorded in Co-1 in both years of investigation which were at par with Kirthibarthi (9.63 %). Further, it was revealed that Kalipatti, Bhuripatti, Pilipatti, Cricket ball, Zumakhiya and PKM-1 were moderately resistance to seed borer whereas, Kirthibarthi and Co-1 was found moderately susceptible to seed borer.

The lowest fruit fly infestation was found in PKM-1 (5.75 %) was at par with Bhuripatti (6.96 %) and Pilipatti (9.79 %) while highest damage in Cricket ball (34.57 %) was followed by Kalipatti (31.47 %) which was at par with it. On the basis of susceptibility ratings, PKM-1 variety was found resistance (R) while, Bhuripatti, Pilipatti and Kirthibarthi were categorized as moderately resistance (MR). However, Zumakhiya and Co-1 were recorded as moderately susceptible (MS) and Kalipatti and Cricket ball was found susceptible (S).

Avoidable yield loss from important insect-pests of sapota was worked out to the tune of be 39.75 per cent which resulted in net profit worth of Rs. 307152 per ha by imposition of recommended and need based treatments in protected trees.

From the present findings, it may be interpreted that application of recommended insecticides *i.e.* Alternate spray of dichlorvos 0.03 %, nimbecidine 0.3 % , profenophos + cypermethrin @ 0.044 %, chlorpyriphos 0.05 % at 15 days interval starting from second fortnight of March for bud boring insects. Installation of methyl-eugenol trap for fruit fly (1

trap/10 trees) for fruit fly. Spraying of profenophos 50 EC @ 0.05 % or lambda cyhalothrin 5 EC @ 0.005 % at an interval of 25 days during October-November for seed borer and azadirachtin 1500 ppm @ 40 ml/10 lit water for leaf miner/leaf folder with the initiation of infestation provided avoidable loss of 38.51–41.01 per cent from important insect-pests of sapota in protected plots during the period of investigation.

Module-II recorded the minimum infestation of chicku bud borers and chicku moth which was at par with Module-I. The maximum fruit yield (241.90, 236.22 and 239.06 q/ha) were recorded in Module II during 2014-15, 2015-16 and Pooled, respectively which was at par with module I (231.53, 226.72 and 229.13 q/ha). Maximum net realization of 349864, 341344 and 345604 Rs./ha were realized with Module-II followed by module-I (336757, 329542 and 333157 Rs./ha) during 2014-15, 2015-16 and Pooled. While maximum BCR ratio (10.1, 9.3 and 9.7) recorded with module-I which was followed by module-II (9.2, 8.5 and 8.8) during 2014-15, 2015-16 and Pooled, respectively.

36. Name of the student : Parthkumar P. Dave (1020214005)

Year of completion of degree : 2017

Name of the major advisor : Dr. H. V. Pandya

Title of thesis : Morphological and biochemical basis of resistance against shoot and fruit borer, *Earias vittella* (Fabricius) infesting okra

Abstract

Investigations on morphological and biochemical basis of resistance against shoot and fruit borer, *Earias vittella* (Fabricius) infesting okra was carried out under field condition during *kharif* season of 2015 and 2016 at Regional Horticultural Research Station, Navsari Agricultural University, Navsari, Gujarat.

The results revealed that among all the genotypes / varieties of okra screened, Arka Anamika recorded lowest number of larvae (0.53 larvae/plant), lowest fruit damage (11.61 %) and the highest fruit yield (67.61 q/ha). However, JOL-11-12 recorded lowest shoot damage (9.89 %). Among morphological characters, highly significant and negative correlation existed between number of larvae of *E. vittella* per plant and plant height (r= -0.8615), fruit length (r= -0.8865), fruit diameter (r= -0.8657), fruit width (r= -0.8103) and pericarp thickness (r= -0.8187). However, highly significant and positive association existed between mid rib hair density on leaves and number of larvae of *E. vittella* per plant (r= 0.8256). While, thickness of leaf lamina in different okra genotypes / varieties had significant and positive association with number of larvae of *E. vittella* per plant (r= 0.5703).

Highly significant and negative correlation existed between per cent shoot damage caused by *E. vittella* and plant height (r= -0.7241), fruit length (r= -0.7600), fruit diameter (r= -0.6855), fruit width (r= -0.7030) and pericarp thickness (r= -0.7084). However**,** mid rib hair density on leaves had highlysignificant and positive association (r= 0.6665) with per cent shoot damage. While, thickness of leaf lamina in different okra genotypes / varieties had significantly positive association with per cent shoot damage (r= 0.6029).

Highly significant and negative correlation existed between per cent fruit damage caused by *E. vittella* and plant height (r= -0.8615), fruit length (r= -0.5932), fruit diameter (r= -0.7711), fruit width (r= -0.7900) and pericarp thickness (r= -0.7354). However, mid rib hair density on leaves had highly significant and positive association (r= 0.6993) with per cent fruit damage. While, thickness of leaf lamina in different okra genotypes / varieties had significant positive association with per cent fruit damage (r= 0.6219).

Among biochemical characters, highly significant and positively correlation

existed between larval population of *E. vittella* and moisture content (r= 0.8492), nitrogen content (r= 0.8931), protein content (r= 0.8845), reducing sugar (r= 0.8186), non reducing sugar (r= 0.8727), total soluble sugar (r= 0.8364), potash content (r= 0.8781), phosphorus content (r= 0.7761) and magnesium content (r= 0.7711). However, highly significant and negative correlation existed between larval population and ash content (r= -0.8805), calcium content (r= -0.8694) and tannin content (r= -0.8368).

Among biochemical characters, highly significant and positively correlation existed between shoot damage caused by *E. vittella* and moisture content (r= 0.7997), nitrogen content (r= 0.7704), protein content (r= 0.8002), reducing sugar (r= 0.7384), non reducing sugar (r= 0.8061), total soluble sugar (r= 0.7778), potash content (r= 0.7794), phosphorus content (r= 0.7761) and magnesium content (r= 0.6784). However, highly significant and negative correlation existed between larval population and ash content (r= -0.8039), calcium content (r= -0.7922) and tannin content (r= -0.7210).

In case of fruit damage caused by *E. vittella*, highly significant and positive correlation existed between fruit damage and moisture content (r= 0.7837), nitrogen content (r= 0.8276), protein content (r= 0.8397), reducing sugar (r= 0.7514), non reducing sugar (r= 0.8137), total soluble sugar (r= 0.7963), potash content (r= 0.8330), phosphorus content (r= 0.7151) and magnesium content (r= 0.6857).

However, highly significant and negative correlation existed between larval population and ash content (r= -0.8285), calcium content (r= -0.8352) and tannin content (r= -0.7676).

The biochemical analysis for gossypol was done. However, in none of the genotypes, gossypol was observed.

During 2015 in GAO-5, fruit damage per cent caused by *E. vittella* reached its peak at 10th WAS *i.e.* 36 SW (48.05 per cent fruit damage/week). While in Vikas 101 (Hybrid) fruit damage by *E. vittella* reached its peak at 10th WAS *i.e.* 36 SW (30.14 per cent fruit damage/week). During 2016 in GAO-5, fruit damage caused by *E. vittella* reached its peak at 13th WAS *i.e* 38 SW (45.15 per cent fruit damage/week). While in Vikas 101 (Hybrid), fruit damage caused by *E. vittella* reached its peak at 13th WAS *i.e.* 38 SW (30.92 per cent fruit damage/week).

During 2015 in GAO-5, shoot damage per cent caused by *E. vittella* reached its peak at 6th WAS *i.e.* 32 SW (34.74 per cent shoot damage/week). While in Vikas 101 (Hybrid) shoot damage by *E. vittella* reached its peak at 7th WAS *i.e.* 33 SW (29.68 per cent shoot damage/week). During 2016 in GAO-5, fruit damage caused by *E. vittella* reached its peak reached its peak at 6th WAS *i.e.* 31st SW (36.71 per cent shoot damage/week). While in Vikas 101 (Hybrid), fruit damage caused by *E. vittella* reached its peak at 7th WAS *i.e.* 32 SW (27.2 per cent shoot damage/week).

During 2015 in GAO-5, number of *E. vittella* larvae per okra plant reached its peak at 10th WAS *i.e.* 36 SW (1.64 larval population/week).While in Vikas 101 (Hybrid) number of *E. vittella* larvae per okra plant reached its peak at 7th WAS *i.e.* 33 SW (2.31 larval population/week). During 2016 in GAO-5, number of *E. vittella* larvae per okra plant reached its peak at 9th WAS *i.e.* 34th SW (1.62 larval population/week). While in Vikas 101 (Hybrid) number of *E. vittella* larvae per okra plant reached its peak at 7th WAS *i.e.* 32 SW (2.63 larval population/week).

Correlation coefficients were worked out for morphological as well as biochemical based varietal screening against all the three infestation parameters of *E. vittella*. Correlation coefficients were also worked out between weather parameters and population dynamics of *E. vittella.* Regression equations were developed for those parameters having significant correlations.

37. Name of the student : Ashokkumar Tarabhai Chaudhary (1020216002)

Year of completion of degree : 2019

Name of the major advisor : Dr. H. V. Pandya

Title of thesis : Morphological and biochemical basis of resistance against thrips (*Scirtothrips dorsalis* Hood) infesting chilli [*Capsicum annum* L.]

Abstract

Investigations were carried out on "Morphological and biochemical basis of resistance against thrips (*Scirtothrips dorsalis* Hood) infesting chilli [*Capsicum annum* L.]" at Instructional Farm, ASPEE College of Horticulture and Forestry, Regional Horticultural Research Station, Navsari Agricultural University, Navsari during 2017-18 and 2018-19.

Minimum thrips population was found in GVC-121 (3.01/3 leaves) whereas, it remained maximum thrips population in GCH-3 (6.95/3 leaves). Likewise, maximum fruit yield was obtained in GAVC hybrid-1 (50.60 q/ha) it was minimum in GCH-3 (35.11 q/ha). Overall, GVC-121 and GVC-111 were grouped under highly resistant category with respect to susceptibility to thrips population. Similarly, GAVC hybrid-1 and GVC-101 were grouped in resistant category against thrips population. GAVC-112 and AVNPC-131 were grouped in the susceptible category against thrips population. Lastly, GCH-1 and GCH-3 were grouped in highly susceptible category against thrips population.

Maximum thickness of leaf lamina (1.24 µm) and minimum leaf area (12.16 cm^2) was recorded in chilli variety GVC-111 which in turn had moderate number of thrips (3.34/3 leaves). Significantly maximum internode length (11.03 cm), number of branches per plant (6.87), number of leaves per plant (56.87), number of fruits per plant (66.33) and plant height (51.33 cm) were recorded in GAVC hybrid-1 (51.33 cm) which in turn had moderate number of thrips (3.80/3 leaves). On the contrary, minimum days to flower initiation was recorded in GVC-121 (40.47 days) wherein thrips population was minimum (2.89/3 leaves). Highly significant and negative correlation (r= -0.836) was found between number of thrips per leaves and number of fruits per plant while, remaining morphological parameters failed to exhibit any significant correlation with thrips population.

Maximum moisture content (90.86 %) was recorded in chilli variety GVC-101 which harboured moderate thrips population (4.25/3 leaves). The lowest ash content (33.45 %) was recorded in GAVC-112 which in turn had moderate thrips population (4.70/3 leaves). Significantly minimum total soluble sugar content (3.60 %), minimum reducing sugar content (1.02 %), maximum non reducing sugar (2.58 %), maximum total phenol (0.62 ppm), minimum nitrogen (0.15 %), minimum protein (0.90 %), maximum chlorophyll A (5.21 mg/g), maximum chlorophyll B (10.53 mg/g) and maximum chlorophyll total (15.74 mg/g) were recorded in GVC-111 which in turn had moderate thrips population (3.34/3 leaves).

Results obtained in the current investigation further revealed that thrips population was from initiated third week after transplanting (WAT) *i.e.* 38th SMW and its appearance continued till crop maturity *i.e.* 3rd SMW indicating its peak level (5.85/3 leaves) during 14th WAT *i.e.* 49th SMW. Similarly, population of whitefly started appearing from 3rd WAT *i.e.* 38th SMW (0.70/3 leaves) which reached to its peak level (7.30/3 leaves) during 12th WAT *i.e.* 47th SMW. The population of aphid started from the 6th WAT *i.e.* 41st SMW (1.36/3 leaves) which increased gradually and reached its peak level (10.05/3 leaves) at 10th WAT coinciding with 45th SMW. Lastly, mite population started appearing from 1st WAT *i.e.* 36th SMW (3.43/3 leaves) which reached to the peak level (18.93/3 leaves) during 8th WAT *i.e.* 43rd SMW.

Highly significant and negative correlation was found between thrips population

on chilli and minimum temperature (r= -0.620) as well as average relative humidity (r= -0.572). Similarly, whitefly population on chilli exhibited highly significant and negative correlation with minimum temperature (r= -0.601), evening relative humidity (r= -0.612) and average relative humidity (r= -0.613). Likewise, highly significant and positive correlation was found between aphid population and sunshine hours (r= 0.620) whereas, it was minimum with wind speed (r= -0.589). Lastly, highly significant and positive correlation was found between mite population on chilli and maximum temperature (r= 0.894), average temperature (r= 0.738) and evaporation (r= 0.832).

HORTICULTURAL PLANT PATHOLOGY

38. Name of the student : Nidhika D. Mehta (1020214010)

Year of completion of degree : 2017

Name of the major advisor : Dr. P. R.Patel

Title of thesis : Epidemiology, assessment of losses and management of mango powdery mildew (*Oidium mangiferae* Berthet)

Abstract

The mango (*Mangifera indica* L.) belongs to the dicotyledenous family Anacardiaceae. This tree is indigenous to India and southern Asia and originated from the Indian Burmese border region where it has been cultivated for many centuries (Kwee & Chang, 1985). Today, mangoes are cultivated in most tropical and subtropical parts of the world where they are commonly eaten fruits (Prakash & Srivastava, 1987; Schroeder, 1990). Among these diseases, Powdery mildew (*Oidium mangiferae* Berthet) of mango is emerging as one of the most common, wide spread and serious disease throughout the world and causes significant yield losses. The most serious losses occur when flowering and growth flushes are infected during cool and dry conditions. A minimum temperature range of 11-14 °C and maximum of 27-31 °C along with 64-72 % RH are the most conducive for disease development (Nasira *et al*., 2014). So the present investigations were carried out to pinpoint exact cause, survey, morphological characters, epidemiology, and assessment of losses, bio chemical study and management strategies biological and chemical control. Survey studies on occurrence of powdery mildew of mango showed that powdery mildew disease was appeared in all the surveyed areas of Navsari district. Powdery mildew found from initiation of flowering, initiation of fruits to pea or marble size fruit. For to know the variation in conidia, the morphological studies was done. The mycelium was hyaline, whitish and slightly flexuous, profuse. The ellipsoidal-ovoid shape single celled conidia were found to be borned in chain on the conidiophores. Conidiophores were wider than mycelium. The basal septum delimited the conidiophores from mycelium. And the sexual stage was not found. The loss due to powdery mildew disease in mango was estimated to the tune of 55.42 per cent. Thus, 75 per cent disease can be controlled by protecting the mango tree with the fungicidal spray of hexaconazole @ 0.01 % or wettable sulphur @ 0.3 % or bio control agent *Pseudomonas fluorescence* @ 5 % 1st at appearance of the disease, 2nd and 3rd was at 15 days interval. Observations of the powdery mildew disease intensity were recorded at weekly interval in susceptible cv. Keasr for epidemiological study. The trial was carried out at R.H.R.S, NAU, Navsari. Studies on development of disease indicated that it first appeared in the month of December-January. In epidemiological studies, the powdery mildew disease intensity was found higher during last week of February or first week of March. The disease appearance was also found at flowering stage. The powdery mildew of mango is high to moderately occurring in Navsari district during winter season. The infection on inflorescence produced huge quantity of inoculum in the

presence of favourable climatic conditions. Due to presence of heavy load of inoculum, the pathogen attacked on all part of the inflorescences. Hence, from over all study, 2nd to 9th MSW were extremely crucial for development of the powdery mildew. Comparatively, powdery mildew intensity was more during 2016 than the previous year, 2015. The weekly observations on the powdery mildew intensity in cv. Kesar grown in the field were correlated with weather parameters. During 2015, minimum temperature (9.8) was found negatively correlated while wind speed (3.0) was found significant negatively correlated. Maximum temperature (30.1), evening relative humidity (32.4) and rainfall (0.00) were significant negatively correlated with the disease intensity. During 2016, maximum temperature (30.29) and wind speed (9.86) were found significant negatively correlated. Minimum temperature (12.93), evening relative humidity (38.04) and rainfall (0.00) were significant positively correlated while, morning relative humidity (86.65) was found non-signi ficant and positively correlated with the powdery mildew disease intensity. The pooled results showed that maximum temperature (30.51) and wind speed (2.73) were found significantly negatively correlate. Minimum temperature (11.13), evening relative humidity (32.13) and rainfall (0.00) were significantly and negatively correlated with the powdery mildew intensity. All these factors played an important role in the development of disease in mango under south Gujarat condition. In the biochemical constituents, moderately susceptible variety Kesar infected inflorescences, leaves and pea size fruits recorded less amount of reducing sugar and non reducing, total phenol, PAL, PPO, POX compare to the healthy inflorescences, leaves and pea size fruit. Another variety Totapuri showed moderately same reaction. The management studies against powdery mildew of mango in field condition showed hexaconazole @ 0.01 % recorded highest per cent disease control of powdery mildew and also significantly inhibited growth of the pathogen and proved strongly fungi toxic at the given concentrations. Wettable sulphur @ 0.3 % significantly inhibited disease incidence and at par with the best one. The next best in order of merit was *Pseudomonas fluorescence* @ 5 % inhibited the disease incidence.*In vitro* evaluation of seven fungicides and two bio agent against *O. mangiferae* showed hexaconazole @ 0.01 % and Wettable sulphur @ 0.3 % were highly effective and inhibited the conidial germination. The next best in order of merit was *Pseudomonas fluorescence* @ 5 % inhibited comparatively least growth of the pathogen.Similarly, significantly higher fruit yield was recorded in fungicidal treatment of hexaconazole @ 0.01% and Wettable sulphur @ 0.3 % in comparison to other treatments.

M. Sc. THESIS ABSTRACTS

FRUIT SCIENCE

1. Name of the student : Prerak Jayesh Gondaliya (04-1072-2011)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. Y. N. Tandel
   Title of thesis : Influence of preharvest spray and postharvest dip treatments on physico-chemical properties and shelf life of sapota cv. Kalipatti fruits

Abstract

An investigation on "Influence of preharvest spray and postharvest dip treatments on physico-chemical properties and shelf life of sapota cv. Kalipatti fruits" was conducted at Regional Horticultural Research Station and P.G. laboratory of Centre of Excellence in Post-Harvest Technology, Navsari Agricultural University campus, Navsari during the month of January to February 2016. The experiment was laid with two factors *viz.*, preharvest spray (S_0– Control, S_1– $CaCl_2$ 1 %, S_2– GA_3 50 ppm and S_3– CPPU 10 ppm) and postharvest dip (D_0– Control, D_1– $CaCl_2$ 1 %, D_2– GA_3 50 ppm, D_3– Bavistin 0.2 %, D_4– $CaCl_2$ 1 % + Bavistin 0.2 % and D_5– GA_3 50 ppm + Bavistin 0.2 %) treatments in Completely Randomized Design with factorial concept and repeated four times with twenty-four treatment combinations. The preharvest spray of chemicals were applied 15 days before probable optimum harvesting stage during winter season by preparing 20 litres of respective formulation on 20 years old each sapota trees. After harvesting of fruits, the subsequent postharvest dip treatments were given for 5 minutes.

The physical parameters *viz.,* fruit length (mm), fruit girth (mm), fruit weight (g), fruit volume (ml), physiological loss in weight (%), fruit firmness (kg/cm^2), shelf life (days), marketable fruits (%), spoilage (%) and organoleptic evaluation as well as chemical parameters *viz.,* total soluble solids (°Brix), total sugars (%), reducing sugar (%), acidity (%) and ascorbic acid (mg/100g) were recorded at 2nd, 4th, 6th and 8th days intervals by storing in CFB boxes of 3 kg capacity (30 cm × 30 cm × 15 cm) at ambient (room) temperature.

The fruit growth characters *viz*., fruit length, girth, weight and volume of sapota were found to be superior in GA_3 50 ppm and CPPU 10 ppm as compared to rest of the treatments. The physiological loss in weight and spoilage of fruits were found minimum when trees were subjected to preharvest spray of $CaCl_2$ 1 %. The higher fruit firmness, more number of marketable fruits and higher shelf life as well as superior chemical parameters *viz.,* total soluble solids, total sugars, reducing sugar, acidity and ascorbic acid content of fruits were also recorded in those fruits subjected to preharvest spray of $CaCl_2$ 1 % on 8th day of storage.

While in case of the effect of postharvest treatments, the fruits dipped in $CaCl_2$ 1 % + 0.2 % Bavistin had recorded significantly least physiological loss in weight and spoilage percentage of fruits and higher firmness, shelf life and marketable fruits along with superior chemical parameters of fruits as compared to control.

Hence, it is concluded from the present study that preharvest spray of GA_3 50 ppm or CPPU 10 ppm can be used for increasing fruit traits *viz*., length, girth, weight and volume of sapota fruits. Whereas, preharvest spray of $CaCl_2$ 1 % and postharvest dip treatment of $CaCl_2$ 1 % + Bavistin 0.2 %, individually were found to be superior for extension of shelf-life, reduction of postharvest losses and retention of firmness and quality attributes of sapota fruits.

2. Name of the student : Chaudhari A. A. (2020214003)
Year of completion of degree : 2016
Name of the major advisor : Dr. S. J. Patil
Title of thesis : Response of paclobutrazol and KNO_3 on top working of mango var. Sonpari

Abstract

The present experiment entitled "Response of paclobutrazol and KNO_3 on top working of mango var. Sonpari" was conducted during the year 2014-15 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The experiment was laid out with seven treatments in Randomized Block Design and replicated thrice. Seven treatments comparising paclobutrazol (1.25, 2.50 and 3.75 g *a.i.* per tree) with or without combination of KNO_3 @ 1 % along with one control. The effect of these treatments on different parameter of flowering, fruiting, yield and quality were recorded and analyzed statistically.

The results of present investigation revealed that soil application of paclobutrazol @ 2.50 g *a.i.* per tree with foliar spray of KNO_3 @ 1 % was superior in fruit retention at pea stage, marble stage and at harvest stage per panicle, panicle breath, number of fruits per tree, fruit yield, fruit weight, fruit length, fruit volume and shelf life. While, paclobutrazol @ 1.25 g *a.i.* per tree + KNO_3 1 % improving the quality parameters like maximum TSS, acidity, total sugar and non reducing sugar of mango var. Sonpari. For economic point of view paclobutrazol @ 2.50 g *a.i.*per tree + KNO_3 1 % was more remunerative in respect to net realization and benefit cost ratio.

Therefore, soil application of paclobutrazol @ 2.50 g *a.i* per tree in combination of foliar spray of KNO_3 @ 1 % can be utilized for enhancing flowering, fruit retention, yield and quality of top working of mango var. Sonpari.

3. Name of the student : Chaudhari Hiralal L. (2020214007)
Year of completion of degree : 2016
Name of the major advisor : Dr. B. M. Tandel
Title of thesis : Effect of type of cutting and growth regulators on rooting of wax apple (*Syzygium samarangense* L.)

Abstract

The present study was carried out at the Agriculture Experimental Station, Navsari Agricultural University, At & Po. Paria, Ta: Pardi, District- Valsad, Gujarat, India during the year 2015-16 to investigate the "Effect of type of cutting and growth regulators on rooting of Wax apple (*Syzygium samarangense* L.)". The experiment was laid out in Completely Randomized Design with Factorial concept having eighteen treatment combinations, comprising with two factors (1) types of cutting (hardwood cutting and semi-hardwood cutting) and (2) growth regulators (IBA 5000 ppm, IBA 7500 ppm, NAA 5000 ppm, NAA 7500 ppm, IBA 5000 + NAA 5000 ppm, IBA 5000 + NAA 7500 ppm, IBA 7500 + NAA 5000 ppm and IBA 7500 + NAA 7500 ppm). The treatments were repeated thrice. The effect of these treatments on sprouting, shoot and root growth parameters, and survival percentage were studied. The results revealed that the different types of cuttings, growth regulators and their interactions exerted significant influences on different parameters studied. The results regarding different type of cuttings indicated that the propagation of wax apple through hardwood cutting. Whereas among the growth

regulators IBA 5000 ppm + NAA 5000 ppm found superior in terms of significantly less days taken for sprouting of cuttings with maximum sprouting percentage. Similar trend were observed on the growth parameters of shoot and root such as number of leaves and shoots, leaf area, diameter of longest shoot, length of longest shoot and root, fresh and dry weight of root and shoot, and survival percentage. The interaction of type of cuttings and different growth regulators concentrations revealed that hardwood cutting treated with IBA 5000 ppm + NAA 5000 ppm recorded the maximum sprouting, better growth rate of roots and shoots at different intervals with higher survival percentage. On the basis of the results obtained, it was concluded that the hardwood cuttings of wax apple treated with IBA 5000 ppm + NAA 5000 ppm recorded the highest shoot growth and survival of cutting, and was found most useful for healthy and vigorous planting material of wax apple (*Syzygium samarangense* L.).

4. Name of the student : Kachhadia Palak Arvindbhai (2020214018)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. R. V. Tank
   Title of thesis : Response of post-shooting bunch spray of chemicals on ratoon banana (*Musa paradisiaca* L.) cv. Grand Nain

Abstract

An experiment entitled "Response of post-shooting bunch spray of chemicals on ratoon banana (*Musa paradisiaca* L.) cv. Grand Nain" was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) during the year 2014-2015. The experiment was laid out in Randomized Block Design (RBD) with twelve treatments and three replications. The treatments included GA_3 @ 100 mg l^{-1}, SOP @ 1.5 %, $CaCl_2$ (0.25 %, 0.50 % and 0.75 %), KH_2PO_4 (1.5 %, 2.0 % and 2.5 %), KCl (0.5 %, 1.0 % and 1.5 %) and control. The first spray was given immediately after complete opening of the bunch and second spray was given at 15 days after first spray.

Result of present investigation revealed that the banana bunches cv. 'Grand Nain' when sprayed with SOP @ 1.5 % shortened the maturity period and produced quality fruits with maximum TSS, ascorbic acid, reducing sugars, non-reducing sugar and total sugars and minimum acidity. Whereas, bunches sprayed with GA_3 @ 100 mg l^{-1} produced maximum bunch length, bunch girth, finger length from third hand, finger girth from third hand, finger weight from third hand, weight of third hand, bunch weight and fruit yield.

Banana bunches sprayed twice with $CaCl_2$ @ 0.75 % found most effective as it gave the minimum physiological loss in weight and maximum shelf life and pulp : peel ratio of fruits. The maximum score of organoleptic evaluation for colour, flavour, taste, texture and over all acceptability were recorded with KCl @ 1.0 %**.**

From the economic point of view the highest net return along with maximum benefit cost ratio (BCR) was noted in GA_3 @ 100 mg l^{-1}**.**

5. Name of the student : L. K. Thongdok (2020214020)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. S. J. Patil
   Title of thesis : Effect of scion dip treatment of IAA, BAP and $ZnSo_4$ on the success of epicotyl grafting in mango cv. ‘Kesar’

Abstract

The present study was carried out under nethouse conditions at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India during the year 2015-16 to investigate the "Effect of scion dip treatment of IAA, BAP and $ZnSO_4$ on the success of epicotyl grafting in mango cv. Kesar".

The experiment was laid out in Completely Randomized Design having thirteen treatments, comprising untreated control, distilled water, $ZnSO_4$ 500 mg l^{-1}, $ZnSO_4$ 750 mg l^{-1}, IAA 750 mg l^{-1}, IAA 750 mg l^{-1} + $ZnSO_4$ 500 mg l^{-1}, IAA 750 mg l^{-1} + $ZnSO_4$ 750 mg l^{-1}, BAP 10 mg l^{-1}, BAP 20 mg l^{-1}, BAP 10 mg l^{-1} + $ZnSO_4$ 500 mg l^{-1}, BAP 10 mg l^{-1} + $ZnSO_4$ 750 mg l^{-1}, BAP 20 mg l^{-1} + $ZnSO_4$ 500 mg l^{-1} and BAP 20 mg l^{-1} + $ZnSO_4$ 750 mg l^{-1} treatment. The effect of these treatments on sprouting, graft success, height of graft, girth of scion, girth of rootstock, girth of union, number of leaves, total leaf area, survival percentage and number of branches were studied.

The results of present investigation revealed that among different treatments, BAP 20 mg l^{-1} + 750 mg l^{-1} $ZnSO_4$ was found to be beneficial for early sprouting, graft success and survival percentage. Girths of the grafts showed variable result with maximum girth of rootstock noted in IAA 750 mg l^{-1} + $ZnSO_4$ 750 mg l^{-1}, maximum girth of scion was observed in IAA 750 mg l^{-1} and maximum girth of union was found in case of 10 BAP mg l^{-1} + $ZnSO_4$ 500 mg l^{-1} treatment. The maximum height was observed in scion treated with $ZnSO_4$ 500 mg l^{-1}. Whereas, the total number of leaves were found maximum in of $ZnSO_4$ 750 mg l^{-1}, but total leaf area was maximum in $ZnSO_4$ 500 mg l^{-1}. The total number of branches were found to be highest when grafts were prepared by dipping scion in IAA 500 mg l^{-1} treatment.

Hence, it can be concluded that the use of Zinc Sulphate alone or in combination with Benzyl Amino Purine can be used for production of healthy and vigorous epicotyl grafts of mango cv. 'Kesar' with high success rate.

6. Name of the student : Parmar Anirudhdh B. (2020214025)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. Y. N. Tandel
   Title of thesis : Assessment of genetic diversity using D^2 analysis in sapota [*Manilkara achras* (Mill.) Fosberg]

Abstract

The present investigation on "Assessment of genetic diversity using D^2 analysis in sapota [*Manilkara achras* (Mill.) Fosberg]" was carried out on 20-25 years old sapota orchard at the Fruit Research Station, Navsari Agricultural University, Gandevi during 2014-2015.

Analysis of variance revealed significant genotypic differences for all eighteen characters under investigation, indicates wide range of variation was present in genotypes for the traits. The genotypic coefficient of variation was observed higher for the characters *viz*., fruit yield, number of fruits per tree and average fruit weight. High estimates of heritability coupled with high genetic advance were observed for average fruit weight, number of leaves per shoot, fruit length, fruit diameter, shoot length, average leaf size, days to fruit set, average number of seed per fruit, fruit yield, total soluble solids, number of flowers per shoot, number of fruits per tree, L: B ratio, acidity and plant height indicating that phenotypic selection would be effective for genetic improvement in these traits.

Association between fruit yield and other seventeen characters revealed that fruit

yield was highly significant and positively correlated with canopy spread East – West, number of leaves per shoot, number of flowers per shoot, L : B ratio, average fruit weight, number of fruits per tree, total soluble solids and chlorophyll content at genotypic and phenotypic levels. These yield contributing traits also possessed positive and highly significant association among themselves.

Path coefficient analysis indicated average fruit weight having highest positive direct effect on fruit yield followed by number of fruits per tree. The character average leaf size exerted the highest negative direct effect on fruit yield.

Studies pertaining to genetic divergence were also carried out using Mahalanobis D^2 statistics, for fourteen sapota genotypes were grouped in six clusters. The clustering pattern of the genotypes was independent of their geographical distribution. On the basis of inter cluster distances, cluster VI was found to be more divergent with cluster I, IV, II and V. Therefore, it was concluded that the genotypes belonging to these clusters should be inter-crossed in order to generate more variability and improving fruit yield in sapota.

7. Name of the student : Patel Dharmishta D. (2020214027)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. S. S. Gaikwad
   Title of thesis : Influence of seed priming treatments on germination and seedling vigour of custard apple (*Annona squamosa* L.) cv. Local

Abstract

The present experiment entitled "Influence of seed priming treatments on germination and seedling vigour of custard apple (*Annona squamosa* L.) cv. Local" was conducted during the year 2014-2015 at Agricultural Experimetal Station, Navsari Agricultuaral University, Paria.

The experiment was laid out in Complete Randomized Design with three replications and thirteen treatments *viz.*, GA_3 at 100 mg/l (T_1), GA_3 at 150 mg/l (T_2), GA_3 at 200 mg/l, Ethrel at 1000 mg/l (T_4), Ethrel at 1500 mg/l (T_5), Ethrel at 2000 mg/l (T_6), Thiourea at 1000 mg/l (T_7), Thiourea at 1500 mg/l (T_8), Thiourea at 2000 mg/l (T_9), KNO_3 at 1.0 % (T_{10}), KNO_3 at 1.5 % (T_{11}), KNO_3 at 2.0 % (T_{12}) and a control (T_{13}).

The results of present investigation revealed that GA_3 @ 150 mg l^{-1} minimized the days taken for germination and improved the germination percentage. Similar trend was observed in growth parameters such as height of plant, girth of plant, number of leaves, leaf area, fresh and dry weight of plant and survival percentage.

Hence, it can be concluded that custard apple seeds soaked in GA_3 @ 150 mg l^{-1} gave maximum germination percentage with optimum vegetative growth and survival percentage of seedlings.

8. Name of the student : Patel Dharmishthaben Mukeshbhai (2020214028)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. D. K. Sharma
   Title of thesis : Effect of season and growing environment on success of patch budding in tamarind (*Tamarindus indica* L.)

Abstract

The present investigation entitled "Effect of season and growing environment on success of patch budding in Tamarind (*Tamarindus indica* L.)" was carried out at

Agriculture Experimental Station, Navsari Agricultural University, Paria–Valsad, during the year 2015- 2016. The experiment was laid out in Completely Randomized Design (CRD) with factorial concept with three replications and fifteen treatments. Five seasons of budding *i.e.* June, July, August, September and October under three different rootstocks growing environment *i.e.* Open condition, Net house condition and Low polythene tunnel raised rootstock were tested using patch method of budding.

The results of present investigation clearly indicated that the time required for sprouting, sprouting percentage, number of leaves per new shoot, length and girth of new shoot and survival of budded plants were affected significantly. The effect of rootstock growing environment and budding season on the success of patch budding was found to be significant. Among the different combinations of growing environment and budding seasons, low polythene tunnel growing condition with patch budding in the month of August was found to be most effective for obtaining large number of good quality planting material of tamarind.

9. Name of the student : Rathva Kajalben Kesarsinh (2020214033)
   Year of completion of degree : 2016
   Name of the major advisor : Dr. Y. N. Tandel
   Title of thesis : Effect of post harvest treatments on extension of shelf life of sapota [*Manilkara achras* (Mill.) Fosberg]

Abstract

The present investigation on "Effect of post harvest treatments on extension of shelf life of sapota [*Manilkara achras* (Mill.) Fosberg]" was carried out on freshly harvested sapota at the Centre of Excellence, Department of Post Harvest Technoloy, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2015-2016.

The experiment consisted two precooling treatments *viz*., without precooling (P_0) and precooling at 10 ^oC for 8 hrs (P_1); two packaging treatments *viz*., without packaging (W_0) and low density polyethylene bag (1.2 % vent) (W_1), both treatments commonly kept in CFB box and two storage conditions *viz*., ambient temperature (C_0) and cold storage at 12 ^oC temperature (C_1). Whole experimental material (fruits) was kept on shaking plate for 3 days to give transportation treatment as the co-operative societies of South Gujarat sending their sapota to Delhi market which will take 3 days to reach and stored as per treatments until end of shelf life. The experiment was laid out in completely randomized design (CRD) with factorial concept and repeated twice. The analysis of data has been done with above three factors upto 9 DAS but it was not possible on 12 DAS due to over ripening of fruits in ambient temperature (C_0) storage and discarded the same.

The experiment results indicated that the sapota fruits subjected to precooling at 10 ^oC for 8 hrs (P_1) and packed in low density polyethylene bag (1.2 % vent) and kept in corrugated fibre board box (W_1) and subsequently cold stored at 12 ^oC temperature for 8 days (C_1) had taken maximum days for ripening. The lower physiological loss in weight and spoilage were recorded for extended period in these same treatments. The maximum fruit firmness and marketable fruits along with better quality were also noted in the sapota fruits subjected to above treatments.

The minimum total sugars, reducing sugar, ethylene concentration and total colony count were noted in sapota fruit precooled at 10 ^oC for 8 hrs (P_1), packed in low density polyethylene bag (1.2 % vent) and kept in corrugated fibre board box and stored at 12 ^oC temperature (C_1). The maximum fruit TSS, acidity, ascorbic acid and non-reducing sugar also noted in the sapota fruits subjected to above treatments.

The treatment combinations of precooling at 10 ^{o}C temperature for 8 hrs and storage at 12 ^{o}C temperature (P_1C_1) as well as fruits packed in low density polyethylene bag (1.2 % vent) and kept in corrugated fibre board box and storage at 12 ^{o}C temperature (W_1C_1) were also found superior in all the physico-chemical parameters of sapota fruits.

10. Name of the student : Ahir Hetalbahen K. (2020215001)
Year of completion of degree : 2017
Name of the major advisor : Dr. S. S. Gaikwad
Title of thesis : Effect of auxins on rooting of cuttings of phalsa (*Grewia subinaequalis* DC) cv. Local

Abstract

The present study was carried out under poly tunnel conditions at Polytechnic in Horticulture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, At & Po: Paria, Ta: Pardi, District- Valsad Gujarat, India during the year 2015-16 to investigate the "Effect of auxins on rooting of cuttings of phalsa (*Grewia subinaequalis* DC) cv. Local".

The experiment was laid out in Completely Randomized Design with Factorial concept having fourteen treatment combinations, comprising with two factors (1) Hardwood cutting (C_1) and (2) Semi hardwood cutting (C_1) and concentration of IBA with NAA (1000, 1500, 2000 mg l^{-1}). The treatments were repeated thrice. The effect of these treatments on sprouting, shoot and root growth parameters, root: shoot ratio and survival percentage were studied.

The results of present investigation revealed that among the different cutting types and different IBA and NAA concentrations, hardwood cutting and IBA @ 2000 mg l^{-1} were individually as well as in their combination found to be the most beneficial for early sprouting and the maximum sprouting percentage. Similar trend was observed on growth parameters of shoot and root such as number of leaves, shoots, leaf area, length shoot and root and survival percentage, fresh and dry weight of root and root: shoot ratio was higher in semi hardwood cutting treated with NAA @ 2000 mg l^{-1}.

Hence, it can be concluded that the hardwood cuttings of phalsa treated with 2000 @ mg l^{-1} gives maximum sprouting, root and shoot growth and survival percentage of phalsa cutting. Therefore, use of hardwood cuttings with combination of 2000 @ mg l^{-1} IBA can be utilized for producing healthy and vigorous planting material of phalsa.

11. Name of the student : Ahir Unnatibahen J. (2020215002)
Year of completion of degree : 2017
Name of the major advisor : Dr. B. M. Tandel
Title of thesis : Standardization of method and period of grafting in black jamun (*Syzygium cuminii* (L.) Skeel) cv. Konkan Bahadoli

Abstract

The present investigation entitled "Standardization of method and period of grafting in black jamun (*Syzygium cuminii* (L.) Skeel) cv. Konkan Bahadoli" was carried out at Regional Horticultural Research Station, Navsari Agricultural University, Navsari, Gujarat during the year 2016-2017. The experiment was laid out in a Completely Randomized design with factorial concept (FCRD) and repeated thrice with eight treatments combination. The experiment involved four grafting month at monthly interval

starting from June to September and two grafting methods *viz.* wedge & side, using cultivar 'Konkan Bahadoli' on black jamun rootstocks raised in polythene bags and kept under 50 % shade-net house condition. The results revealed that the different grafting month, methods of grafting and their interaction exerted significant influences on different parameters studied. The results regarding different grafting month indicated that the grafting done during June found most favorable, whereas different grafting methods, wedge grafting found superior in terms of significantly minimum days for first sprouting of scions, maximum number of sprouted grafts, sprouting percentage and the growth parameters like increment total number of leaves, height of grafts, scion girth and length, number of shoots and survival percentage of grafts. The interactions between month and methods of grafting revealed that grafting done in month of June with wedge grafting method proved superior for the various parameters like, minimum days for first sprouting of scion, higher number of sprouted grafts and sprouting percentage. The growth of grafts in terms of total number of leaves and height of grafts, scion girth and length, number of shoot and survival of grafts were also significantly higher in the graft prepared in month of June with wedge grafting. On the basis of the results obtained under the study, it was concluded that wedge grafting done in the month of June found most useful for obtaining good quality grafts of black jamun cv. Konkan Bahadoli.

12. Name of the student : Bagul Hemantbhai Bhaskarbhai (2020215005)
Year of completion of degree : 2017
Name of the major advisor : Dr. B. R. Parmar
Title of thesis : Effect of pre-sowing seed treatments on germination and growth of papaya (*Carica papaya* L.) seedlings cv. Red Lady

Abstract

The present investigation "Effect of pre-sowing seed treatments on germination and growth of papaya *(Carica papaya* L.) seedlings cv. Red Lady" was carried out during the year of 2015- 2016 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The experiment was laid out in Completely Randomized Design (CRD) with having nine organic treatments namely: T_1- Cowdung slurry, T_2- Cow urine (3 % for 3 hours), T_3- Amritpani (3 % for 3 hours), T_4- Bijamrut (3 % for 3 hours), T_5- Novel (3 % for 3 hours), T_6- Panchgavya (3 % for 3 hours), T_7- Vermiwash (20 % for 3 hours), T_8- Water soaking and T_9- Control with three repetitions. The effect of the treatments on different parameters of germination and growth of seedlings were studied.

The results of present investigation revealed that among the different organic treatments for 3 hours soaking and panchgavya were found to be most beneficial for improving germination percent and took minimum days for germination. Similar trend was observed on growth parameters such as height of seedling (cm), number of leaves, stem girth (mm), leaf area (cm^2), length of tape root (cm), number of roots per seedling, fresh weight of seedling (g), dry weight of seedling (g), survival percentage and minimized mortality percentage.

Hence, it can be concluded that the papaya seeds soaked for 3 hours and treated panchgavya have maximum germination percentage with optimum vegetative growth and survival percentage of papaya seedlings.

13. Name of the student : Chaudhary Ashaben Mashrubhai (2020215012)
Year of completion of degree : 2017
Name of the major advisor : Dr. T. R. Ahlawat
Title of thesis : Effect of gibberellic acid on seed germination and seedling growth in Kagzi lime

Abstract

The present investigation entitled "Effect of gibberellic acid on seed germination and seedling growth in Kagzi lime" was conducted at RHRS farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2016-17. The experiment was laid out in a Completely Randomized Design (CRD) with factorial concept with sixteen treatments and three repetitions. The different concentration of gibberellic acid were G_1– 200 ppm; G_2 – 300 ppm; G_3 – 400 ppm; G_4– 500 ppm; where S_1 is freshly extracted kagzi lime seeds and S_2 is seeds stored for l5 days, duration D_1 is 12 hour and D_2 is 24 hours. Storage treatments had a significant effect on all the parameters included in the study. The minimum number of days taken for 50 % germination (31.80) was observed when freshly extracted kagzi lime seeds were sown. The maximum germination percentage (77.03), seedling vigour index (2800.90), shoot length (17.61 cm), collar diameter (2.04 mm), number of leaves (20.84), leaf area (9.57 cm^2), total chlorophyll content (78.52 SPAD value), tap root length (23.02 cm), tap root diameter (1.71 cm), survival percentage (73.52) and total dry weight (7.39 g) respectively, were registered after the sowing of fresh seeds. The minimum sturdiness quotient (8.70) and shoot root dry weight ratio (3.82) was recorded when seeds were sown immediately after extraction. The minimum root shoot fresh weight ratio (16.89) was recorded when seeds were sown after 15 days storage. Storage treatments, pre-soaking treatments and duration of soaking had a significant impact on all parameters. Kagzi lime seeds treated with 500 ppm GA_3 recorded the minimum days taken for 50 % germination (29.37), maximum germination percentage (82.70), seedling vigour index (2898.81), number of leaves (23.19), leaf area (10.17), total chlorophyll content (81.38 SPAD value), tap root diameter (1.75 cm) and survival percentage (75.45). Whereas, shoot length (19.01 cm) collar diameter (2.09 mm), taproot length (24.88 cm), shoot dry weight (4.09 g) and total dry weight (7.97 g) was observed maximum when kagzi lime seeds were treated with 400 ppm GA_3. Root shoot fresh weight ratio (16.38), sturdinesss quotient (8.65) and shoot root dry weight ratio (3.73) was observed minimum when kagzi lime seeds were treated with 200 ppm GA_3. Soaking kagzi lime seeds for 12 hours recorded the minimum days taken for 50 % germination (31.82), sturdiness quotient (8.69), shoot root dry weight ratio (3.82) and maximum seedling vigour index (2791.58), shoot length (17.63 cm), collar diameter (2.04 mm), tap root length (23.02 cm), tap root diameter (1.71 cm), survival percentage (16.87), shoot dry weight (3.50g), total dry weight (7.37 g). Seeds soaked for 24 hours recorded maximum germination percentage (76.82), number of leaves (2.073) and minimum root shoot fresh weight ratio (16.87). The interaction between effect of storage treatments, pre-soaking treatments and duration of soaking (S x G x D) was significant with respect to days taken for 50 % germination, seed germination percentage, seedling vigour index, shoot length, number of leaves, root shoot fresh weight ratio and survival percentage.

14. Name of the student : Chauhan Bhathibhai Vahajibhai (2020215015)
Year of completion of degree : 2017
Name of the major advisor : Dr. D. K. Sharma

Title of thesis : Effect of season and growing conditions on success of soft wood grafting in jamun (*Syzygium cuminii* L.)

Abstract

The present investigation entitled "Effect of season and growing conditions on success of softwood grafting in Jamun (*Syzygium cuminii* L.)" was carried out at Agriculture Experimental Station, Navsari Agricultural University, Paria–Valsad, during the year 2016- 2017. The experiment was laid out in Completely Randomized Design (CRD) with factorial concept with three repetitions and twelth treatments. Four seasons of grafting *i.e.* July, August, September and October under three different growing conditions *i.e.* open field condition, poly house condition and shed net condition were tested using softwood method of grafting.

The results of present investigation clearly indicated that the graft-take and sprouting percent, days taken to sprouting, number of leaves per new shoot, sprout length of graft, leaf area, girth of graft and survival of grafted plants were affected significantly. The effect of grafts growing condition and season of grafting with softwood grafting was found to be significant. Among the different combinations August followed by July month of grafting under poly house growing condition with softwood grafting were found to be most best effective for obtaining large number of good quality planting material of jamun.

15. Name of the student : Harish Maharudrappa Patil (2020215023)

Year of completion of degree : 2017

Name of the major advisor : Dr. R. V. Tank

Title of thesis : Effect of seed treatment on germination and foliar spray of chemical substances on seedling growth of jamun (*Syzygium cuminii* L.)

Abstract

The present investigation entitled "Effect of seed treatment on germination and foliar spray of chemical substances on seedling growth of jamun (*Syzygium cuminii* L.)" was carried out during 2016-17 at Regional Horticultual Research Station, Navsari Agricultural University, Navsari. The experiment was laid out in completely randomized design with two factors repeated three times. The treatments comprised of six different seed treatments *viz.* control (S_1), water soaking for 24 hrs (S_2), hot water 100 ^{0}C for 5 sec (S_3), GA_3 @ 200 mg l^{-1} for 10 min (S_4), KNO_3 @ 0.5 % for 10 min (S_5) and thiourea @ 0.5 % for 10 min (S_6) and foliar spray of five different chemical substances *viz*. control (F_1), GA_3 @ 200 mg l^{-1} (F_2), NAA @ 200 mg l^{-1} (F_3), urea @ 1 % (F_4) and 19:19:19 @ 1% (F_5). The foliar sprays were done at 60 and 90 days after sowing.

Result of present investigation revealed that the jamun seeds soaked in water for 24 hrs (S_2) found better for germination attributes *viz.* days for initiation of germination and germination percentage, whereas GA_3 @ 200 mg l^{-1} for 10 min (S_4) was found better for shoot parameters *viz.* height of seedling, number of leaves per seedling, stem diameter of seedling, number of shoots per seedling, days to reach graftable size, leaf area, fresh weight of seedling and dry weight of seedling and root parameters *viz.* primary root length, number of secondary roots, fresh weight of root, dry weight of root and root: shoot ratio.

Among the foliar spray of different chemical substances, jamun seedlings sprayed with GA_3 @ 200 mg l^{-1} at 60 and 90 days after sowing (F_2) was found better for shoot and root parameters as compared to other chemical substances.

Considering the interaction effect between seed treatment and foliar spray of chemical substances, the vigorous seedling growth was observed in jamun seedlings

receiving treatment combination of GA_3 @ 200 mg l^{-1} for 10 min as a seed treatment and GA_3 @ 200 mg l^{-1} at 60 and 90 days after sowing as a foliar spray (S_4F_2). The minimum day to reach graftable size was also found due to imposition of this treatment. Whereas, minimum shoot and root parameters were noted in combination of control (without seed treatment) and foliar spray of NAA @ 200 mg l^{-1} at 60 and 90 days after sowing (S_1F_3).

16. Name of the student : Jnanendra M (2020215025)
Year of completion of degree : 2017
Name of the major advisor : Dr. B. N. Patel
Title of thesis : Influence of plant growth regulators on vegetative growth, flowering, fruiting and yield of papaya (*Carica papaya* L.) Taiwan Red Lady

Abstract

The field experiment "Influence of plant growth regulators on vegetative growth, flowering, fruiting and yield of papaya cv. Taiwan Red Lady" was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, N.A.U., Navsari during 2016.

The experiment was laid out in Randomized Block Design (RBD) with 11 treatments of different plant growth regulators along with control (without plant growth regulators) which were replicated thrice. The observations on vegetative parameter, flowering, yield and yield attributes and quality parameters were recorded during the investigation.

Spraying of different levels of plant growth regulators at 3rd, 5th and 7th MAP was significantly changed the plant height, stem girth and plant spread in both direction *i.e.*, N-S and E-W in papaya.

An application of GA_3 150 mg/1 (T_8) had higher value of plant height (86.48 cm, 132.88 cm and 191.08 cm) and maximum incremental plant height (46.01 cm, 46.40 cm and 50.91 cm) in papaya at 5th MAP, 7th MAP and at last picking, respectively.

Regarding stem girth of papaya, application of TIBA @ 150 mg/1 (T_5) recorded significantly maximum stem girth (23.49 cm, 34.64 cm and 47.12 cm) and maximum value of incremental plant girth (12.86 cm, 16.82 cm and 12.48 cm) at 5th MAP, 7th MAP and at last picking, respectively.

Maximum plant spread and incremental plant spread in both the direction *i.e.*, NS and EW was registered in treatment of GA_3 at 150 @ mg/1 (T_8) during 5th MAP, 7th MAP and at last picking in papaya.

An early initiation of flowering (100.36 days) was observed in treatment of Ethrel @ 300 mg/1 (T_{10}), which was applied at 3rd, 5th and 7th MAP in papaya.

Considering the effect on yield and yield attributing characters in papaya, an application of GA_3 @ 150 mg/1 (T_8) rank first with respect to produce maximum fruit length (29.01 cm), fruit diameter (52.54 cm), number of fruit per plant (25.02), weight of fruit (1187.32 g), pulp thickness (3.19 cm) and higher yield per plant (28.04 kg) and per hectare (70.10 t/ha), when spray application was given at 3rd, 5th and 7th MAP.

17. Name of the student : Joshi Champaklal Jayantilal (2020215026)
Year of completion of degree : 2017
Name of the major advisor : Dr. D. K. Sharma

Title of thesis : Effect of different chemicals on germination and seedling growth of chironji (*Buchanania lanzan* Spreng.)

Abstract

The present investigation on "Effect of different chemicals on germination and seedling growth of chironji (*Buchanania lanzan* Spreng.)" was carried out during the year of 2016-17 at the Agriculture Experimental Station, Navsari Agricultural University, Paria. The experiment was laid out in completely randomized design and replicated thrice with eleven treatments *viz.*, H_2SO_4 (5 percent), Mechanical scarification, GA_3 (200 and 300 ppm), KNO_3 (1 and 2 percent), Thiourea (1 percent), Biomix (50 g per kg seed), Cow urine (5 percent), Cow dung slurry. The results of present investigation revealed that the GA_3 @ 200 ppm minimized the days taken for germination and improved the germination percentage. Similar trend was observed in growth parameters such as seedling height, seedling diameter, number of leaves, leaf area, fresh and dry weight of shoot and root, total biomass and survival percentage. Hence, it can be concluded that the seeds soaked in water for 24 hrs and dipped in GA_3 @ 200 ppm for 24 hours gave the early germination, maximum germination percentage with optimum vegetative growth and survival percentage of seedlings.

18. Name of the student : Mutteppa Gotur (2020215029)
Year of completion of degree : 2017
Name of the major advisor : Dr. D. K. Sharma
Title of thesis : Performance of wedge grafting in guava (*Psidium guajava* L.) under different growing conditions

Abstract

The present investigation entitled "Performance of wedge grafting in guava (*Psidium guajava* l.) under different growing conditions" was carried out at Agriculture Experimental Station, Navsari Agricultural University, Paria–Valsad, during the year 2016-2017. The experiment was laid out in Completely Randomized Design (CRD) with factorial concept with three repetitions and sixteen treatments. Four seasons of grafting *i.e.* July, August, September and October on two scion varieties namely Lalit and Shweta under two different growing conditions *i.e.* open field condition, poly house condition were tested using wedge method of grafting.

The results of present investigation clearly indicated that the graft take and sprouting percent, days taken to sprouting, number of leaves per new shoot, height of graft, leaf area, girth of graft and survival of grafted plants were affected significantly. The effect of grafts growing condition and season of grafting with variety on the success of wedge grafting was found to be significant. The Lalit variety play an important role on early sprouting, graft take and sprouting per cent and survival percentage of graft as compare to Shweta variety. Among the different combinations August followed by July month of grafting on Lalit variety under poly house growing condition with wedge grafting were found to be most best effective for obtaining large number of good quality planting material of guava.

19. Name of the student : Noorullah (2020215032)
Year of completion of degree : 2017
Name of the major advisor : Dr. T. R. Ahlawat

Title of thesis : Effect of silicon and salicylic acid on fruiting, yield and quality of mango (*Mangifera indica* L.) cv. Kesar

Abstract

The present investigation entitled "Effect of silicon and salicylic acid on fruiting, yield and quality of mango (*Mangifera indica* L.) cv. Kesar" was conducted at RHRS farm and laboratory of Center of Excellence on Post-harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2016-17. The experiment was laid out in a Randomized Block Design (RBD) with ten treatments and three repetitions. The different silicon sources and salicylic acid treatments were T_1– Control; T_2- Potassium silicate @ 1 ml/l; T_3- Potassium silicate @ 2 ml/l; T_4- Potassium silicate @ 3 ml/l; T_5- Silicic acid @ 2 ml/l; T_6- Silicic acid @ 3 ml/l; T_7- Silicic acid @ 4 ml/l; T_8- Salicylic acid (1500 ppm); T_9- Salicylic acid (2000 ppm) and T_{10}- Salicylic acid (2500 ppm). Mango trees cv. Kesar were sprayed twice *i.e.* once at pea stage and second spray was done at marble stage of fruits. Application of silicon and salicylic acid had a significant impact on most of the parameters included in the study except ascorbic acid contents and total carotenoids. Of the different silicon sources, foliar spray of potassium silicate @ 1 ml/l recorded the maximum average fruit weight (289.57 g), fruit length (11.30 cm) and shelf life (16.80 days). On the 12th day of storage, it registered the highest value for firmness (4.67 kg/cm^2) and the lowest value for PLW (13.14 %). When applied at a slightly higher concentration *i.e.* 2 ml/l, potassium silicate resulted in higher (387.50) number of fruits per tree. Whereas, Potassium silicate @ 3 ml/l gave the maximum fruit retention (79.34 %). Silicic acid @ 2 ml/l recorded the highest fruit yield (106.50 kg/tree) in mango cv. Kesar. The maximum fruit breadth (7.53 cm) was observed in silicic acid @ 3 ml/l. Mango trees sprayed with silicic acid @ 4 ml/l had the maximum fruits per panicle (1.53). On the 12th day of storage, silicic acid @ 4 ml/l resulted in the maximum TSS (17.50 ^{o}Brix), total sugars (20.17 %), reducing sugars (4.84 %), non-reducing sugars (15.33 %) and titrable acidity (0.200 %). Between the three different levels of salicylic acid, trees sprayed with salicylic acid 2000 ppm recorded the highest fruit retention (89.83 %), average fruit weight (290.17 g), maximum fruit length (12.10 cm) and breadth (8.60 cm). It also recorded the highest fruit firmness (3.60 kg/cm^2), TSS (19.40 ^{o}Brix), total sugar content (24.83 %), reducing sugars (4.87 %) and non-reducing sugars (19.96 %) on the 16th day of storage. For that very storage period, salicylic acid @ 2000 ppm had the minimum PLW (19.20 %) and titrable acidity (0.217 %). It also prolonged the shelf life (18.00 days). Trees treated with salicylic acid @ 2500 ppm had the maximum number of fruits per panicle (1.77), number of fruits per tree (419.00) and total yield (120.64 kg/tree). The highest score (8.16) for fruit color, fruit taste (8.72) and overall acceptability (8.11) were noticed in the treatment involving silicic acid 4 ml/l on the 12th day of storage. However, on the 16th day of storage, the highest score (8.17) for fruit color, fruit taste (8.60) and overall acceptability (8.50) were observed in the treatment comprising of salicylic acid 2000 ppm. In conclusion, foliar application of salicylic acid at 2000 ppm emerged as the best treatment in all aspects of this investigation. This treatment improved fruit retention, increased yield, enhanced fruit quality and extended the shelf life of mango fruits cv. Kesar.

20. Name of the student : Parmar Jivabhai Rajshi (2020215035)
    Year of completion of degree : 2017
    Name of the major advisor : Dr. Virendra Singh
    Title of thesis : Influence of different organics on fruit set, yield and quality of sapota cv. Kalipatti

Abstract

The present experiment entitled “Influence of different organics on fruit set, yield and quality of sapota cv. Kalipatti” was conducted during the year 2016-17 at College Farm, College of Agriculture, Navsari Agricultural University, Bharuch Campus, Bharuch (Gujarat).

The experiment was laid out with nine treatments in Randomized Block Design and replicated three times. The treatment comprised of two different concentrations of humic acid (T_1: 1.0 % and T_2: 2.0 %), two concentrations of Novel Organic Liquid Fertilizer (T_3: 1.0 % and T_4: 2.0 %), two concentrations of cow urine (T_5: 1.0 % and T_6: 2.0 %), two concentrations of CPPU (T_7: 5 ppm and T_8: 10 ppm) along with control as water spray (T_0). All the organics were sprayed thrice: first in the month of February at the flowering stage, second in the month of March at fruit set stage and third in the month of November at Marble stage. The observations on fruiting, yield, physical and quality parameters were recorded and analyzed statistically.

Humic acid at 1.0 % was found best treatment with respect to fruit set and retention. However, it was statistically at par with T_7. Although, highest number of fruits was found in T_1 being statistically at par with T_7, highest fruit yield per tree and per hectare was obtained in T_1.

Among the physical characters, highest fruit weight was found in T_3 having statistically at par result with T_5, T_6 and T_1. However, highest fruit volume was observed in T_3, which was found at par with T_5, T_6 and T_4, although specific gravity shows no statistical difference.

However, with respect to quality parameters, T_5 shows better result in majority of the parameters. Highest TSS was observed in T_5, which was at par with T_3, while, lowest acidity was observed in T_1 showing at par with T_2 and T_5. Ascorbic acid was seen higher in T_3, which was significantly at par with T_4, T_7 and T_8. Highest total sugar and reducing sugar was found in T_5 which was found at par with T_6, but highest non-reducing was found in T_3, but was at par with T_6.

From the overall experiment it can be concluded that application of humic acid at 1.0 % and CPPU at 5 ppm was effective in increasing fruit retention, yield and application of Cow urine at 1.0 % was effective in quality characters in the peak season fruiting (Harvesting in December- March) when sprayed thrice. While, economically, Novel Organic Liquid Fertilizer (Banana *pseudostem* sap) at 1.0 % gave highest B:C ratio.

21. Name of the student : Patel Ankitkumar K. (2020215039)
    Year of completion of degree : 2018
    Name of the major advisor : Dr. S. S. Gaikwad
    Title of thesis : Effect of grafting method and age of rootstock of cashewnut under South Gujarat condition

Abstract

The present investigation entitled “Effect of grafting method and age of rootstock of cashewnut under South Gujarat condition” was carried out at Polytechnic in Horticulture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, At & Post: Paria, Ta: Pardi, District- Valsad Gujarat, India during the year 2016-2017.

The experiment was laid out in Completely Randomized Design (CRD) with factorial concept having ten treatment combinations, comprising with two factors (1)

different age of rootstocks (1.5, 2.0, 2.5, 3.0 and 3.5 months) and (2) types of grafting (wedge grafting and side grafting) were replicated thrice. Grafting done at different interval as per treatment on rootstock by wedge and side grafting techniques on cashew nut rootstock raised in polythene bags and kept under polytunnel.

The results of present investigation revealed that among the different age of rootstock studied, 2.5 months age of rootstock, whereas among the grafting methods, *i.e.* wedge grafting technique proved significantly higher for total number of leaves & leaf area, height of grafts, incremental height of grafts, girth of scion above union, incremental girth of scion above union, girth of rootstock below union, incremental girth of rootstock below union, scion length, incremental scion length, number of primary branches and survival of grafts. Whereas, the interaction between grafting method and age of rootstock revealed that the treatment combination of M_1R_3 (wedge grafting on 2.5 months rootstock) had recorded significantly maximum on number of grafts sprouted per treatment, sprouting percentage, total number of leaves per graft height of grafts number of branches and survival percentage .

22. Name of the student : Patel Manoliben Rajendrakumar (2020215043)

Year of completion of degree : 2017

Name of the major advisor : Dr. R. V. Tank

Title of thesis : Response of soaking time and chemicals on germination and growth of tamarind (*Tamarindus indica* L.)

Abstract

An experiment entitled "Response of soaking time and chemicals on germination and growth of tamarind (*Tamarindus indica* L.)" was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) during the year 2016-2017. The experiment was laid out in Completely Randomized Design with two factors repeated three times. The treatment comprised of two soaking time *viz*., 12 hours and 24 hours and nine different seed treatment chemicals *viz*., KNO_3 @ 1 % (C_1), KNO_3 @ 2 % (C_2), GA_3 @ 100 mg l^{-1} (C_3), GA_3 @ 200 mg l^{-1} (C_4), NAA @ 100 mg l^{-1} (C_5), NAA @ 200 mg l^{-1} (C_6), Thiourea 2 % (C_7), Thiourea 4 % (C_8) and Control (without chemical) (C_9).

The results of present investigation revealed that the tamarind seeds soaked for 24 hours soaking time treatment (S_2) recorded minimum number of days required for germination and maximum germination percentage. The 24 hours soaking time treatment (S_2) maintained its superiority in producing maximum seedling height, number of leaves per seedling, number of leaflets/plant, stem diameter, leaf area/plant, fresh and dry weight of shoot, fresh and dry weight of root. Significantly, the longest root, shoot : root ratio, vigour index-I, vigour index-II, and survival percentage was also noted in 24 hours soaking time treatment (S_2).

Among the different seed treatment chemicals, tamarind seeds treated with GA_3 @ 200 mgl^{-1}(C_4) was found better for germination parameters and all growth parameters as compared to other seed treatment chemicals.

Considering the interaction effect between soaking time and seed treatment chemicals, treatment combination of 24 hours soaking time with GA_3 @ 200 mgl^{-1} (S_2C_4) as seed treatment was found best for days required for germination, germination percentage, seedling height, number of leaves per seedling, number of leaflets/leaf, stem diameter, leaf area/plant, fresh weight of shoot, dry weight of shoot, dry weight of root, longest root length, shoot : root ratio, vigour index-I, and vigour index-II. Whereas

maximum days required for germination, minimum seedling height, number of leaves per seedling, number of leaflets/plant, stem diameter, shoot : root ratio, fresh and dry weight of shoot, dry weight of root and vigour index-II were noted in treatment combination of 12 hrs soaking time and control (S_1C_9). Whereas minimum germination percentage, longest root length, leaf area/plant and vigour index-I were noted in treatment combination of 24 hours soaking time and control-without chemical treatment (S_2C_9).

23. Name of the student : Patoliya Rahulkumar M. (2020215050)
Year of completion of degree : 2017
Name of the major advisor : Dr. B. M. Tandel
Title of thesis : Response of foliar spray of different chemicals on flowering and fruiting in Dashehari mango under ultra high density plantation

Abstract

The present experiment entitled "Response of foliar spray of different chemicals on flowering and fruiting in Dashehari mango under ultra high density plantation" was conducted during the year 2015-16 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Randomized Block Design and replicated thrice. Nine treatments comprising urea (1, 1.5 and 2 %), KNO_3 (1 and 2 %), ethephon 200 mg l^{-1} and novel organic liquid fertilizer (1 and 2 %) along with one control and they were sprayed twice, first fortnight of October and November. The effect of these treatments on different parameters of flowering, fruiting, yield and quality were recorded and analyzed statistically. Results of present investigation revealed that among all the treatments, foliar application of KNO_3 @ 2 % treatmentgaveminimum vegetative shoot and maximum flowering shoot per terminal, minimum vegetative shoot (%), maximum flowering shoot (%), maximum length of panicle and minimum days for full bloom. Fruit setting percentage at pea, marble and maturity stage were significantly the maximum in same treatment.

The number of fruits, average fruit weight and yield (kg/tree) were significantly the maximum in KNO_3 @ 2 % treatment. Untreated trees of mango produced minimum yield and its attributes as compared to other treatments. In case of quality parameters, foliar application of KNO_3 @ 2 % treatment improved the quality parameters like shelf life, TSS, total sugar, non reducing sugar, reducing sugar, fruit firmness, ascorbic acid and minimum titrable acidity in Dashehari mango under ultra high density plantation. For economic point of view, foliar application of KNO_3 @ 2 % treatment at first fortnight of October and November were more remunerative in respect to net realization and benefit cost ratio. On the basis of results obtained in present investigation, it can be summarized that foliar application of KNO_3 @ 2 % at first fortnight of October and November, can be utilized for enhancing flowering, fruit retention, yield and quality in Dashehari mango under ultra high density plantation.

24. Name of the student : Pinal Parmar (2020215051)
Year of completion of degree : 2017
Name of the major advisor : Dr. S. J. Patil
Title of thesis : Response of fertilizer application on growth, yield and quality of papaya var. Red Lady

Abstract

The present experiment entitled “Response of fertilizer application on growth, yield and quality of papaya var. Red Lady” was conducted during the year 2016-17 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat). The experiment was laid out with nine treatments in a Randomized Block Design (RBD) and replicated thrice. The treatments included 100 % RDF (200:200:250 g NPK/plant) as control in four equal splits (2^{nd}, 4^{th}, 6^{th}, and 8^{th} MAP), 100 and 80 % recommended dose of nitrogen and potash in 8 equal splits starting from 2^{nd} month after planting in 15 days interval with or without foliar application of 1 % Grade-IV micronutrient and Grade-IV micronutrient at 2^{nd}, 4^{th}, 6^{th} and 8^{th} month after planting. Growth, yield and quality parameters were recorded and analyzed statistically.

Results of present investigation revealed that papaya var. Red Lady plants fed with 100 % RDNK (200:250 g/plant) and applied in 8 equal splits starting from 2^{nd} month after planting in 15 days interval with foliar application of 1 % Grade-IV micronutrient at 2^{nd}, 4^{th}, 6^{th} and 8^{th} month after planting gave maximum growth characters like plant height, plant girth and leaf area. While, the minimum days required for first flower initiation, total acidity (%) and physiological loss in weight (%) and maximum number of fruits per plant, average fruit weight (kg), diameter of fruit (cm), length of fruit (cm), yield (kg/plant and t/ha), firmness (kg/cm^2), TSS (^{0}Brix), total sugar (%) reducing sugar (%) and shelf life (days) were noted in 80 % RDNK in 8 equal splits + foliar application of 1 % novel organic liquid fertilizer treatment.

Economics indicated Papaya plants fed with 80 % RDNK (200:250 g/plant) when applied in 8 equal splits starting from 2^{nd} month after planting in 15 days interval with foliar application of 1 % novel organic liquid fertilizer treatment at 2^{nd}, 4^{th}, 6^{th} and 8^{th} month after planting found most remunerative as it gave the highest gross income and net realization with maximum benefit cost ratio.

25. Name of the student : Rajni Rajan (2020215053)
Year of completion of degree : 2017
Name of the major advisor : Dr. S. S. Gaikwad
Title of thesis : Effect of post shooting bunch spray of chemicals on bunch characters and yield of banana (*Musa paradisiaca* L.) cv. Grand Naine

Abstract

An experiment entitled “Effect of post shooting bunch spray of chemicals on bunch characters and yield of banana (*Musa paradisiaca* L.) cv. Grand Naine" was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) during the year 2015 - 2016. The experiment was laid out in Randomized Block Design (RBD) with twelve treatments and three replications. The treatments included GA_3 @ 50 mg l^{-1} (T_1), GA_3 @ 100 mg l^{-1} (T_2), NAA @ 50 mg l^{-1} (T_3), NAA @ 100 mg l^{-1} (T_4), Ethephon @ 0.1 ml l^{-1} (T_5), Ethephon @ 0. 2 ml l^{-1} (T_6), CPPU @ 1 mg l^{-1} (T_7), CPPU @ 2 mg l^{-1} (T_8), Brassinosteroid @ 1 mg l^{-1} (T_9), Brassinosteroid @ 2 mg l^{-1} (T_{10}), SOP @ 1.5 % (T_{11}) and Control (T_{12}). The first spray was given immediately after complete opening of the bunch and second spray was given at 20 days after first spray.

The results of present investigation revealed that the banana bunches when

sprayed with Ethephon @ 0.2 ml l^{-1} shortened the maturity period of cv. Grand Naine banana. Whereas, bunches sprayed with Brassinosteroid @ 2 mg l^{-1} found effective in higher bunch size (length and girth), finger size (length and girth), finger weight, weight of third hand, bunch weight and fruit yield.

The minimum physiological loss in weight and maximum shelf life and pulp: peel ratio of banana fruit was observed when bunches were sprayed with CPPU @ 2 mg l^{-1}. From the economic point of view the highest net return was obtained in the bunches sprayed with Brassinosteroid @ 2 mg l^{-1} while the maximum BCR was noted in the bunches sprayed with GA_3 @ 100 mg l^{-1}.

26. Name of the student : Thakriya Hitesh Ramanlal (2020215059)
Year of completion of degree : 2017
Name of the major advisor : Dr. Virendra Singh
Title of thesis : Effect of soaking treatments on mango stones to success of epicotyl grafting

Abstract

The present experiment entitled "Effect of soaking treatments on mango stones to success of epicotyl grafting" was conducted during the year 2016-17 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The experiment was conducted in completely randomized design including twelve treatments and three repetitions before grafting. After grafting the experiment was laid out in completely randomized design with factorial concept including twelve different treatment combinations and three repetitions comprised of two factors, varieties for scions *viz.,* Kesar (V_1) and Sonpari (V_2); and soaking treatments *i.e.,* P_1– *Neem seed* kernel extract (5 %), P_2– *Neem seed* kernel extract (10 %), P_3– Custard apple leaf extract (5 %), P_4– Custard apple leaf extract (10 %), P_5– Basil leaf extract (5 %), P_6– Basil leaf extract (10 %), P_7– Sucrose solution (1 %), P_8– Sucrose solution (2 %), P_9– *Vermiwash* (1 %), P_{10}– *Vermiwash* (2 %), P_{11}– Novel Liquid Organic Fertilizer (5 %) and P_{12}– Novel Liquid Organic Fertilizer (10 %). The effect of these treatments on germination, vigour and growth of mango stones and earliness, vigour, growth, success and mortality percentage of mango grafts were studied.

The results of present investigation revealed that among different soaking treatments and varieties for scion, *Vemiwash* 1 % was the best treatment for enhancing germination percentage and production of vigorous seedling. Whereas, soaking mango stones in 1 % *Vermiwash* and grafted by Kesar variety of scion proved best with respect to minimum days taken to first sprout, more number of success grafts, less mortality percentage, more number of leaves, maximum height of grafts and length of scion.

Hence, it can be concluded that mango seeds soaked with *Vemiwash* 1 % and grafted with scion of Kesar variety gave maximum success and production of vigorous mango grafts in green house condition.

27. Name of the student : Chavda Jay Kantilal (2020216004)
Year of completion of degree : 2018
Name of the major advisor : Dr. S. J. Patil
Title of thesis : Effect of defoliation and storage of scion stick on growth and survival of softwood graft of jamun var. Goma Priyanka

Abstract

The present study was carried out under poly house condition at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India during the year 2017-2018 to investigate the "Effect of defoliation and storage of scion stick on growth and survival of softwood graft of jamun var. Goma Priyanka".

The experiment was laid out in Completely Randomized Design with Factorial concept and repeated thrice with eight treatment combinations. The experiment compromising with two factors (1) Defoliation (with and without defoliation) and (2) Storage of scion stick (1, 2, 3 and 4 days). The effect of this treatments on days required to leaf emergence (days), number of leaves, incremental girth (mm), incremental length of sprouted scion shoot (cm), number of shoots, leaf area (cm^2), sprouting percentage (%), graft survival percentage at 180 DAG (%) were studied.

The results of present investigation revealed that among different defoliation treatment and storage of scion stick, defoliated and one day stored scion stick of jamun var. Goma Priyanka, individually superior in all the growth parameters like minimum days required to leaf emergence, maximum number of leaves, incremental girth, incremental length of sprouted scion shoot, number of shoot, leaf area and graft survival percentage at 180 days. While, sprouting percentage was significant individually as well as in their combination.

Hence it can be concluded that defoliated and one day stored scion stick of jamun var. Goma Priyanka is better than storing scion stick for 2 to 4 days and without defoliation for growth and survival of softwood graft.

28. Name of the student : Khalasi Devang N. (2020216011)
Year of completion of degree : 2018
Name of the major advisor : Dr. A. K. Pandey
Title of thesis : Nutrient accumulation during fruit growth of mango (*Mangifera indica* L.)

Abstract

The present experiment entitled "Nutrient accumulation during fruit growth of mango (*Mangifera indica* L.)" was conducted during the year 2016–17 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat). The interpretation of fruit analysis must consider many factors that may influence leaf nutrient levels, seasonal differences related to rainfall, fruit load, pruning, age, variety, rootstock, nutritional interaction and nutrient removal. Information about the nutritional status of a plant is a basic prerequisite for its adequate nutrition and crucial to achieve high yield productivity. Assessing the annual concentration of nutrient that tree needs to absorb in order to successfully complete a vegetative and reproductive growth is a fundamental step for developing rational fertilization in orchards. For conducting this experiment fruit of variety Kesar, Alphonso, Sonpari and Totapuri were collected at different stages like Marble, Egg and Harvest for estimation of macronutrients (N, P, K, Ca, Mg and S) and micronutrients (Zn, Fe, Mn and Cu). In the present investigation it can be concluded that highest accumulation of N (1.72 %) and Mg (1.08 %) was recorded at marble stage while, Cu (49.89 ppm) at harvest stage in the Sonpari variety. The maximum Fe (120.53 ppm) and Mn (17.87 ppm) were in Totapuri variety at egg and marble stage, respectively. Whereas Zn (45.05 ppm) content was found higher in the same variety but, at marble stage. However, higher P (0.31 %) and S (0.55 %) accumulation was found in Alphonso variety while, K (1.57

%) and Ca (0.70 %) in Kesar at egg stage. Nutrient partitioning at harvest stage is revealed maximum N (2.29 %), Mg (0.22 %) and S (0.36 %) content were in peel and highest Ca (0.80 %) accumulation in pulp of Kesar variety. The Sonpari variety found maximum P (0.30 %), Fe (150.60 ppm), Mn (17.58 ppm) and Cu (63.94 ppm) accumulation in kernel of fruit. While, K (1.07 %) and Zn (92.00 ppm) was recorded higher in pulp of Totapuri and Sonpari variety, respectively. The result leaf nutrients analysis displayed maximum K (1.62 %), Ca (1.69 %), Mg (0.70 %), S (0.50 %), Zn (36.39 ppm), Fe (184.00 ppm), Mn (69.18 ppm) and Cu (20.14 ppm) contents in Totapuri at harvest stage, whereas, P (0.38 %) was recorded higher at egg stage in the same variety and N (1.54 %) was observed maximum in Kesar variety at harvest stage.

29. Name of the student : Laxmi Bagewadi (2020216013)

Year of completion of degree : 2018

Name of the major advisor : Dr. R. V. Tank

Title of thesis : Response of chemicals and colour shade nets on growth of epicotyl grafting of mango (*Mangifera indica* L.) cv. Kesar

Abstract

The present investigation entitled 'Response of chemicals and colour shade nets on growth of epicotyl grafting of mango (*Mangifera indica* L.) cv. Kesar' was carried out during the year 2017-18 at Regional Horticultural Research Station, NAU, Navsari. The experiment was laid out in completely randomized design with two factors repeated three times. The treatment comprised of 3 different chemicals as scion dip *viz*., No application of chemical (C_1), BAP @ 20 mg l^{-1} for 5 second (C_2) and BAP (20 mg l^{-1}) +$ZnSO_4$ (750 mg l^{-1}) (C_3) for 5 second and five different colour shade nets *viz*., open field condition (P_1), green colour shade net (P_2), red colour shade net (P_3), white colour shade net (P_4) and blue colour shade net (P_5).

Results of present investigation revealed that the scion treated with BAP 20 mgl^{-1} + $ZnSO_4$ 750 mg l^{-1} for 5 seconds (C_3) was found better for early sprouting, number of grafts sprouted, graft sprouting percentage, number of graft success and survival percentage, number of leaves, total leaf area, root length, number of roots, fresh weight and dry weight of root per graft. Whereas, BAP @ 20 mg l^{-1} for 5 seconds (C_2) was found beneficial for incremental height of graft, incremental girth of scion, fresh and dry weight of shoot, fresh and dry shoot to root ratio.

Among the different colour shade nets, mango epicotyl grafts kept under green colour shade net (P_2) was found effective with respect to graft success parameters (days taken for sprouting, number of grafts sprouted, graft sprouting percentage, number of graft success and survival percentage and shoot parameters *viz*., incremental height of graft, number of leaves, total leaf area, fresh and dry weight of shoot. Similarly, root parameters (number of roots, root length, fresh and dry weight of roots) were also found superior in green colour shade net. While, girth of scion and fresh and dry shoot to root ratio was found maximum under red and blue colour shade net, respectively compared to other colour shade nets.

Considering the interaction effect between chemicals and colour shade nets, maximum fresh and dry weight of shoot and root length were found beneficial when scion treated with BAP 20 mg l^{-1} for 5 seconds and grafts kept under green colour shade net (C_2P_2) at 6 months after grafting. While, maximum number of leaves, total leaf area and fresh and dry shoot : root ratio were recorded with the C_3P_2, C_1P_2 and C_1P_5 treatment combinations, respectively at 6 months after grafting.

30. Name of the student : Archana V. Mahida (2020216015)

Year of completion of degree : 2018

Name of the major advisor : Dr. Y. N. Tandel

Title of thesis : Effect of foliar spray of iron and zinc fertilization on yield and quality of mango cv. Kesar

Abstract

A field experiment was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) during 2016-2017 to find out "Effect of foliar spray of iron and zinc fertilization on yield and quality of mango cv. Kesar". The experiment consisted of nine treatments *viz.*, control (T_1), 0.25 % $FeSO_4$ (T_2), 0.50 % $FeSO_4$ (T_3), 0.25 % $ZnSO_4$ (T_4), 0.50 % $ZnSO_4$ (T_5), 0.25 % $FeSO_4$ + 0.25 % $ZnSO_4$ (T_6), 0.25 % $FeSO_4$ + 0.50 % $ZnSO_4$ (T_7), 0.50 % $FeSO_4$ + 0.25 % $ZnSO_4$ (T_8), 0.50 % $FeSO_4$ + 0.50 % $ZnSO_4$ (T_9).The experiment was laid out in a completely randomized design (CRD) with three replications. Micronutrients were sprayed at three stages *i.e.* at flowering, pea and egg stage on 20 years old mango orchard planted 10 × 5 m spacing.

The results indicated that significantly higher fruit set percentage at marble (27.20 %), egg (9.54 %) and maturity stage (2.69 %) was recorded in treatment T_9 (0.50 % $FeSO_4$ + 0.50 % $ZnSO_4$) which was at par with T_7 (0.25 % $FeSO_4$ + 0.50 % $ZnSO_4$) and T_5 (0.50 % $ZnSO_4$). The fruit retention (2.95 %) at harvesting was also observed higher in treatment T_9 (0.50 % $FeSO_4$ + 0.50 % $ZnSO_4$) which was at par with treatment T_7 (0.25 % $FeSO_4$ + 0.50 % $ZnSO_4$). The lowest fruit set and fruit retention were registered in control (T_1).

Yield parameters *viz.*, number of fruits per tree (284.23), average fruit weight (289.77 g) and yield per tree (82.37 kg/tree) were found maximum in treatment T_9 (0.50 % $FeSO_4$ + 0.50 % $ZnSO_4$) which was at par with T_7 (0.25 % $FeSO_4$ + 0.50 % $ZnSO_4$) and T_5 (0.50 % $ZnSO_4$). While this yield characters were recorded minimum in control (T_1).

Significantly the highest TSS (19.35 °Brix) and ascorbic acid (36.70 mg/ 100g) were observed in mango fruit when the trees treated with 0.50 % $FeSO_4$ and 0.50 % $ZnSO_4$ (T_9). With above mentioned quality attributes, T_9 was at par with treatment T_7 (0.25 % $FeSO_4$ + 0.50 % $ZnSO_4$) and T_5 (0.50 % $ZnSO_4$). Untreated trees *i.e.* control (T_1) noted the lowest TSS and ascorbic acid. While organoleptic score and shelf life were found to be non-significant among the various micronutrients treatments.

Studies on nutrient content in leaves of mango revealed that the major nutrients (N, P and K) and minor nutrients (Zn, Fe, Mn and Cu) content before spray and P, K, Cu, Mn content after spray were not significantly affected by the foliar application of $FeSO_4$ and $ZnSO_4$. The highest nitrogen content (1.10 %) and Fe content (599.33 ppm) in leaves after foliar spray of micronutrients were recorded the highest in T_9 (0.50 % $FeSO_4$ + 0.50 % $ZnSO_4$) whereas, the lowest nitrogen and iron content were obtained in control (T_1).

Among all the micronutrient under study, P in pulp; N and K in peel; Cu and Mn in pulp and peel of mango fruit were not altered significantly by foliar spray of Zn and Fe. N content (48.73 mg/100 g), K content (94.17 mg/100 g), Fe (1.66 mg/100 g) and Zn (1.20 mg/100 g) content in pulp and Fe content (418.67 ppm) in peel were noted maximum in T_9 (0.50 % $FeSO_4$ + 0.50 % $ZnSO_4$) and it is at par with T_8 (0.50 % $FeSO_4$ + 0.25 % $ZnSO_4$). While Zn and P content in peel (70.33 ppm and 0.056 %, respectively) of mango observed higher in the same treatment which were at par with T_7 (0.25 % $FeSO_4$ + 0.50 % $ZnSO_4$). The content of all nutrients content in pulp and peel of fruit were noted lowest in untreated treatment (T_1).

On the basis of the present investigation, it can be inferred that the foliar application of 0.50 % $ZnSO_4$ can be done at flowering, pea and egg stage of fruit for getting higher fruit retention, yield and quality of mango cv. Kesar fruits. However, the mineral nutrients content *i.e.* N, P, K, Zn, Fe in fruit; and N in leaves can be improved by the foliar spray 0.50 % $FeSO_4$ and 0.50 % $ZnSO_4$ at flowering, pea and egg stage of fruit.

31. Name of the student : Ankita Mantri (2020216018)
Year of completion of degree : 2018
Name of the major advisor : Dr. Y. N. Tandel
Title of thesis : Effect of saline water on growth and physiological attributes of rayan (*Manilkara hexandra* L.)

Abstract

A field study was carried out at Fruit Research Station, Navsari Agricultural University, Gandevi (Gujarat) during 2017 to find out "Effect of saline water on growth and physiological attributes of rayan (*Manilkara hexandra* L.)". The experiment consisted of six treatments of salinity levels of irrigation water *viz.,* 0.5 dS m^{-1} (T_1), 2 dS m^{-1} (T_2), 4 dS m^{-1} (T_3), 6 dS m^{-1} (T_4), 8 dS m^{-1} (T_5) and 10 dS m^{-1} (T_6). It was laid out in a completely randomized design (CRD) with three repetitions. The observations on growth parameters; mineral composition in leaves, stem and roots; photosynthetic parameters and survival percentage were recorded.

The results indicated that all growth parameters, physiological parameters and nutrient content in leaves, stem and roots of rayan seedlings were decreased with increasing salinity levels.

Significantly the maximum plant height (9.38, 18.75 and 24.27 cm, respectively) and number of leaves (6.40, 10.20 and 12.33) were recorded in treatment T_1 which was at par with T_2 at 40, 80 and 120 days after treatment. The fresh weight of plant (9.30 g) and dry weight of shoots (2.57 g), roots (0.92 g) and whole plant (3.49 g) were also observed higher in treatment T_1 at 120 days after treatment. The minimum plant height, number of leaves, fresh weight and dry weight were registered in treatment T_6 (10 dS m^{-1}).

It was clearly observed that dry biomass was increased as the level of saline irrigation water increased. The permissible dry biomass (50 % or nearby) was noted in 8 dS m^{-1} salinity level of irrigation water with values of in 48.54 % shoots, 53.09 % roots and 49.85 % plants.

The N content (%) in leaves, stem and roots of rayan seedlings due to different salinity levels was found to be non-significant. While P and K content in leaves (0.174 and 1.09 %, respectively), stem (0.090 and 1.98 %) and roots (0.122 and 1.77 %) were recorded higher in treatment T_1 (0.5 dS m^{-1}) which was at par with treatment T_2 (2 dS m^{-1}).

The minimum Na content (%) and Na/K ratio in leaves (0.14 % and 0.14), stem (0.13 % and 0.06) and roots (0.30 % and 0.17) were observed when rayan seedlings irrigated with lower salinity level *i.e.* 0.5 dS m^{-1} (T_1) whereas the maximum Na content and Na/K ratio were recorded in treatment T_6 (10 dS m^{-1}).

In case of Ca and Mg content in leaves (0.95 and 0.59 %, respectively) and stem (0.54 and 0.732 %, respectively) were noted significantly higher in treatment T_1 (0.5 dS m^{-1}). The non significant differences were observed for Ca content in roots. The Mg content in roots (0.48 %) was noted higher in treatment T_1. While minimum Ca, Mg and P content in leaves, stem and roots of rayan were recorded at higher salinity level *i.e.* (10 dS m^{-1}).

Photosynthetic parameters *viz.,* photosynthetic rate (26.14, 27.31 and 29.79 µmol CO_2 $m^{-2}s^{-1}$, respectively), stomatal conductance (0.036, 0.061 and 0.066 mmol CO_2 $m^{-2}s^{-1}$) and transpiration rate (0.54, 0.57 and 0.623 mmol H_2O $m^{-2}s^{-1}$) were recorded the highest in treatment T_1 (0.5 dS m^{-1}) at 40, 80 and 120 days after treatment. Whereas the lowest photosynthetic parameters were noted in the treatment T_6 (10 dS m^{-1}). The treatment T_1 (0.5 dS m^{-1}) showed higher relative water content (86.25 %) in rayan seedlings. The minimum RWC (%) was recorded in treatment T_6 (10 dS m^{-1}).

Physico-chemical properties of soil *viz.,* pH (6.71), EC (0.98 dS m^{-1}), extractable Ca (15.60 me/100 g), Mg (9.31 me/100 g) and Na (0.78 me/100 g) were registered lower in treatment T_1 (0.5 dS m^{-1}) and the higher values of all these properties were obtained in treatment T_6 (10 dS m^{-1}). Available K content and soil organic carbon was not affected significantly by different salinity levels. In case of available N and P, a decline was recorded with increasing salinity levels. The maximum available N (171.33 mg/kg) and P (52.66 mg/kg) were noted in treatment T_1 (0.5 dS m^{-1}) and the minimum values of available N and P were obtained in treatment T_6 (10 dS m^{-1}).

In survival percentage, the maximum survival (97.58 %) was observed in treatment T_1 (0.5 dS m^{-1}) and the minimum was obtained in treatment T_6 (10 dS m^{-1}). However, more than 85 per cent seedlings were survived well up to 8 dS m^{-1} salinity level (T_5).

It is therefore, inferred from the present study that rayan seedlings can grow well upto 8 dS m^{-1} salinity level with higher survival and minimum reduction in dry biomass; whereas higher growth with optimum physiological parameters in seedlings can get upto 4 dS m^{-1} salinity level.

32. Name of the student : Patel Malhar Vishnubhai (2020216024)

Year of completion of degree : 2018

Name of the major advisor : Dr. B. R. Parmar

Title of thesis : Effect of growing media and foliar spray of organics on seedling growth and vigour of Acid Lime

Abstract

The present investigation entitled "Effect of growing media and foliar spray of organics on seedling growth and vigour of acid lime" was conducted at RHRS farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2017.

The experiment was arranged over eighteen treatment combinations comprising of three levels of growing media (M_I- Red soil, M_2- Red soil + FYM (1:1) and M_3- Red soil + FYM + Vermicompost (1:1:1) and six levels of organic foliar spray (F_1- Cow Urine (3 %), F_2- *Amritpani* (3 %), F_3- Novel (1 %), F_4- *Panchagavya* (3 %), F_5- Vermiwash (10 %) and F_6- Control) laid out in Completely Randomized Design (CRD) with factorial concept with three repetitions.

The experimental results indicated that media (M_3) red soil + FYM + vermicompost (1:1:1) noted greater germination percentage (82.11 %), height of seedling at 120, 150 and 180 DAS (29.38 cm, 38.53 cm and 47.00 cm, respectively), number of leaves (22.48, 30.29 and 36.34, respectively) and stem diameter (2.10 mm, 2.70 mm and 3.12 mm, respectively). Whereas, the maximum fresh (17.67 g) and dry weight (10.06 g) of seedling, vigour index- I (3859.66) and II (826.02), highest survival percentage (75.26 %) and least mortality percentage (24.73 %) was noted in (M_3) red soil + FYM + vermicompost (1:1:1) at 180 DAS. While maximum NPK and organic carbon content was also recorded in same media.

Among the foliar spray treatment, (F_4) *panchagavya* @ 3 % was significantly improved growth parameter *viz.*, height of seedling at 120, 150 and 180 DAS (29.64 cm, 38.30 cm and 47.32 cm, respectively), number of leaves (22.22, 30.69 and 36.31, respectively) and stem diameter (2.10 mm, 2.73 mm and 3.12 mm, respectively). Likewise the highest fresh (17.97 g) and dry weight (10.02 g) of seedling, vigour index- I (3681.89) and II (778.31), highest survival percentage (75.20 %) and least mortality percentage (24.82 %) was noted in same foliar spray at 180 DAS.

The interaction effect between the media and foliar spray had a significant effect only on height of seedling at 150 and 180 DAS as well as number of leaves at 150 DAS. The maximum height of seedling (42.87 cm) at 150 DAS and 51.90 cm at 180 DAS as well as the highest number of leaves (35.07) at 150 DAS was recorded in treatment (M_3F_4) red soil + FYM + vermicompost (1:1:1) and *Panchagavya* @ 3 %.

On the basis of the results obtained in present investigation, it concluded that the media (M_3) red soil + FYM + vermicompost (1:1:1) and foliar spray of (F_4) *panchagavya* @ 3 % was found significantly effective to improve growth and vigour in acid lime.

33. Name of the student : Ahir Priya Jayantilal (2020217002)

Year of completion of degree : 2019

Name of the major advisor : Dr. D. K. Sharma

Title of thesis : Effect of fruit maturity and ethrel on ripening, quality and shelf life of banana cv. Grand Naine under low cost ripening chamber

Abstract

The investigation entitled “Effect of fruit maturity and ethrel on ripening, quality and shelf life of banana cv. Grand Naine under low cost ripening chamber” was conducted at Fruit Research Station (FRS), Gandevi and Department of Post Harvest Technology, Navsari Agricultural University, Navsari under agro-ecological situation-III under heavy rainfall zone during the year 2017-18 by adopting the completely randomized design with factorial concept with three repetitions and 12 treatments. The treatments include two factors with four and three levels *i.e.*, (i) Fruit maturity stage (M) with levels of M_1 (80 days after flowering), M_2 (90 days after flowering), M_3 (100 days after flowering), M_4 (110 days after flowering) and (ii) Ethrel exposure durations (E) with levels of E_1 (6 hrs exposure), E_2 (12 hrs exposure), E_3 (18 hrs exposure). Total 12 treatments and three repetitions were laid out in CRD with factorial concept. The observations were made on physical quality parameters of fruits like number of days taken for ripening, organoleptic score, shelf life, fruit firmness, physiological loss in weight, number of shriveled fruits, spoilage percentage, peel thickness, pulp peel ratio and marketable fruits percentage. The chemical quality parameters like content of Total Soluble Solids, acidity, ascorbic acid, reducing sugar, total sugar, non reducing sugar, starch and ethylene concentration in banana cv. Grand Naine. Regarding the effect of four different maturity stages on banana fruits, maximum TSS, sugars, optimum ascorbic acid and minimum titratable acidity, early and uniform ripening, excellent sensory attributes were found in the 110 days after flowering fruits *i.e.*, M_4. Fruits of 80 days after flowering *i.e.*, M_1 obtained maximum shelf life, higher firmness, also the less mature fruits obtained acceptable quality. Among the ethrel exposure durations (E), the fruits under treatment E_3 (18 hrs exposure to ethrel) led to the early ripening, less firmness, PLW, shrivelling per cent, peel thickness, acidity, starch, highest TSS and ethylene concentration. However, the fruits under treatment E_1 (6 hrs exposure to ethrel) led to the highest shelf life, marketable fruits, pulp peel ratio, ascorbic acid and non-

reducing sugar. Duration of exposure to ethylene (E_2- 12 hrs) led to the more acceptability score, highest reducing sugar and total sugar. Among all the treatment combinations; M_4E_2 *i.e.*, 110 days after flowering fruits exposed to 12 hrs exposure gave the excellent quality of fruits, M_4E_1 *i.e.*, 110 days after flowering fruits exposed to 6 hrs exposure gave highest marketable fruit percentage as well as higher benefit cost ratio as compared to the rest of the treatments.

34. Name of the student : Patel Nikshita Rohitbhai (2020217022)
Year of completion of degree : 2019
Name of the major advisor : Dr. Y. N. Tandel
Title of thesis : Effect of seed scarification and soaking treatments on germination and seedling growth of sapota

Abstract

The present investigation on "Effect of seed scarification and soaking treatments on germination and seedling growth of sapota" was carried out under nursery condition at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during October 2017 to July 2018. The experiment consisted two seed scarification treatments *viz*., without scarification and with scarification; and six soaking treatments *viz*., GA_3 200 ppm, thiourea 1 %, cow urine 10 %, cow dung slurry, potassium nitrate 2 % and water soaking for 24 hrs. The experiment was laid out in completely randomized design (CRD) with factorial concept and repeated thrice.

The experimental results indicated that the maximum germination percentage, emergence rate index (ERI) and Bartlett rate index (BRI) were obtained when sapota seeds sown without scarification as compared to with scarification treatment. While no significant differences were observed among scarification treatments on days for initiation of germination. Among seed soaking treatments, the minimum days required for initiation of germination and the maximum germination attributes were recorded in cow dung slurry which was at par with cow urine 10 % and GA_3 200 ppm as compared to water soaking treatment for 24 hrs.

Growth parameters *viz.*, number of leaves per seedling, seedling height and stem diameter at 5, 7 and 9 MAS and biomass *viz.*, fresh weight of shoot and root and dry weight of shoot and root at 9 MAS registered the maximum in without scarification treatment than scarification treatment. In case of seed soaking treatments, all the periodical observations on growth parameters at 5, 7 and 9 MAS and biomass at 9 MAS were significantly the maximum in cow dung slurry which was at par with cow urine 10 % and GA_3 200 ppm for 24 hrs. While the least values in all these attributes were noted in water soaking treatment.

The maximum survival and minimum mortality percentage were recorded in those seeds sown without scarification as compared to scarification treatment. Among seed soaking treatments, cow dung slurry was found to be superior with higher survival and lesser mortality percentage which was at par with cow urine 10 % and GA_3 200 ppm for 24 hrs whereas, water soaking treatment was found to be inferior with lesser survival and higher mortality percentage of spaota seedlings.

Results on vigour index of sapota seedlings revealed that higher seedling vigour index (SVI) - Ⅰ and seedling vigour index (SVI) - Ⅱ was recorded in without scarification treatment over scarification treatment. Out of all seed soaking treatments, the highest SVI - Ⅰ and SVI - Ⅱ were registered in cow dung slurry treatment which was at par with cow urine 10 % and GA_3 200 ppm treatments. The water soaking

treatment noted the lowest SVI - Ⅰ and SVI - Ⅱ as compared to rest of the treatments.

Interaction effect of seed scarification and soaking treatments was found to be non-significant for all parameters under study.

Owing to the results obtained during study, it is inferred that the sapota seeds sown without scarification and soaking in cow dung slurry or cow urine (10 %) for 24 hrs to get higher seed germination, growth and survival of sapota seedlings.

35. Name of the student : Twinkle A. Patel (2020217025)
Year of completion of degree : 2019
Name of the major advisor : Dr. A. K. Pandey
Title of thesis : Effect of pre-harvest treatments of paclobutrazol and calcium chloride on yield and quality of mango (*Mangifera indica* L.) cv. Amrapali

Abstract

The present investigation entitled "Effect of pre-harvest treatments of paclobutrazol and calcium chloride on yield and quality of mango (*Mangifera indica* L.) cv. Amrapali" was conducted during 2017-18 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat. The experiment was laid out in a completely randomized design (CRD) with three repetitions. Paclobutrazol and $CaCl_2$ were sprayed at 75 days after full bloom and 15 days before harvest respectively, on 10 years old mango orchard planted at 2.5 m × 2.5 m spacing. Paclobutrazol at 200 mg/l with $CaCl_2$ at 1.5 per cent significantly increased fruit weight (244.52 g), fruit length (11.02 cm), fruit breadth (7.01 cm), fruit volume (206.81 cm_3), pulp to (peel + stone) ratio (3.34), yield (44.20 kg/tree), fruit firmness (3.62 kg/cm_2) and organoleptic scores for overall acceptability of mango cv. Amrapali fruits. While, 100 mg/l paclobutrazol with 1.5 per cent $CaCl_2$ application significantly increased shelf life (6.83 days), TSS (20.70 °B), total sugar (17.65 %), reducing sugar (7.16 %), ascorbic acid (41.08 mg/100g), total carotenoids (0.99 mg/100 g) and phenol (86.53 mg/100 g). The same treatment significantly reduced titratable acidity (0.13 %), PLW of fruit for 2^{nd}, 4^{th} and 6^{th} day of storage (1.20 %, 1.50 % and 2.47 %, respectively) and spoilage per cent (22.03 %) of mango cv. Amrapali fruits.

36. Name of the student : Patel Zarna Kamleshbhai (2020217026)
Year of completion of degree : 2019
Name of the major advisor : Dr. B. N. Patel
Title of thesis : Influence of fruit bagging on quality of mango (*Mangifera indica* L.) under high density planting

Abstract

The present investigation on "Influence of fruit bagging on quality of mango (*Mangifera indica* L.) under high density planting" was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari from January 2018 to July 2018 on Sonpari variety.

The experiment consisted of three planting distance (D) *viz*., 5 m × 5 m (D_1), 3 m × 3 m (D_2) and 3 m × 2 m (D_3) and seven fruit bagging materials (B) *viz*., control (B_1) newspaper bag (B_2), brown paper bag (B_3), transparent PP bag (B_4), butter paper bag (B_5), muslin cloth bag (B_6) and non woven bag (B_7). It was laid out in Randomized Block Design with factorial concept and repeated thrice. The fruits were bagged at egg

stage (55-60 days after fruit set).

Results indicated that early harvesting of fruits (56.95 days), maximum per cent fruit retention (70.37), PAR (290.21 and 304.38 μ mol m^{-2} s^{-1} at 40 and 60 DAFB, respectively), marketable fruit (60.20 %), TSS (19.90 ºBrix), reducing sugars (5.15 %), total sugars (12.12 %), sensory parameters and minimum fruit fly infestation (6.15 %) and titrable acidity (0.16 %) were obtained in the planting distance of 5 m × 5 m. While maximum fruit weight (406.78 g), fruit length (11.44 cm), fruit diameter (8.78 cm), fruit volume (388.36 cm^3), pulp weight (175.89 g), stone weight (54.85 g), non reducing sugars (7.07 %) content of fruit and minimum (26.96 %) damage fruits (sun burned or bruised) and anthracnose infected fruits (4.12 %) were observed in planting distance of 3 m × 3 m. Maximum fruit firmness (4.00 kg cm^{-2}) and shelf-life (16.69 days) at ambient temperature was recorded in planting distance of 3 m × 2 m.

Among fruit bagging treatments, maximum per cent fruit retention (70.15 %), fruit firmness (4.18 kg cm^{-2}), marketable fruits (67.70 %), shelf-life (18.22 days), TSS (20.55 ºBrix), reducing sugars (5.33 %), total sugars (13.15 %), non reducing sugars (7.82 %), ascorbic acid content of fruit (36.26 mg 100 g^{-1}) and minimum damaged fruits (22.26 %), titrable acidity content of fruit (0.14 %) was noticed in fruits bagged with newspaper bag. Fruit fly incidence and anthracnose infestation was not observed in newspaper bag, butter paper bag and muslin cloth bag. While, maximum fruit weight (407.34 g), fruit length (12.24 cm), fruit diameter (8.93 cm), fruit volume (383.27 cm^3), pulp weight (175.56 g), stone weight (55.99 g) was found in fruits bagged with muslin cloth bag which was at par with newspaper bags. While, maximum β carotene content (1290.10 μg 100 g^{-1}) was noted in fruits of brown paper bag.

Interaction effect between planting distance and bagging materials was found significant with respect to fruit volume, per cent damaged fruit, per cent fruit fly incidence, per cent anthracnose infestation and marketable fruit. The interaction between D_2B_6 (3 m × 3 m distance and fruit bagging with muslin cloth bag) recorded maximum fruit volume (426.49 cm^3), which was at par with D_2B_2 (3 m × 3 m distance and fruit bagging with newspaper bag). While, minimum damaged fruits (17.10 %) and maximum marketable fruits (72.86 %) were noted in D_1 (5 m × 5 m) and fruits bagged with B_2 (newspaper bag). There was no fruit fly infestation in the interaction of D_1B_2, D_1B_3, D_1B_6, D_2B_2, D_2B_3, D_2B_5, D_2B_6, D_3B_2, D_3B_5, and D_3B_6. Anthracnose free fruits were recorded in the interaction of D_1B_2, D_1B_3, D_1B_5, D_1B_6, D_1B_7, D_2B_2, D_2B_3, D_2B_5, D_2B_6, D_3B_2, D_3B_3, D_3B_5, and D_3B_6.

The highest BCR (3.25) was recorded in the combination of D_1B_2 (5 m × 5 m and fruits covered with newspaper bag) followed by D_2B_2 (3 m × 3 m and fruits bagged with newspaper bag) with benefit cost ratio of 3.23.

Owing to the results obtained during this study, it is inferred that fruits bagged with newspaper bag with planting distance of 5 m × 5 m was found better for enhancing the quality of mango fruit cv. Sonpari.

37. Name of the student : Patel Dhiralbahen S. (2020217019)
Year of completion of degree : 2019
Name of the major advisor : Dr. S. S. Gaikwad
Title of thesis : Effect of different chemical treatments on germination and seedling vigour of bael (*Aegle marmelos* L.)

Abstract

The present investigation entitled “Effect of different chemical treatments on germination and seedling vigour of bael (*Aegle marmelos* L.)” was carried out at

Polytechnic in Horticulture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Paria, Gujarat during the year 2018. The experiment was laid out in a Completely Randomized Design (CRD) and repeated thrice with thirteen treatments. Comprising three treatments of GA_3 concentrations *i.e.* (100, 150 and 200 mg l^{-1}), three treatments of ethrel concentrations *i.e.* (1000, 1500 and 2000 mg l^{-1}), three treatments of Thiourea concentrations *i.e.* (1000, 1500 and 2000 mg l^{-1}), three treatments of KNO_3 concentrations *i.e.* (1.0, 1.5 and 2.0 %) and control.

The observations were recorded on seed germination (*viz*. number of days taken for 50 % seed germination, percentage of seed germination), physical parameters of growth (*viz.* number of leaves per seedling, seedling height, seedling girth, leaf area, internodal length, fresh and dry weight of shoot and root).

The results of the investigation revealed that, there was a significant variation in germination and seedling growth of bael due to growth regulators and chemicals. Amongst the effect of growth regulators and chemicals, the seeds soaked in GA_3 @ 150 mg l^{-1} solution for 24 hours resulted in higher per cent of germination, maximum number of leaves per seedling, maximum seedling height, maximum seedling girth, higher internodal length, maximum leaf area, higher fresh and dry weight of shoot and root, maximum survival percentage and higher income with maximum cost benefit ratio (CBR), while seeds soaked in thiourea @ 2000 mg l^{-1} for 24 hours recorded minimum number of days taken for 50 per cent germination.

Hence, it can be concluded that the seeds soaked in GA_3 @ 150 mg l^{-1} for 24 hours gave the maximum germination percentage with optimum vegetative growth and survival percentage of seedlings.

38. Name of the student : Pradeepkumar M. (2020217027)
Year of completion of degree : 2019
Name of the major advisor : Dr. D. K. Sharma
Title of thesis : Determination of maturity index of mango (*Mangifera indica* L.) fruits var. Kesar

Abstract

The investigation entitled “Determination of optimum maturity index of mango (*Mangifera indica* L.) fruits var. Kesar” was conducted during 2017-18 at Agriculture Experimental Station, Paria and Department of Post-Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari with the objective to standardize the optimum period of time for harvesting fruits of Kesar mangoes and also assess the physical and quality parameters of mangoes harvested at different maturity periods. The experiment was laid out in completely randomized design (CRD) with three repetitions and six treatments of different maturity weeks *viz.*, T_1: 12^{th} week, T_2: 13^{th} week, T_3: 14^{th} week, T_4: 15^{th} week, T_5: 16^{th} week and T_6: 17^{th} week after flowering. The trees under experimentation were 12 years old of var. Kesar at AES, NAU, Paria. All flowering panicles were tagged at the time of full bloom stage and retained for maturity. The fruits of Kesar mango were harvested as per the treatments. The results from the study revealed that among the different weeks of harvest period of Kesar mangoes, fruits harvested at 17th week after flowering (T_6) and 16^{th} week after flowering (T_5) were found to be optimum period for harvesting of mangoes for better fruit quality and optimum shelf life. Fruits harvested at 16^{th} week after flowering (T_5) showed the maximum organoleptic score and less spoilage due to optimum physiological loss in weight as compared to the rest of treatments. Treatment T_5 also showed the maximum fruit weight, pulp: stone ratio, acid: sugar ratio. Further the fruits harvested at

17th week after flowering (T_6) also recorded the superior quality attributes and biochemical parameters in ripened fruits. From the foregoing discussion, it can be inferred from the study that size of fruit *i.e.* (length and diameter), specific gravity, external skin and pulp colour, fruit firmness, TSS, sugars content, ascorbic acid and pH were found optimum when fruits of mango var. Kesar was harvested at 17th week after flowering (T_6) followed by 16th week after flowering (T_5).

39. Name of the student : Rathod Khushbuben Dhirubhai (2020217030)
Year of completion of degree : 2019
Name of the major advisor : Dr. Binayak Chakraborty
Title of thesis : Effect of plant growth regulators on growth, yield and quality of strawberry (*Fragaria* × *ananassa* Duch.) cv. Winter Dawn

Abstract

The present investigation entitled "Effect of plant growth regulators on growth, yield and quality of strawberry (*Fragaria* × *ananassa* Duch.) cv. Winter Dawn" was carried out at Rambhas Farm, Hill Millet Research Station, Navsari Agricultural University, Waghai, Gujarat, India during 2017-2018. The experiment consisted of foliar application NAA (50, 75, 100 and 125 mg l^{-1}) and GA_3 (50, 75, 100 and 125 mg l^{-1}) along with control (no spray) and laid out in randomized block design (RBD) with three replications. The spraying was done at 30 and 60 DAP.

The experimental results indicated that among the plant growth regulator treatments, foliar spraying of GA_3 @ 100 mg l^{-1} found significant with respect to maximum plant spread, number of leaves, number of crown, leaf area, length of petiole, number of runners, number of flowers, number of fruits, fruit weight, marketable fruit percentage, marketable and total fruit yield and higher income with maximum benefit cost ratio (BCR).

Whereas, the strawberry fruit quality parameters like total soluble solid, ascorbic acid, reducing sugar, non-reducing sugar and total sugar content were recorded significantly maximum in plants treated with NAA @ 125 mg l^{-1}.

However, the plant growth regulator treatments failed to influence any significant effect on days taken to 50.0 % flowering, fruit setting percentage, fruit firmness and acidity content of strawberry fruits.

Therefore, on the basis of the results obtained in the study and from economical point of view, the strawberry cv. Winter Dawn should be sprayed twice at 30 and 60 DAP with GA_3 @ 100 mg l^{-1} to gain higher yield and maximum profit.

40. Name of the student : Shivakumara N. R. (2020217033)
Year of completion of degree : 2019
Name of the major advisor : Dr. T. R. Ahlawat
Title of thesis : Characterization studies in papaya (*Carica papaya* L.) cv. Red Lady Taiwan

Abstract

The present investigation entitled "Characterization studies in papaya (*Carica papaya* L.) cv. Red Lady Taiwan" was conducted at Instructional Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat during July 2018 to May 2019. In this study 200 plants of papaya cv. Red Lady Taiwan were

characterized for establishing the phenological events and correlation between different characters with fruit yield. Growth and production parameters were also correlated with weather parameters. The experiment was laid out in non-replicated trail. Papaya seedlings of cv. Red Lady Taiwan were planted in May 2018 at a spacing of 2m x 2m. Vegetative traits in pistillate plants of papaya cv. Red Lady Taiwan *viz.*, plant height, stem girth and leaf area increased gradually from July, 2018 to May, 2019. Number of leaves counted from flowering till harvesting exhibited a similar trend from July, 2018 to March, 2019. Number of pistillate flowers were maximum in the month of October, 2018. Whereas, number of fruits per plant were found to be maximum in May, 2019. Further, the maximum fruit weight, fruit diameter and fruit length were recorded in fruits harvested during February, 2019. Fruit yield per plant in cv. Red Lady Taiwan was found maximum in April, 2019. In case of hermaphrodite plants plant height, stem girth and leaf area showed a gradual increase from July, 2018 to May, 2019. The number of leaves confirmed to this trend albeit from July, 2018 to March, 2019 (flowering till harvesting). Further, floral parameters such as number of flowers were found maximum in the month of February, 2019 (elongate flowers) and October, 2018 (barren flowers), respectively. The highest number of fruits per plant as well as mis-shapen fruits was recorded in the month of May, 2019. Also the maximum fruit weight, fruit diameter and fruit length in fruits born on hermaphrodite plants was registered in the month of March, 2019. Further, fruit yield per plant in papaya cv. Red Lady Taiwan was noticed to be maximum in the month of April, 2019. Fruit yield in papaya cv. Red Lady Taiwan exhibited positively significant correlation with vegetative traits *viz.*, plant height, stem girth and leaf area in both pistillate as well as in hermaphrodite plants. It also showed positively significant correlation with number of flowers and positive highly significant with insertion height of first fruit in both the type of plants. Further, yield attributing characters *viz.*, number of fruits per plants, fruit weight, fruit diameter and fruit length showed highly positive significant correlation with yield in pistillate as well as in hermaphrodite plants. With regard to weather parameters, vegetative traits (plant height, stem girth and leaf area) showed positively significant correlation with maximum temperature in both pistillate and hermaphrodite plants. Further, pistillate flowers showed positive and highly significant correlation with minimum temperature. Barren flowers exhibited positively significant correlation with maximum temperature also positive and highly significant correlation with sunshine hours. Mis-shapen hermaphrodite fruits showed positive and highly significant correlation with maximum temperature. Yield exhibited significantly positive correlation with maximum temperature. Further, it exhibited positive and highly significant correlation minimum temperature and sunshine hours in both pistillate and hermaphrodite plants of papaya cv. Red Lady Taiwan.

41. Name of the student : Smita Kesurbhai Chaudhari (2020217034)
Year of completion of degree : 2019
Name of the major advisor : Dr. B. R. Parmar
Title of thesis : Effect of pre-harvest spray and post-harvest dipping of fruits on shelf life and quality of papaya

Abstract

The present experiment entitled “Effect of pre- harvest spray and post-harvest dipping of fruits on shelf life and quality of papaya” was carried out at Instructional Farm and P.G. laboratory of Centre of Excellence in Post-Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the month of May, 2018 to April, 2019.

The experiment was laid out in Completely Randomized Design with Factorial

concept having twelve treatment combinations, comprising of four levels of pre- harvest spray *viz.*, GA_3 15 mg/l, $CaCl_2$ 1.0 %, $Ca(NO_3)_2$ 2.0 % and potassium schoenite 1.0 % and three levels of post-harvest dipping *viz.*, water dipping (control), $CaCl_2$ 1.0 % and $Ca(NO_3)_2$ 2.0 %. The treatments were repeated thrice. The pre- harvest spray of chemicals was applied 20 days before probable optimum harvesting. After harvesting of fruits, the subsequent post-harvest dipping treatments were given for 5 minutes. The effect of these treatments on physical parameters as well as bio-chemical parameters of papaya fruits was recorded on 2^{nd}, 4^{th}, 6^{th} and 8^{th} days by storing at ambient (room) temperature.

The results of present experiment revealed that either pre-harvest spray or post-harvest dipping treatment of $CaCl_2$ 1.0 % was found to be most beneficial for physical parameters *viz.*, minimizing PLW, spoilage, ripened fruit percentage, increasing marketable fruit percentage, days to ripening as well as improved physico-chemical parameters *viz.*, TSS, reducing sugar, non-reducing sugar, total sugar, acidity, ascorbic acid, vitamin A.

The interaction between pre-harvest spray and post- harvest dipping was found significant with respect to shelf life. The interaction between S_2D_2 (pre-harvest spray of $CaCl_2$ 1.0 % (S_2) and post-harvest of dipping of $CaCl_2$ 1.0 % (D_2) was recorded maximum shelf life.

Owing to the results obtained during this study, it is inferred that fruits either sprayed or dipped with $CaCl_2$ 1.0 % (S_2) found better for enhancing the quality of papaya fruits.

42. Name of the student : Tandel Jinalben J. (2020217035)
Year of completion of degree : 2019
Name of the major advisor : Dr. S. J. Patil
Title of thesis : Effect of defoliation and storage of scion stick on growth and survival of softwood graft of mango var. Sonpari

Abstract

The present study was carried out under poly house condition at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India during the year 2018-2019 to investigate the "Effect of defoliation and storage of scion stick on growth and survival of softwood graft of mango var. Sonpari".

The experiment was laid out in Completely Randomized Design with Factorial concept and repeated thrice with twelve treatment combinations. The experiment comprising with two factors (1) effect of defoliation (6, 9 and 12 days before detachment from mother plant) and (2) effect of storage of scion stick (0,1, 2, and 3 days). The effect of this treatments on days required to sprouting (days), number of leaves, incremental girth at union (mm), incremental length of sprouted scion shoot (cm), incremental height of graft (cm), number of shoots, leaf area (cm^2), sprouting percentage (%), graft survival percentage (%) were studied.

The results of present investigation revealed that among different defoliation treatment and storage of scion stick, 12 days prior defoliated and fresh (without storage) scion stick of mango var. Sonpari, individually superior in softwood grafting for all the growth parameters like maximum number of leaves, incremental girth at union, incremental length of sprouted scion shoot, incremental height of graft, number of shoots, leaf area, sprouting percentage and graft survival percentage. While, 12 days

prior defoliated and fresh (without storage) scion stick of mango var. Sonpari individually as well as in their combination required minimum days to sprouting.

Hence, it can be concluded that 12 days prior defoliated and fresh (without storage) scion stick of mango var. Sonpari used to softwood grafting for better growth and survival of graft.

43. Name of the student : Ajay Kumar Sahu (2020218001)
Year of completion of degree : 2020
Name of the major advisor : Dr. B. N. Patel
Title of thesis : Effect of post shooting application of fertilizers through pouch feeding on fruit yield and quality attributes in banana cv. Grand Naine

Abstract

The present investigation was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2018-19. This experiment was undertaken in a Randomized Block Design with fifteen treatments *viz.*,T_1- Control, T_2- 300 g cow dung slurry + *Panchagavya* (15 ml), T_3- 300 g cow dung slurry + *Panchagavya* (15 ml) + $(NH_4)_2SO_4$ (10 g), T_4 - 300 g cow dung slurry + *Panchagavya* (15 ml) + SOP (10 g), T_5 - 300 g cow dung slurry + *Panchagavya* (15 ml) + KNO_3 (10 g), T_6 - 300 g cow dung slurry + Novel (10 ml), T_7 - 300 g cow dung slurry + Novel (10 ml) + $(NH_4)_2SO_4$ (10 g), T_8 - 300 g cow dung slurry + Novel (10 ml) + SOP (10 g), T_9 - 300 g cow dung slurry + Novel (10 ml) + KNO_3 (10 g), T_{10} - 300 g cow dung slurry + $(NH_4)_2SO_4$ (10 g), T_{11} - 300 g cow dung slurry + $(NH_4)_2SO_4$ (10 g) + SOP (10 g), T_{12} - 300 g cow dung slurry + $(NH_4)_2SO_4$ (10 g) + KNO_3 (10 g), T_{13} - 300 g cow dung slurry + SOP (10 g), T_{14} - 300 g cow dung slurry + KNO_3 (10 g) and T_{15} - 300 g cow dung slurry + $(NH_4)_2SO_4$ (20 g) + SOP (10 g). These treatments were applied through pouch, which tied at distal end of the bunch.

Banana bunches were harvested early (82.33 days) in treatment of 300 g cow dung slurry + $(NH_4)_2SO_4$ (20 g) + SOP (10 g) as a pouch feeding. Higher bunch weight (34.53 kg), weight of third hand (3.98 kg), finger length (25.53 cm) and finger girth from third hand (15.65 cm) and finger weight from third hand (234.78 g) of third hand as well as higher fruit yield (119.88 t/ha) was obtained when banana bunches were fed with 300 g cow dung slurry + $(NH_4)_2SO_4$ (10 g) + SOP (10 g) through pouch feeding.

Regarding quality parameters, bunches of banana cv. Grand Naine fed with 300 g cow dung slurry + $(NH_4)_2SO_4$ (10 g) + SOP (10 g) resulted with the maximum pulp: peel ratio (3.34), total soluble solids (21.80 ºBrix) and ascorbic acid content (8.36 mg/100g), reducing sugars content (6.59 %) and shelf life (11.60 days) with minimum titrable acidity (0.210 %). However, treatment of 300 g cow dung slurry + $(NH_4)_2SO_4$ (20 g) + SOP (10 g) gave maximum value of non reducing sugars (8.39 %) and total sugars content of fruit (14.75 %). The highest net return (Rs./ha 1180675) and maximum BCR (4.57) was obtained in the treatment of banana bunch fed with 300 g cow dung slurry + $(NH_4)_2SO_4$ (10 g) + SOP (10 g) as pouch feeding.

44. Name of the student : Boricha Urvashi Kamleshkumar (2020218006)
Year of completion of degree : 2020
Name of the major advisor : Dr. B. R. Parmar
Title of thesis : Effect of pre-sowing treatments on seed germination and seedling growth of guava

Abstract

The present investigation entitled "Effect of pre-sowing treatments on seed germination and seedling growth of guava" was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2019-20.

The experiment was laid out in a Completely Randomized Design (CRD) and repeated thrice with ten treatments comprising Control (T_1), GA_3 150 mg l^{-1} (T_2), KNO_3 1 % (T_3), Thiourea 500 mg l^{-1} (T_4), Cow dung slurry 3 % (T_5), Cow urine 3 % (T_6), *Bijamrut* 3 % (T_7), *Amritpani* 3 % (T_8), *Pseudomonas fluorescens* 10 ml l^{-1} (T_9) and Water soaking (T_{10}). Seeds were soaked for 24 hours in all treatments except control.

The observations were recorded on seed germination *viz.* days to germination, percentage of seed germination, growth parameters namely number of leaves per seedling, seedling height, stem diameter, primary root length, number of secondary roots, fresh and dry weight of shoot and root and shoot : root ratio.

The results of the investigation revealed that there was a significant variation in germination and seedling growth of guava due to different pre-sowing treatments. Among the treatments, the seeds soaked in GA_3 @ 150 mg l^{-1} solution for 24 hours resulted in higher per cent of germination, maximum number of leaves per seedling, maximum seedling height, maximum stem diameter, longest primary root length, maximum number of secondary roots, higher fresh and dry weight of shoot and root, maximum shoot root ratio and maximum survival percentage. It could be concluded that the seeds soaked in GA_3 @ 150 mg l^{-1} for 24 hours gave the maximum germination percentage with higher vegetative growth and survival percentage of guava seedlings.

45. Name of the student : Desai Devanshi Jayeshbhai (2020218011)
Year of completion of degree : 2020
Name of the major advisor : Dr. R. V. Tank
Title of thesis : Effect of *Arbuscular Mycorrhizal* fungi and bio-inoculants on germination and seedling growth of papaya (*Carica papaya* L.) var. GJP-1

Abstract

The current investigation entitled "Effect of *Arbuscular Mycorrhizal* fungi and bio- inoculants on germination and seedling growth of papaya (*Carica papaya* L.) var. GJP-1" was carried out at the Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2019.

The experiment consisted 9 treatments *viz. Glomus intraradices* 10 g (T_1), *Pseudomonas fluorescens* 10 ml (T_2), *Trichoderma viride* 10 g (T_3), *Trichoderma harzianum* 10 g (T_4), $T_1 + T_2$ [*Glomus intraradices* (10 g) + *Pseudomonas fluorescens* (10 ml)] (T_5), $T_1 + T_3$ [*Glomus intraradices* (10 g) + *Trichoderma viride* (10 g)] (T_6), $T_1 + T_4$ [*Glomus intraradices* (10 g) + *Trichoderma harzianum* (10 g)] (T_7), $T_1 + T_2 + T_3 + T_4$ [*Glomus intraradices* (10 g) + *Pseudomonas fluorescens* (10 ml) + *Trichoderma viride* (10 g) + *Trichoderma harzianum* (10 g)] (T_8) and control (T_9). The research was laidout in Completely Randomized Design and repeated thrice. The seeds of papaya were coated with these bio- inoculants and then dried in shade. After drying seeds were sown in polybags.

The result of investigation revealed that the seeds treated with *Trichoderma harzianum* 10 g (T_4) gave the highest germination (89 %) along with early emergence (6 days). Maximum seedling growth *viz.* seedling height (9.47 cm and 19.80 cm), seedling

diameter (4.200 mm and 9.920 mm) and number of leaves (8.20 and 13.03) were observed with the seed treatment of *Trichoderma harzianum* 10 g (T_4) at 30 and 45 days after sowing, respectively. Highest tap root length (14.03 cm), tap root diameter (8.50 mm), number of secondary roots (12.80), chlorophyll content (1.36 mg/g), leaf area per plant (136.67 cm^2), fresh weight of shoot and root (9.05 g and 2.253 g), dry weight of shoot and root (0.860 g and 0.396 g), shoot : root ratio (4.01) and survival (92.43 %) were also noted in treatment *Trichoderma harzianum* 10 g (T_4) at 45 days after sowing.

46. Name of the student : Desai Yashkumar Gamanbhai(2020218012)
Year of completion of degree : 2020
Name of the major advisor : Dr. D. K. Sharma
Title of thesis : Performance of exotic mango cultivars under south Gujarat agro-climatic conditions

Abstract

The present investigation entitled "Performance of exotic mango cultivars under South Gujarat agro-climatic conditions" was conducted during 2018-19 at Agriculture Experimental Station, NAU, Paria and Center of Excellence on Post Harvest Technology, Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was taken on 15 year old exotic mango cultivars planted at 8 m spacing in square system and laid out in a Completely Randomized Design (CRD) repeated thrice with nine treatments; Comprising T_1- Lily, T_2- Osteen, T_3- Palmer, T_4- Maya, T_5- Kent, T_6- Keitt, T_7- Kensington, T_8- Sensation and T_9- Apple. The observations were recorded on morphological parameters of plant (viz. plant height, plant spread, stem girth, panicle emergence and initiation of flowering, full bloom stage, plant canopy), physical parameters of fruit (*viz.* weight of fruit, specific gravity, fruit length, external skin color, flesh color, fruit set, fruit retention, number of fruits per plant, yield per plant, pulp weight, pulp percent, organoleptic evaluation) and chemical parameters of fruit (*viz.* TSS, titrable acidity, ascorbic acid, reducing sugar, total sugar). Result of study revealed that the entire nine exotic cultivars can be grown successfully under South Gujarat agro-climatic conditions. Among these cultivar, Apple found superior with respect to plant spread, fruit weight, fruit size, and yield. Whereas, on the basis of maximum fruit set, fruit retention, pulp percent, number of fruits per tree, TSS, ascorbic acid, reducing sugar, total sugar and overall acceptability cultivar Maya was found the best. Hence, it can be concluded that among these exotic cultivars, Maya is the superior cultivar due to better yield, quality and attractive appearance of fruits. Mango growers of this region may go for commercial plantation of this cultivar not only for export but for domestic market also.

47. Name of the student : Lalitha K. R. (2020218017)
Year of completion of degree : 2020
Name of the major advisor : Dr. R. V. Tank
Title of thesis : Effect of chemicals on seed germination and seedling growth of aonla (*Emblica officinalis* Gaertn.)

Abstract

The experiment entitled "Effect of chemicals on seed germination and seedling growth of aonla (*Emblica officinalis* Gaertn.)" was carried out at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2019-20. The experiment consisted of 11

treatments *viz.* control (T_1), water soaking (T_2), thiourea @ 0.5 % (T_3), thiourea @ 1.0 % (T_4), thiourea @ 1.5 % (T_5), KNO_3 @ 0.5 % (T_6), KNO_3 @ 1.0 % (T_7), KNO_3 @ 1.5 (T_8), GA_3 @ 250 mg/l (T_9), GA_3 @ 500 mg/l (T_{10}) and GA_3 @ 750 mg/l (T_{11}). The seeds of aonla were soaked with these chemicals for 24 hours and sown in polybags. The experiment was carried out in Completely Randomized Design (CRD) and repeated thrice. The effect of different treatments on germination, seedling growth and survival were recorded.

The results of experiment showed that aonla seeds treated with GA_3 @ 500 mg/l (T_{10}) gave the highest germination percentage (67.89) along with early emergence (6.20 days). Maximum seedling growth *viz.* number of leaves (25.46, 71.93, 106.26 and 119.26), seedling diameter (3.48, 6.40, 7.84 and 8.76 mm) and seedling height (48.60, 90.36, 106.40 and 114.60 cm) were observed with the treatment of GA_3 @ 500 mg/l (T_{10}) at 60, 90, 120 and 180 days after sowing. The highest leaf area (55.50 cm^2), fresh weight of shoot and root (117.86 and 32.06 g), dry weight of shoot and root (15.07 and 3.88 g), shoot : root ratio (3.67), vigour index- Ⅰ (9839.25 cm) vigour index - Ⅰ Ⅰ (1627.71 g) and survival percentage (72.12) were also noted in treatment GA_3 @ 500 mg/l (T_{10}) at 180 days after sowing.

48. Name of the student : Patel Arpitaben Maheshbhai (2020218028)

Year of completion of degree : 2020

Name of the major advisor : Dr. B. N. Patel

Title of thesis : Effect of foliar spray of biostimulants and growth substances on seedling growth of Kagzi lime (*Citrus aurantifolia* Swingle)

Abstract

The present investigation entitled "Effect of foliar spray of biostimulants and growth substances on seedling growth of Kagzi lime (*Citrus aurantifolia* Swingle.)" was carried out at Regional Horticultural Research Station, ACHF, NAU, Navsari during 2019-20. The experiment was laid out in Completely Randomized Design with three repetitions and nine treatments *viz.* T_1 (19:19:19 @ 1 %), T_2 (KNO_3 @ 1 %), T_3 (Urea @ 1 %), T_4 (BA @ 50 ppm), T_5 (GA_3 @ 100 ppm), T_6 (Novel$^+$ @ 1 %),T_7 (*Panchgavya* @ 3 %), T_8 (Cow urine @ 3 %), T_9 (Control). Two months old seedlings of kagzi lime was selected. Foliar spray was done with sprayer at 25 and 50 days after transplanting.

The foliar application of GA_3 @ 100 ppm (T_5) significantly influenced seedling growth as compared to other treatments which registered the maximum increment in number of leaves, increment in seedling height and increment in number of shoot at 10, 40 and 70 days after 2nd foliar spray. However, this treatment was statistically at par with *panchgavya* @ 3 % with respect to the increment in number of leaves at 10 and 70 days after 2nd foliar spray and increment in seedling height at 40 and 70 days after 2nd foliar spray. The lower value of increment in number of leaves, seedling height and number of shoots were recorded in control (T_9) treatment at all stage of growth. The highest leaf area (4.37 cm^2), primary root length (24.35 cm), number of secondary roots (22.12), fresh weight (18.16 g and 8.57 g, respectively) and dry weight (11.40 g and 5.58 g, respectively) of shoot and root, root : shoot ratio (0.47) and survival percentage (92.20 %) was also recorded in same treatment *i.e.* GA_3 @ 100 ppm (T_5) at 70 days after 2nd foliar spray. The fresh weight of shoot (16.74 g), root : shoot ratio (0.43 g) and survival (86.67 %) were found at par with treatment *panchgavya* @ 3 % (T_7) at 70 days after 2nd foliar spray.

So, on the basis of the results obtained under the study it can be concluded that

the foliar application of GA_3 @ 100 ppm found better for enhancing seedling growth of Kagzi lime seedlings which was applied as a foliar spray at 25 and 50 days after transplanting.

49. Name of the student : Patel Jollyben Jayeshbhai (2020218030)
Year of completion of degree : 2020
Name of the major advisor : Dr. T. R. Ahlawat
Title of thesis : Influence of growth substances through injection on yield and quality of banana cv. Grand Naine

Abstract

The present investigation on "Influence of growth substances through injection on yield and quality of banana cv. Grand Naine" was carried out at Instructional Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2018-19. The experiment was laid out in Completely Randomized Design with three repetitions and nine treatments *viz.*, control (T_1), GA_3 @ 10 ppm (T_2), GA_3 @ 20 ppm (T_3), GA_3 @ 30 ppm (T_4), BA @ 2.5 ppm (T_5), BA @ 5.0 ppm (T_6), NOVEL$^+$ @ 0.5 % (T_7), NOVEL$^+$ @ 1.0 % (T_8), NOVEL$^+$ @ 1.5 % (T_9). Growth substances were applied through injection at the time of bell emergence. Results indicated that maximum bunch weight (36.38 kg), fruit yield (126.31 t/ha), bunch length (101.78 cm), bunch girth (119.17 cm), finger length (22.96 cm), finger girth (13.99 cm), finger weight (205.78 g) and minimum days from flowering to harvest (89.28) in banana cv. 'Grand Naine' were recorded by injecting of GA_3 @ 30 ppm. There was a marked improvement in fruit quality of banana cv. 'Grand Naine' under the treatment comprising of GA_3 @ 30 ppm as reflected by the maximum value recorded for TSS (21.87 ºBrix), reducing sugars (7.84 %) and total sugars (17.73 %). However, the maximum number of fingers per bunch (179.89), number of hands per bunch (14.06) and shelf life (11.13 days) were observed on injecting NOVEL$^+$ @ 1.5 % followed by GA_3 @ 30 ppm. From the economic point of view, the highest net realization (Rs. 11,41,968) was recorded by the application of GA_3 @ 30 ppm closely followed by NOVEL$^+$ @ 1.5 % with Rs. 11,09,356. Thus, it can be concluded that injecting GA_3 @ 30 ppm at the time of bell emergence improved yield and quality attributes of banana cv. 'Grand Naine' with higher net realization.

50. Name of the student : Patel Khushbuben Ashokbhai (2020218032)
Year of completion of degree : 2020
Name of the major advisor : Dr. A. K. Pandey
Title of thesis : Evaluation of rejuvenated mango (*Mangifera indica* L.) cultivars for growth, yield and quality under South Gujarat region

Abstract

The research endeavour entitled "Evaluation of rejuvenated mango (*Mangifera indica* L.) cultivars for growth, yield and quality under South Gujarat region" involving ten different rejuvenated mango cultivars namely Kesar, Rajapuri, Alphonso, Totapuri, Neelum, Langra, Sardar, Jamadar, Dadamio and Vanraj was conducted in Randomized Block Design (RBD) with five replications at Instructional Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. The vegetative characters *viz.*, tree height (m), trunk girth (m), canopy spread (m) and canopy volume (m^3) were observed to revealed profound effect due to rejuvenated mango cultivars. Among different rejuvenated mango cultivars, Rajapuri exhibited maximum

tree height (6.09 m), trunk girth (1.47 m), canopy spread (4.99 m) and canopy volume (8.92 m^3). With respect to flowering characters, early flower bud initiation (December 13, 2018), early flowering (December 21, 2018), early full bloom (January 28, 2019) and early fruit set (February 05, 2019) were observed in cv. Vanraj. Highest number of fruits/tree (274.20) and yield (110.46 kg/tree) were obtained in cv. Neelum and Totapuri, respectively. Significantly maximum weight of fruit (617.39 g), width of fruit (10.94 cm), pulp weight (518.17 g) and pulp:peel ratio (7.96) were observed in cv. Vanraj, while maximum fruit length (16.59 cm) and peel weight (68.43 g) were recorded in cv. Totapuri and Rajapuri, respectively. The highest total soluble solids (22 ºBrix), total sugars (15.40 %), reducing sugar (5.35 %) and lowest titratable acidity (0.15 %) were observed in cv. Langra and maximum ascorbic acid was recorded in cv. Totapuri (30.27 mg/100 g).

51. Name of the student : Patel Sejalben Bharatbhai (2020218035)
Year of completion of degree : 2020
Name of the major advisor : Dr. Y. N. Tandel
Title of thesis : Effect of foliar spray of novel organic nutrients on pollen attributes, fruit retention and yield of mango var. Sonpari

Abstract

The present investigation entitled "Effect of foliar spray of Novel organic nutrients on pollen attributes, fruit retention and yield of mango var. Sonpari" was carried out at Regional Horticultural Research Station, ACHF, NAU, Navsari during 2018-19. The experiment was taken on top worked orchard of Sonpari planted at 6 m × 6 m distance. It was laid out in Completely Randomized Design with four repetitions and five treatments *viz.,* control (T_1), Novel organic nutrients 1 % (T_2), Novel organic nutrients 2 % (T_3), Novel plus organic nutrients 1 % (T_4), Novel plus organic nutrients 2 % (T_5). Two foliar spray were done at the time of initiation of flowering and 50 % flowering. The observation on pollen attributes, yield and quality parameters of fruits were recorded and statistically analysed.

The foliar spray of Novel plus organic nutrients 1 % (T_4) showed significantly superior pollen attributes as compared to other treatments which registered the highest pollen viability percentage (88.17 %) and pollen germination percentage (51.53 %). It was statistically at par with T_3 and T_5. The lowest pollen viability and pollen germination were recorded in T_1 *i.e.* control.

The results indicated that significantly higher fruit set percentage at pea (20.17 %), marble (4.64 %), maturity stage (1.49 %) and fruit retention at harvest (23.60 %) were recorded with treatment of foliar spray of Novel plus organic nutrients 1 % (T_4) which was at par with T_3 at pea stage; T_3 and T_5 at marble stage; T_3 at maturity stage and T_3 in fruit retention at harvest. The lowest fruit set and fruit retention were registered in control (T_1).

Yield parameters *viz.,* number of fruit per tree (125.25) and yield (48.24 kg/tree) were found maximum in treatment T_4 (Novel plus organic nutrients 1 %) which was at par with T_3, T_5 and T_2 in number of fruit per tree and T_5 in yield. The average weight of fruit (388.87 g) was recorded significantly highest in T_5 (Novel plus organic nutrients 2 %) which was at par with T_4, T_3 and T_2. While all the yield parameters were noted lowest in T_1 (Control).

Quality parameters of mango var. Sonpari were found to be significant due to the foliar spray of Novel organic nutrients except titratable acidity. The minimum

physiological loss in weight (15.09 %) and maximum TSS (20.29 ˚Brix) and shelf life of fruits (17.48 days) were recorded in treatment T_4 (Novel plus organic nutrients 1 %) which was at par with T_3 and T_5. Whereas, the maximum PLW and minimum TSS and shelf life were obtained in T_1 (Control).

The highest net return with maximum BCR value was obtained with the treatment of 1 % Novel plus organic nutrients (T_4). The trend of net income and BCR due to treatments of Novel organic nutrients were found as $T_4 > T_5 > T_3 > T_2 > T_1$.

Owing to the results of study, it is concluded that the foliar spray of 1 % Novel plus organic nutrients can be done in mango var. Sonpari for obtaining higher yield and net return with BCR. It also gave maximum values of quality parameters of fruits.

52. Name of the student : Tanviben A. Patel (2020218038)
Year of completion of degree : 2020
Name of the major advisor : Dr. A. K. Pandey
Title of thesis : Influences of pre harvest treatments on yield and biochemical behaviour of mango cv. Amrapali

Abstract

The present investigation entitled "Influences of pre harvest treatments on yield and biochemical behaviour of mango cv. Amrapali" was carried out during 2018-19 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat. The experiment was laid out in a completely randomized design (CRD). The study was framed out with ten treatments and three repetitions. Ten treatments involving; T_1 (Absolute control), T_2 (1000 ppm Salicylic acid), T_3 (2000 ppm Salicylic acid), T_4 (3000 ppm Salicylic acid), T_5 (1000 ppm Salicylic acid + 0.5 % $CaCl_2$), T_6 (1000 ppm Salicylic acid + 1.0 % $CaCl_2$), T_7 (2000 ppm Salicylic acid + 0.5 % $CaCl_2$), T_8 (2000 ppm Salicylic acid + 1.0 % $CaCl_2$), T_9 (3000 ppm Salicylic acid + 0.5 % $CaCl_2$) and T_{10} (3000 ppm Salicylic acid + 1.0 % $CaCl_2$). Foliar spray of salicylic acid was done at 5 weeks after full bloom and calcium chloride was sprayed at 15 days before harvesting on 12 years old mango orchard planted 2.5 m × 2.5 m spacing. Salicylic acid at 3000 ppm with $CaCl_2$ at 1.0 per cent significantly increased the fruit weight (257.59 g), length (10.72 cm), breadth (6.39 cm), volume (251.18 ml), number of fruits per tree (134.74), yield (36.25 kg/tree), pulp to (peel + stone) ratio (3.19), fruit firmness (3.55 kg/cm^2), shelf life (6.82 days), TSS (20.10°B), total sugars (16.04 %), reducing sugar (6.43 %), ascorbic acid (34.46 mg/100 g), total carotenoids (0.97 mg/100 g) and phenol (86.23 mg/100 g), pectin (0.45 %) and organoleptic scores for overall acceptability (8.00) of mango cv. Amrapali. The same treatment significantly reduced titrable acidity (0.20 %), PLW of fruit for 2nd, 4th and 6th day of storage (1.20 %, 1.52 % and 2.46 %, respectively) and spoilage per cent (22.95 %) of mango cv. Amrapali fruits. Looking into the economics of various pre harvest treatments were calculated the highest BCR ratio (7.48) in treatment T_3 (2000 ppm Salicylic acid). However, treatment T_9 (3000 ppm Salicylic acid + 0.5 % $CaCl_2$) and T_{10} (3000 ppm Salicylic acid + 1.0 % $CaCl_2$) exhibited maximum net return owing to higher yield.

53. Name of the student : Prajapati Dipti Rameshbhai (2020218040)
Year of completion of degree : 2020
Name of the major advisor : Dr. B. M. Tandel

Title of thesis : Influence of IBA and rooting media on stem cuttings of dragon fruit (*Hylocereus polyrhizus* L.) var. Red Flesh

Abstract

The present investigation entitled "Influence of IBA and rooting media on stem cuttings of dragon fruit (*Hylocereus polyrhizus* L.) var. Red Flesh" was carried out at Regional Horticulture Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Completely Randomized Design with Factorial Concept and repeated thrice, consisting three levels of IBA *i.e.* Control (I_1), IBA at 2000 mg l^{-1} (I_2), IBA at 4000 mg l^{-1} (I_3) and IBA at 6000 mg l^{-1} (I_4) and five different types of rooting media *i.e*. Sand + Red soil (1:1) (M_1), Sand + Bio compost (1:1) (M_2), Sand + Vermicompost (3:1) (M_3), Red soil + Vermi compost (3:1) (M_4) and Red soil + Bio compost (3:1) (M_5). Among the various levels of IBA, 4000 ppm IBA (I_3) was found to be most effective for obtaining minimum days for sprouting (15.73 DAP), maximum number of sprouts (6.133 and 16.66) and sprouting percentage (30.66 and 83.33 %) at 30 and 60 DAP, respectively and also gave maximum plant height from new sprout (21.71, 34.28 and 49.32 cm), length of longest shoot (19.95, 24.23 and 30.00 cm) and diameter of longest shoot (3.55, 4.02 and 4.25 cm) at 60, 90 and 120 DAP, respectively. At 120 DAP maximum number of roots (26.40), number of shoots (2.38), length of longest root (19.31 cm), fresh weight of shoot (131.95 g), dry weight of shoot (30.46 g), fresh weight of root (3.04 g), dry weight of roots (0.77 g) and survival percentage (98.67 %) were recorded with IBA at 4000 mg l^{-1} (I_3). Consequently, Sand + Vermicompost (3:1) (M_3) was found most promising for early sprouting (16.25 DAP), number of sprouts (6.33 and 15.75), sprouting percentage (31.66 and 78.75 %) at 30 DAP and 60 DAP, respectively and also gave maximum plant height of new sprout (20.28 cm, 31.83 and 46.0 cm), length of longest shoot (18.80 cm 22.45 and 28.05 cm), diameter of longest shoot (3.43, 3.94 and 4.17 cm) at 30, 60 and 120 DAP, respectively. At 120 DAP maximum number of roots (24.41), number of shoots (2.23), length of longest root (18.54 cm), fresh weight of shoot (154.93 g), dry weight of shoot (29.42 g), fresh weight of roots (2.97 g), dry weight of roots (0.73 g) and survival percentage (95.83 %) were recorded in rooting media of Sand + Vermicompost (3:1) (M_3). Dragon fruit cutting treated with IBA @ 4000 mg l^{-1} and planted in rooting media of Sand + Vermi compost (3:1) *i.e.* I_3M_3 found significant for early sprouting (14.66 DAP), highest number of sprouts (6.33 and 15.75 number at 30 and 60 DAP), and maximum percentage of sprouted cuttings (41.67 % at 30 DAP), number of roots (32.00), number of shoots (2.93), length of longest root (23.47 cm) were found in same treatment at 120 DAP. While highest fresh weight of roots (3.77 g) was noticed in cuttings treated with IBA 4000 mg l^{-1} (I_3) and grown in a mixture of Sand + Vermi compost (3:1) (M_3). Interaction effect of IBA and rooting media was found to be non significant for the character like plant height and new sprout, length of longest shoot, shoot fresh weight, shoot dry weight, diameter of longest shoot, dry weight of root and survival per cent. On the basis of the result obtained from the investigation, it can be concluded that the dragon fruit (*Hylocereus polyrhizus* L.) cuttings soaked for 60 seconds in the solution of IBA at 4000 mg l^{-1} and planted in Sand + Vermicompost rooting media were found most effective to induce early sprouting and increasing sprouting percentage, number of roots, number of shoots and length of longest root. Consequently, 4000 ppm IBA and Sand + Vermicompost (3:1) was found promising for increased survival percentage as well as quality of shoots.

54. Name of the student : Shailaja H. K. (2020218045)
Year of completion of Degree : 2020
Name of Major Advisor : Dr. B. M. Tandel
Title of thesis : Effect of pre harvest bagging on fruit quality of mango var. Sonpari

Abstract

The current investigation entitled "Effect of pre-harvest bagging on fruit quality of mango var. Sonpari" was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2019. An experiment comprised with two factors *i.e.* (1) Stage of bagging (S) at marble stage (S_1) and egg stage (S_2) (2) Type of bagging material (B); newspaper bag (B_1), non-woven white bag (B_2), non-woven red bag (B_3), non-woven blue bag (B_4), non-woven green bag (B_5), butter paper bag (B_6) and control (B_7). Fruits were bagged at marble and egg stage of fruit with different type of bagging materials and removed 7 days before harvest. The experiment was carried out in Completely Randomized Design with factorial concept (FCRD) and repeated thrice. The effect of different treatment combination on physical parameters, chemical parameters and their interaction effect were recorded. The results indicated that significantly maximum number of fruits per tree (43.30), yield per tree (16.97 kg), and hectare (18.85 t), fruit weight (387.80 g), fruit length (11.06 cm), fruit volume (380.57 cm^3), pulp weight (267.74 g), pulp: stone ratio (5.24), fruit firmness (6.48 kg cm^{-2}), increased shelf life (13.69 days) and marketable fruit (94.42 %) and minimum physiological loss of weight (6.77 %) were recorded in egg stage of fruit bagging. Among chemical parameters maximum TSS (19.21 °Brix), reducing sugars (4.90 %), total sugars (11.94 %), ascorbic acid (33.17 mg 100 g^{-1} pulp), β-carotene (995.96 µg 100 g^{-1} pulp) and minimum titrable acidity (0.15 %) were recorded in egg stage of fruit bagging. Among different type of bagging materials maximum fruit retention in marble stage of fruit bagging (59.37 %) and egg stage of fruit bagging (92.23 %) was obtained in non-woven red colour bag while, maximum number of fruit per tree (42.23) recorded in non-woven green colour bag. Minimum number of days required for harvesting in marble stage of fruit bagging (76.67 days) and egg stage of fruit bagging (51.33 days) was recorded in butter paper bag. The higher yield per tree (17.18 kg), yield per hectare (19.09 t), fruit weight (414.00 g), fruit length (12.09 cm), fruit volume (402.33 cm^3) and pulp weight (291.94 g), fruit diameter (8.81 cm), fruit firmness (6.71 kg cm^{-2}) and lower PLW (7.08 %) were recorded in butter paper bag. Among chemical parameters, maximum reducing sugar content of fruit (5.33 %), total sugar content of fruit (12.93 %), non-reducing sugar content of fruit (7.60 %), ascorbic acid content (34.40 mg 100 g^{-1} pulp), β-carotene content of fruit (1016.46 µg 100 g^{-1} pulp) and lowest titrable acidity (0.147 %) were recorded in butter paper fruits bagging. In interaction effect maximum number of fruits per tree (50.83), yield per tree (20.23 kg), yield per hectare (23.69 t), fruit volume (404.67 cm^3), pulp: stone ratio (6.34) and maximum score in texture (8.25), colour (8.50), flavor (8.42), test (8.33) and overall acceptability (8.38) were recorded in bagging of fruits with butter paper bag at egg stage of fruit (B_6S_2). The highest net return (647648 Rs./ha) was recorded in bagging of fruits with butter paper bag at egg stage of fruit (B_6S_2). Owing to the results obtained during this research work, it can be concluded that fruits bagged with butter paper at egg stage of fruit was found better for enhancing the yield and quality of mango fruit *var.* Sonpari.

55. Name of the student : Thejaswini K (2020218047)
Year of completion of degree : 2020

Name of Major Advisor : Dr. S. J. Patil

Title of Thesis : Effect of foliar spray of growth substances on growth of mango seedling

Abstract

The present investigation entitled "Effect of foliar spray of growth substances on growth of mango seedling" was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2019-20.

An experiment consisted of thirteen treatments *viz.,* GA_3 (100 and 200 mg l^{-1}), BA (50 and 100 mg l^{-1}), NAA (50 and 100 mg l^{-1}), Novel organic liquid nutrients (1 and 2 %), Sea weed extract (1 and 2 %), Urea (0.5 and 1%) and control. Above growth substances applied thrice at 3rd, 4th and 5th months after sowing of mango stones. The experiment was laid out in Completely Randomized Design (CRD) and repeated thrice.

The results of present investigation revealed that, there was a significant difference on growth of mango seedling due to foliar spray of growth substances at 3rd, 4th and 5th months after sowing of mango stones. Among the different treatments, the maximum incremental seedling height at 4th, 5th, 6th, 7th and 8th MAS (6.07, 7.28, 8.56, 9.46 and 11.86 cm, respectively), incremental girth of seedling (1.92, 2.01, 2.99, 3.38 and 4.33 mm, respectively), whereas, the length of the longest root at 8th MAS (52.67 cm), girth of the longest root (2.35 mm), fresh and dry weight of mango seedling (52.97 g and 15.67 g) were recorded in GA_3 @ 200 mg l^{-1} treatment. The incremental number of leaves at 4th, 5th, 6th, 7th and 8th MAS (2.00, 4.33, 5.13, 5.33 and 6.07, respectively), number of shoots/seedling (1.80, 2.20, 2.60, 3.00 and 3.40, respectively) and number of roots at 8th MAS (7.47) were maximum in BA @ 100 mg l^{-1} treatment. Foliar application of NAA @ 100 mg l^{-1} on mango seedlings recorded maximum leaf area at 4th, 5th, 6th, 7th and 8th MAS (56.79, 58.42, 60.62, 62.66 and 65.22 cm^2, respectively). While, all the growth characters of mango seedlings were recorded significantly minimum in control.

Based on the results of the present investigation, it can be concluded that, foliar application of GA_3 @ 200 mg l^{-1} at 3rd, 4th and 5th months after sowing of mango stones were more effective for enhancing growth of mango seedling.

PLANTATION, SPICE, MEDICINAL AND AROMATIC CROPS

56. Name of the student : Ashwini Yaddalagundi (2020214002)

Year of completion of Degree : 2016

Name of Major Advisor : Dr. M. M. Patel

Title of thesis : Assessment of phytoremediation potential of *Ocimum* species

Abstract

An experiment was conducted at ACHF, Navsari Agricultural University, Navsari (Gujarat) during 2015-16 for assessment of phytoremediation potential of *Ocimum* species. Seed germination study of two species *Ocimum gratissimum* and *Ocimum basilicum* was conducted by applying cadmium treatments (0, 50 µM, 100 µM, 500 µM, 1000 µM, 2000 µM and 5000 µM) in the form of $CdCl_2$. A linear decrease in germination percentage was observed as the concentration of Cd increased. Reduction of germination percentage was less in *O. gratissimum* (65.25 %) than in *O. basilicum*. But, reduction of radicle length was less in *O. basilicum* (49.32 %) than *O. gratissimum.*

Pot experiment was conducted to study plant growth parameters, Cd accumulation potential and activity of antioxidant enzymes of both species (*O.*

gratissimum and *O. basilicum*). Cd has no significant impact on plant height of both species however, root length and number of roots were significantly affected. Reduction in root length was less in *O. gratissimum* (16.14 %) as compared to *O. basilicum.* Number of roots was significantly affected by Cd concentration in both species. Reduction in number of roots was less in *O. basilicum* (17.04 %)as compared to *O. gratissimum.* Cd had significant impact on fresh biomass in *O. gratissimum* but had no significant effect in *O. basilicum.* There was less reduction in dry biomass of *O. basilicum* as compared to *O. gratissimum* under higherconcentration of Cd. Dry shoot and root biomass decreased with increase in Cd concentration in both species. Reduction in dry shoot biomass was less in *O. basilicum* (22.11 %) than in to *O. gratissimum*.

Cd accumulation by plants *viz.*, in shoots and in roots for both species (*O. gratissimum* and *O. basilicum*) was significantly affected by Cd concentration in soil. A comparative evaluation showed that more Cd was accumulated in roots than in shoots for both species. *O. gratissimum* accumulated more amount of applied Cd than *O. basilicum.* Highest Cd accumulation in *O. gratissimum* was 307.20 mg/kg dry mass in root portion. Highest Cd accumulation in *O. basilicum* was 205.1 mg/kg dry mass in root portion. In, *O. gratissimum* translocation factor ratio was more than 1 at Cd concentrations *viz.* 10 mg/kg, 20 mg/kg, 30 mg/kg, 40 mg/kg however, bioconcentration factor of roots was more than 1 at higher Cd concentrations *viz.*, 40 mg/kg, 50 mg/kg and 100 mg/kg soil an. In, *O. basilicum* TF ratio was more than 1 at Cd concentration of 10 mg/kg however it was less than 1 at Cd levels *viz*., 20 mg/kg, 30 mg/kg, 40 mg/kg. BCF of shoots was less than 1 at all Cd treatments (20 mg/kg, 30 mg/kg, 40 mg/kg, 50 mg/kg and 100 mg/kg) except 10 mg/kg.

Activities of antioxidant enzymes *viz.*, SOD, Catalase, APX and GPX for both species (*O. gratissimum* and *O. basilicum*) were significantly affected by Cd concentration. Activities of SOD, Catalase, APX and GPX increased with increase in Cd concentration. The higher fold increase in SOD (15.43 folds) and APX (9.12 folds) activity was found in *O. basilicum.* But, with respect to CAT (23.03 folds) and GPX (14.12 folds) activity maximum fold increase was found in *O. gratissimum.*

Both the *Ocimum* species (*O. gratissimum* and *O. basilicum*) showed higher tolerance to cadmium and considerable amount of accumulation. Hence, it can be considered for phytoremediation of cadmium polluted soil.

57. Name of the student : Chaudhary Rameshkumar Rajabhai (2020214009)
Year of completion of degree : 2016
Name of the major advisor : Dr. M. M. Patel
Title of thesis : Effect of integrated nutrient management on growth and yield of linseed (*Linum usitatissimum* L.) cv. Local

Abstract

Investigations were carried out on "Effect of integrated nutrient management on growth and yield of linseed (*Linum usitatissimum* L.) cv. Local" at the Instructional Farm, Navsari Agricultural University, Navsari during the *rabi* season of 2015-16. The experiment was conducted in Randomized Block Design with nine treatments *viz.*, T_1 (100 % RDN from Vermicompost), T_2 (100 % RDN from Bio-compost), T_3 (100 % RDN from Neem cake), T_4 (100 % RDN from Castor cake), T_5 (50 % RDN from Vermicompost + 50 % RDN), T_6 (50 % RDN from Bio-compost + 50 % RDN), T_7 (50 % RDN from Neem cake + 50 % RDN), T_8 (50 % RDN from Castor cake + 50 % RDN), T_9 [100 % RDF (60:40:30 NPK kg/ha)] and all treatments were replicated thrice. All the growth and yield attributes were found maximum in T_5 treatment (50 % RDN from

Vermicompost + 50 % RDN) *i.e.*, plant height at 30, 60 and 90 DAS (26.13 cm, 48.38 cm and 60.44 cm, respectively), number of leaves per plant at 30, 60 and 90 DAS (83.14, 249.54 and 338.37, respectively), number of branches per plant at 30, 60 and 90 DAS (4.19, 7.63 and 8.40, respectively), number of capsules per plant (71.49), fresh weight per plant (24.32 g), dry weight per plant (15.97 g), number of seeds per capsule (9.24), seed yield per plant (7.62 g), seed yield per plot and seed yield per hectare (186.26 g and 554.33 kg, respectively) and straw yield per plot and straw yield per hectare (488.01 g and 1452.41 kg, respectively) and oil content (41.75 %) was high under the treatment T_1 (100 % RDN from Vermicompost). From the economic point of view, maximum net realization of Rs. 50,814.16 per hectare was recorded in T_5 treatment (50 % RDN from Vermicompost + 50 % RDN) while in case of BCR maximum of 5.26 was in T_2 treatment (100 % RDN from Biocompost). Thus, it can be concluded that for obtaining higher profitable yield linseed be fertilized with 50 % RDN from Vermicompost + 50 % RDN (60 kg) under South Gujarat condition.

58. Name of the student : Zinzala Mukeshkumar R. (2020214041)
Year of completion of degree : 2016
Name of the major advisor : Dr. P. P. Bhalerao
Title of thesis : Effect of foliar application of plant growth regulators on growth, yield and quality of garlic (*Allium sativum* L.) var. GG-3

Abstract

A field experiment was conducted at Regional Horticultural Research Station, Navsari Agricultural University, Navsari (Gujarat) during *rabi* season of 2014-15 for evaluating the effect of foliar application of plant growth regulators on growth, yield and quality of garlic (*Allium sativum* L.) var. GG-3. The soil of the experimental plot is clay in texture, lower in available nitrogen, high in available phosphorus and fairly rich in potassium. The experiment was laid out in Randomized Block Design with three replications and 9 treatments comprising of GA_3 50 mg/1 (T_1), GA_3 100 mg/1 (T_2), NAA 50 mg/1 (T_3), NAA 100 mg/1 (T_4), cycocel 500 mg/1 (T_5), cycocel 1000 mg/1 (T_6), ethrel 100 mg/1 (T_7), ethrel 150 mg/1 (T_8) and control (T_9). Results revealed that among the different treatments of plant growth regulators, plant height at 60 and 90 DAS were found significantly highest with the application of NAA 50 mg/1 (T_3 42.58 cm and 45.30 cm). Further, the treatment cycocel 1000 mg/1 recorded maximum number of leaves per plant (8.80) at 60 DAS and 10.20 cm at 90 DAS. The application of plant growth regulators produced pronounced effect with liner trend on garlic at all stages of growth. The foliar application of cycocel 1000 mg/1 (T_6) produced the highest fresh (32.39 g) and dry (12.39 g) of bulb weight, diameter of bulb (4.92 cm), number of cloves per bulb (19.52), highest length of clove per bulb (3.06 cm), highest weight of clove per bulb (1.91 g), yield per plot (3.52 kg) and yield/ha (9.57 tonne). In case of quality parameters, there were non-significant results in terms of total soluble solids (%) but, the the treatment cycocel 1000 mg/1 (T_6) was found economical, profitable and proved highly remunerative. Whereas, the control treatment did not influence significantly on growth, yield and quality attributes of garlic cv. GG-3.

59. Name of the student : Chaudhary Lavbhai Bhagubhai (2020215009)
Year of completion of degree : 2017
Name of the major advisor : Dr. M. M. Patel

Title of thesis : Effect of nitrogen and phosphorus on growth and yield of dill seed (*Anethum sowa*)

Abstract

A field experiment was conducted at Cotton Research Sub-Station, Achhalia, Dist- Bharuch, Navsari Agricultural University, Navsari during the *rabi* season with a view to study the "Effect of nitrogen and phosphorus on growth and yield of dill seed (*Anethum sowa*) cv. Gujarat dill seed-3" under south Gujarat conditions. There were twelve treatment combinations comprising four nitrogen levels *i.e.*, N_1 - 0 kg, N_2 - 20 kg, N_3 - 40 kg and N_4 - 60 kg nitrogen perhectare and three phosphorus levels *i.e.*, P_1 - 0 kg, P_2 - 20 kg and P_3 - 40 kg phosphorus per hectare in a randomized block design (Factorial) with three replication.

Almost all the growth and yield attributes such as plant height, number of branches per plant, fresh weight per plant, fresh weight per plot, fresh weight per hectare, dry weight per plant, dry weight per plot, dry weight per hectare, umbel per plant, seed yield per plant, seed yield per plot, seed yield per hectare, straw yield per plant, straw yield per plot and straw yield per hectare were significantly influenced by various treatments of nitrogen and phosphorus levels. The higher value of all the above parameters were recorded in treatment N_4P_3 (60 kg nitrogen and 40 kg phosphorus per hectare). Nitrogen level N_4 (60 kg/ha) recorded significantly the highest plant height at 60, 90 and 120 DAS (46.07, 89.37 and 123.55 cm, respectively), number of branches per plant at 60, 90 and 120 DAS (3.30, 7.28 and 11.33, respectively), fresh weight per plant, plot and hectare (6.59 g, 1.32 kg and2199.02 kg, respectively), dry weight per plant, plot and hectare (5.74 g, 1.14 kg and 1905.24 kg, respectively), umbel per plant (23.50), seed yield per plant, plot and hectare (2.64 g, 0.52 kg and 887.93 kg, respectively), straw yield per plant, plot and hectare (3.08 g, 0.61 kg and 1026.32 kg, respectively). Phosphorus level P_3 (40 kg/ha) recorded significantly the highest plant height at 60, 90 and 120 DAS (42.60, 80.10 and 116.65 cm, respectively), number of branches per plant at 60, 90 and 120 DAS (2.96, 6.79 and 10.73, respectively), fresh weight per plant, plot and hectare (6.31 g, 1.26 kg and 2103.78 kg, respectively), dry weight per plant, plot and hectare (5.39 g, 1.08 kg and 1801.72 kg, respectively), umbel per plant (22.06), seed yield per plant, plot and hectare (2.50 g, 0.49 kg and 835.92 kg, respectively), straw yield per plant, plot and hectare (2.90 g, 0.57 kg and958.97 kg, respectively).

Thus, it can be concluded that nitrogen N_4 (60 kg/ha) and phosphorus P_3 (40 kg/ha) recorded higher seed yield of dill seed. From the economic point of view, the maximum net realization of Rs. 68176 recorded in treatment N_4P_3 with highest B:C ratio (3.07). On the basis of one year experimentation, it could be concluded that higher profitable seed yield of dill seed can be obtained by fertilizing with 60 kg nitrogen and 40 kg phosphorus per hectare under South Gujarat conditions.

60. Name of the student : Patel Urvi Thakorbhai (2020215046)

Year of completion of degree : 2017

Name of the major advisor : Dr. M. M. Patel

Title of thesis : Effect of integranted nutrent management on growth and yield of kalmegh (*Andrographis paniculata* Wall. Ex Nees.)

Abstract

A field experiment was conducted at Instructional farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, during the late *kharif* season of 2016-17 with a view to study the "Effect of integrated nutrient

management on growth and yield of kalmegh *(Andrographis paniculata* Wall. Ex. Nees.)" under South Gujarat conditions. There were ten treatment combinations comprising five levels of organic + inorganic fertilizers and two levels of biofertilizers in randomized block design (factorial) with three replications.

Almost all the growth, yield and quality attributes such as plant height, number of branches, number of leaves, fresh weight per plant, fresh weight per plot, fresh weight per hectare and total alkaloid content were significantly influenced by various treatments of organic + inorganic fertilizers and biofertilizers levels. The higher value of all the above parameters were recorded in treatment F_5B_1 (50 RDN + 50 N through neem cake along with 250 g Azotobacter + 250 g PSB).

Organic + inorganic fertilizers level F_5 (50 % RDN + 50 N through neem cake) recorded significantly the highest plant height (67.17 cm), number of branches (24.30), fresh weight per plant (31.83 g), fresh weight per plot (3.45 kg), fresh weight per hectare (7074.10 kg) and total alkaloid content (4.63 %). Biofertilizers level B_1 (250 g Azotobacter + 250 g PSB) recorded significantly the highest plant height (64.81 cm), number of branches (23.74), number of leaves (37.62), fresh weight per plant (29.49 g), fresh weight per plot (3.20 kg), fresh weight per hectare (6552.91 kg).

Thus, it can be concluded that application of organic + inorganic fertilizers level F_5 (50 % RDN + 50 % N through neem cake) and biofertilizers level B_1 (250 g Azotobacter + 250 g PSB) produced significantly the highest fresh herb yield of kalmegh.

From the economic point of view, the maximum net realization (45442.66 Rs./ha) recorded in treatment F_5B_1 (50 % RDN + 50 % N through neem cake along with 250 g Azotobacter + 250 g PSB) but highest BCR (1.70) recorded in treatment F_3B_1 (75 % RDN + 25 % N through neemcake). On the basis of one year experimentation, it could be concluded that higher profitable herb yield can be obtained by judicious combination of inorganic + organic fertilizers along with biofertilizer.

61. Name of the student : Patel Zina A. (2020215049)
Year of completion of degree : 2017
Name of the major advisor : Dr. P. P. Bhalerao
Title of thesis : Effect of foliar application of chemicals on growth, yield and quality of garlic (*Allium sativum* L.) var. GG-4

Abstract

A field experiment was conducted at Regional Horticultural Research Station, Navsari Agricultural University, Navsari (Gujarat) during *rabi* season of 2015-16 for evaluating the effect of foliar application of chemicals on growth, yield and quality of garlic (*Allium sativum* L.) var. GG-4. The soil of the experimental plot was clay in texture, lower in available nitrogen, medium in available phosphorus and rich in potassium. The experiment was laid out in a Randomized Block Design with three replications and nine treatments comprising of 1 % urea (T_1), 2 % urea (T_2), 50 ppm citric acid (T_3), 100 ppm citric acid (T_4), 200 ppm thiourea (T_5), 300 ppm thiourea (T_6), 50 ppm citric acid + 200 ppm thiourea (T_7), 100 ppm citric acid + 300 ppm thiourea (T_8) and control (T_9). Results of study revealed that the foliar application of different chemicals to garlic plants, the treatment T_8 (100 ppm citric acid + 300 ppm thiourea) showed significantly the highest plant height *i.e.* 43.02 cm and 59.10 cm at 60 DAS and

90 DAS, respectively. Treatment T_8 (100 ppm citric acid + 300 ppm thiourea) exhibited significantly the maximum number of leaves *i.e.* 8.03 and 11.20 at 60 DAS and 90 DAS, respectively. A propose data on different treatments revealed significant influence of foliar application of different chemicals on days to maturity of garlic bulb. It was noticed that the application of 100 ppm citric acid + 300 ppm thiourea recorded the earliest maturity (127.28 days) as compared to rest of the treatments. The foliar application of chemicals showed significant result among the treatments, T_8 (100 ppm citric acid + 300 ppm thiourea) significantly increase fresh weight (24.88 g) and dry or cured weight (20.19 g) of bulb, diameter of bulb (35.92 mm), number of cloves per bulb (19.67), clove weight (2.00 g), clove length (2.73 cm), yield par plot (3.52 kg/plot), yield per ha (7.04 t/ha) with maximum storage days (179.33 days). The quality parameters like TSS (%) and ascorbic acid (mg/100 g) was significantly influenced by foliar application of 100 ppm citric acid + 300 ppm thiourea (T_8) with maximum value of 44.77 % and 17.02 mg/100 g, respectively. However, sulphide content showed nonsignificant result among different treatments. Based on the results obtained in the investigation, it can be concluded that the maximum net return with BCR valueof (4.29:1) was achieved under the treatment of foliar application of 100 ppm citric acid + 300 ppm thiourea which was found economical, profitable and proved highly remunerative.

62. Name of the student : Sachin A. J. (2020215054)
Year of completion of degree : 2017
Name of the major advisor : Dr. P. P. Bhalerao
Title of thesis : Effect of organic and inorganic sources of nitrogen on growth and yield of garlic (*Allium sativum* L.) var. GG-4

Abstract

A field experiment was conducted at Regional Horticultural Research Station, Navsari Agricultural University, Navsari (Gujarat) during *rabi* season of 2015-16 for evaluating the effect of organic and inorganic sources of nitrogen on growth, yield and quality of garlic (*Allium sativum* L.) var. GG-4. The soil of the experimental plot is clay in texture, lower in available nitrogen, high in available phosphorus and fairly rich in potassium. The experiment was laid out in Randomized Block Design with three replications and 9 treatments comprising of 25 % RDN through FYM + 75 % RDN through urea (T_1), 50 % RDN through FYM + 50 % RDN through urea (T_2), 75 % RDN through FYM + 25 % RDN through urea (T_3), 100 % RDN through FYM (T_4), 25 % RDN through VC + 75 % RDN through urea (T_5), 50 % RDN through VC + 50 % RDN through urea (T_6), 75 % RDN through VC + 25 % RDN through urea (T_7), 100 % RDN through VC (T_8) and control (T_9). Results revealed that among the different sources of organic and inorganic nitrogen applied, theplant height at 30 DAS showed non significance whereas, at 60 DAS and 90 DAS T_4 (100 % RDN through FYM) showed significantly highest plant height of 45.73 cm and 61.80 cm, respectively. The applied fertilizer at 30 DAS and 60 DAS showed non-significant result in number of leaves per plant, howerer at 90 DAS T_4 (100 % RDN through FYM) showed significantly highest number of leaves per plant (11.96). Data projected on different treatment revealed that

there was significant influence of different nitrogenous fertilizers and manures on the days to maturity of garlic bulb. It was noticed that application of 100% RDN through FYM was recorded the earliest to maturity (127.15 days). The application of organic and inorganic nitrogen sources showed significant results among the treatments, T_4 (100 % RDN through FYM) significantly increased fresh (24.46 g) and dry weight of bulb (20.46 g), diameter of bulb (39.15 mm), no. of cloves per bulb (19.57), clove length (3.51 cm), clove weight (2.10 g), yield (4.06 kg/plot) and yield (8.16 t/ha). Meanwhile, maximum storage days (164.00 days) with minimum sprouting (6.66 %) were significantly influenced by T_8 treatment (100 % RDN through VC). The quality parameters like TSS (^{0}Brix) and ascorbic acid content (mg/100g) was significantly influenced by T_8 (100 % RDN through VC) with maximum value 45.39 ^{0}brix and 16.60 mg/100 g, respectively. However, total sulphide content showed non-significant difference among different treatments. The treatment T_8 (100 % RDN through VC) showed highest nitrogen content 546.66 kg/ha which was increased by application of treatment when compared before appliacation of 380 kg/ha nitrogen content in the soil. Whereas, phosphorus and potassium showed a medium range of content *i.e.* 51.33 kg/ha and 214.66 kg/ha, respectively. Based on the results obtained in the investigation, it can be conluded that the maximum net return with BCR value of 4.86:1 was achived under the treatment of 100 % RDN through FYM (T_4) was found economical, profitable and proved highly remunerative.

63. Name of the student : Makwana Kalpeshkumar Laxmanbhai (2020216016)
Year of completion of degree : 2018
Name of the major advisor : Dr. M. M. Patel
Title of thesis : Response of *Aloe vera* L. as influenced by organic and inorganic sources of fertilizers

Abstract

Investigations were carried out on "Response of *Aloe vera* L. as influenced by organic and inorganic sources of fertilizers" at the Instructional Farm, Navsari Agricultural University, Navsari during the *kharif* season of 2017-18. The experiment was conducted in a Randomized Block Design with nine treatments *viz.*, T_1 (RDF 50:25:25 NPK kg/ha), T_2 (Vermicompost), T_3 (Neem cake), T_4 (Castor cake), T_5 (FYM), T_6 (½ RDN + ½ T_2), T_7 (½ RDN + ½ T_3), T_8 (½ RDN + ½ T_4) and T_9 (½ RDN + ½ T_5) and all treatments were replicated thrice.

All the growth and yield attributes were found maximum in treatment T_6 (½ RDN + ½ T_2) *i.e.*, plant height (32.00, 36.00 and 40.67 cm at 3, 6 and 9 month after planting), number of leaves (8.00, 11.67 and 13.67 at 3, 6 and 9 month after planting), chlorophyll content (83.31 mg/g), leaf length (51.77 cm), leaf width (6.13 cm), leaf thickness (17.95 mm), leaf weight (223.27 g), number of off shoots (3.00), biological yield (8.50 kg/plot) and gel yield (117.33 g/plant).

From the economic point of view, maximum net realization (419746 Rs/ha) and gross realization (630511 Rs/ha) was recorded in T_6 treatment (½ RDN + ½ T_2). Hence, it can be concluded that the *Aloe vera* plants treated with treatment T_6 (½ RDN + ½ T_2) gave maximum growth parameters with optimum chlorophyll content, gel yield and biological yield.

64. Name of the student : Vishalkumar Ramanbhai Prajapati (2020216027)
Year of completion of degree : 2018
Name of the major advisor : Dr. M. M. Patel
Title of thesis : *In vitro* regeneration of long pepper (*Piper longum* L.)

Abstract

The present investigation on "*In vitro* regeneration of long pepper (*Piper longum* L.)" was carried out at Plant Tissue Culture Laboratory, Department of Forest Biology and Tree Improvement, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India during 2017-18. *In vitro* regeneration protocol for *Piper longum* was established from nodal, axillary shoots, direct organogenesis from spike explants and callus through regeneration from leaf explants. Nodal segments and spikes of long pepper (*Piper longum* L.) were collected from the medicinal plant garden at ASPEE College of Horticulture and forestry, Navsari Agricultural University, India. The nodes were washed under running tap water to remove superficial contamination. The seeds were further washed with Tween-20 (6%, v/v) for 5 min followed by thorough washing under running tap water for 15 min. Later, explants were subjected to appropriate surface sterilization treatment in asceptic condition under Laminar flow. The leaf explants for de novo organogenesis were isolated from in vitro grown cultures.

For the surface sterilization of nodal segment, explants dipped in absolute alcohol for 1 min followed by 0.3 % $HgCl_2$ treatment for 6 min gave the maximum aseptic cultures (58.89 %) which were at par with 0.3 % $HgCl_2$ treatment for 5 minutes. Though, shoot bud regeneration was noticed in all the concentrations of BAP and Kin tested including control, highest shoot regeneration (86.67 %) was observed in MS + 1.5 mg l^{-1} BAP. Mean shoot number as well as shoot length was significantly affected by the concentrations and types of cytokinin tested. Maximum number of shoots (2.67 shoots/explant) and shoot length (4.23 cm) were recorded on MS medium supplemented with 1.5 mgl^{-1}BAP for nodal explants which further increased to 9.90 shoots/explants with 2.50 mm average shoot length on sub-culturing after harvesting elongated axillary shoots. For axillary shoots, the maximum response for shoot multiplication (50 %) observed in media supplemented with 1.5 mg l^{-1} BAP. The maximum number of multiple shoot *i.e.* 11.27 and maximum average shoot length *i.e.* 1.62 cm was also observed in MS media supplemented with 1.5 mg l^{-1} BAP. Highest percent of root induction (83.33 %) was observed on half-strength MS medium fortified with 1.0 mg l^{-1} IBA within 10 days with maximum number of roots 12.33 roots/shoot and average root length 5.07 cm. The highest rate of survival (78 %) along with better shoot and root growth (29.34 and 22.68 cm respectively) and shoot and root biomass (1.26 g and 1.58 g, respectively) observed when plantlets were hardened in Soil:Sand:FYM (1:1:1).

Spike explants cultured on growth regulator-free basal MS medium showed no sign of bud break even after 30 d. Addition of a TDZ was essential to induce bud break and multiple shoot formation from the explants. The maximum response (26.0 per cent) observed in the media supplemented with 0.25 mg l^{-1} TDZ with average 39.90 number of shoot bud and 3.37 number of elongated shoot Elongated shoots were carefully excised and rooted on previously established rooting media e.g. basal MS+1.0 mg l^{-1} IBA, with 80 per cent rooting. Rooted explants successfully hardened in Soil:Sand:FYM (1:1:1) with 100 % success.

Within three weeks of culture, leaf explants showed the callogenic response in media supplemented with various concentrations of TDZ. However no callus observed growth regulator free media. The callogenic response found highest (60 %) in media supplemented with 0.5 mg l^{-1} TDZ. However, the percent callus showing shoot bud

(organogenic callus) was maximum (46.0 %) in MS media supplemented with 0.25 mg l^{-1} TDZ which also showed maximum number of shoot bud per callus clump *i.e.* 8.

These organogenic callus clumps when placed in MS + 1.5 mg l^{-1} BAP gave average 3-4 elongated shoot in each culture. The *in vitro* raised plants were suucessfully rooted in MS + 1.0 mg l^{-1} IBA and rooted shots were subsequently hardened in Soil:Sand:FYM (1:1:1) with 100 % success. Out of the 10 primers tested, three random decamers (OPK-04, OPK-08 and OPK-09) produced good amplified bands that were found monomorhic across the micropropagated plantlets, direct regenerated shoot and callus through regenerated shoots.

In conclusion, protocols have been standardized for *in vitro* regeneration of *Piper longum* via nodal and axillary shoot explants, direct adventitious bud formation on spike explants and callus through regeneration from leaf explants. High rate of establishment, shoot proliferation, *in vitro* rooting and successful acclimatization of plantlets were achieved in all the methods of propagation under study. All the methods found to be genetic stable. These protocols can be utilized in mass multiplication of true-to- type plants for intensive plantation, genetic transformation, metabolic engineering and further genetic improvements of *P. longum.*

65. Name of the student : Dhoti Sachinbhai Dilipkumar (2020217005)
Year of completion of degree : 2019
Name of the major advisor : Dr. M. M. Patel
Title of thesis : Effect of integrated nutrient management on growth, yield and quality of senna (*Cassia angustifolia* Vahl.)

Abstract

The present investigation entitled "Effect of integrated nutrient management on growth, yield and quality of senna *(Cassia angustifolia* Vahl.)" was carried out at Instructional Farm, ASPEE College of Horticulture and Forestry, Naysari Agricultural University, Naysari. The experiment was laid out in Randomized Block Design with factorial concept with ten treatment combinations, consisting two levels of biofertilizer *viz.*, Without bio-fertilizer (B_o), With bio-fertilizer (B_1) and five levels integrated nutrient sources *viz.,* 80:40:40 NPK kg ha^{-1} (F_1), 75 % RDN + 25 % N through FYM (F_2), 75 % RDN + 25 % N through vermicompost (F_3), 50 % RDN + 50 % N through FYM (F_4), 50 % RDN + 50 % N through vermicompost (F_5). The treatments were replicated thrice.

The application of bio-fertilizer (B_1) produced significantly maximum plant height (53.73 cm, 79.19 cm and 107.97 cm), number of branches per plant (5.20, 7.76 and 10.69), numberof leaves per plant (112.08, 173.00 and 230.63) at 60, 90 and 120 DAS, respectively. Significantly, maximum fresh weight of leaves (173.04 g 3.15 kg $plot^{-1}$ and 9716.05 kg ha^{-1}), dry weight of leaves (59.04 g $plant^{-1}$, 1.047 kg plot and 3232.31 kg ha^{-1}), number of pods per plant (31.04), fresh weigh of pods (14.26 g $plant^{-1}$, 252.08 g $plot^{-1}$ and 778.04 kg ha^{-1}) and dry weight of pods (2.93 g $plant^{-1}$, 49.52 g $plot^{-1}$ and 152.84 kg ha^{-1} Regarding nutrient status of soil, only organic carbon content showed significant difference while the other parameters like soil pH, E.C., available N, P and K contents did not show any significant difference. Higher organic carbon in soil (0.62 %) was resulted with application of bio-fertilizer (B_1).

The maximum plant height (57.33 cm, 81.97 cm and 110.97 cm), number of branches per plant (5.63, 8.20 and 10.93) and number of leaves per plant (119.63, 182.43 and 241.33) were noted at 60, 90 and 120 DAS, respectively with the application of 50 RDN + 50 N through FYM. The maximum fresh weight of leaves (181.12 g 3.32

kg plot and 10236.11 kg ha^{-1}), dry weight of leaves (62.15 g $plant^{-1}$, 1.096 kg $plot^{-1}$ and 3381.73 kg ha^{-1}), number of pods per plant (33.17), fresh weight of pods (15.07 g $plant^{-1}$, 267.10 g $plot^{-1}$ and 824.37 kg ha^{-1}), dry weight of pods (3.08 g $plant^{-1}$, 52.69 g $plot^{-1}$ and 162.62 kg ha^{-1}) and quality attribute like sennoside content in leaf (2.06 %) were obtained with the plants treated with of 50 % RDN + 50 N through FYM (F_4). Among the parameters studied for soil fertility status after harvest only organic carbon content showed significant difference with maximum value of 0.65 % in treatment F4 (50 % RDN + 50 % N through FYM). Combined application of 50 % RDN + 50 % N through FYM along with bio-fertilizer (B_1F_4) was found most effective for obtaining higher sennoside content in leaves (2.12 %) and maximum organic carbon in soil (0.66 %).

The highest BCR of 1.70 and net returns (118791 Rs. ha^{-1}) were recorded in treatment combination B_1F_4 [with bio-fertilizer + (50 % RDN + 50 % N through FYM)].

66. Name of the student : Jyoti Uppar (2020217012)
Year of completion of degree : 2019
Name of the major advisor : Dr. M. M. Patel
Title of thesis : Effect of chemical treatments and storage on shelf life and quality of *Aloe vera* leaves

Abstract

The present experiment entitled "Effect of chemical treatments and storage on shelf life and quality of *Aloe vera* L. leaves" was conducted at Laboratory, Centre of Excellence on Post Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat during the year 2019. The experiment was laid out in completely randomized design with factorial concept with twelve treatment combinations, consisting of six levels of chemical treatments *viz.,* 0.1 % Sodium benzoate + 0.1 % ascorbic acid (T_1), 0.1 % Sodium benzoate + 0.1 % citric acid (T_2), 1 % calcium chloride (T_3), 2 % calcium chloride (T_4), 0.1 % acetic acid (T_5) and control (T_6) and two levels of storage *viz.,* ambient condition (S_1) and cold storage at 7°C (S_2) replicated 3 times.

Different chemical treatments showed non-significant results with respect to physiological loss in weight, specific gravity, gel recovery, total soluble solids, titrable acidity, total sugars and ascorbic acid content. Whereas, significant results were obtained with respect to colour, texture, overall acceptability and spoilage. Leaves treated with 2 % $CaC1_2$ resulted in excellent colour (7.18), texture (6.72), overall acceptability (6.95) of the leaves with reduced spoilage (4.74 %) on 30th day of storage.

Different storage conditions showed significant results with respect to physiological loss in weight, gel recovery, sensory characteristics and spoilage. With respect to storage, the minimum physiological loss in weight (7.33 %) with maximum gel recovery (49.42 %), excellent colour (6.87), texture (6.43), overall acceptability (6.69) without spoilage were noticed in leaves placed in cold storage at 7°C (S_2).

The interaction effect of chemical treatments and storage conditions were found non-significant mostly for all characters except sensory characteristics *viz.,* colour, texture and overall acceptability. Highest score for colour (7.32), texture (6.86), overall acceptability (7.09) were obtained in leaves treated with 2 % $CaCl_2$ and stored under cold storage (T_4S_2) on 30th day of storage.

Thus, it can be inferred that leaves treated with 2 % calcium chloride and subsequently stored under cold storage at 7°C proved best for extending post harvest life up to 30 days with better quality and no spoilage in *Aloe vera* leaves.

67. Name of the student : Architha M V (2020218003)

Year of completion of degree : 2020

Name of the major advisor : Dr. M. M. Patel

Title of thesis : Effect of IBA and media on cuttings of giloy (*Tinospora cordifolia* (Willd.) Miers)

Abstract

The current investigation entitled "Effect of IBA and media on cuttings of Giloy (*Tinospora cordifolia* (Willd.) Miers)" was carried out at the Model Nursery for Medicinal and Aromatic plants, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2020.

The experiment was laid out in Completely Randomized Design with factorial concept with fifteen treatment combinations, consisting five levels of IBA concentration *viz.,* control (I_1), 100 ppm (I_2), 200 ppm (I_3), 300 ppm (I_4) and 400 ppm (I_5) and three levels rooting media *viz.,* M_1 Soil + Sand (2:1), M_2 Soil + Sand + FYM (1:1:1) and M_3 Soil + Sand + Vermicompost (1:1:1). The treatments were repeated thrice.

Cuttings treated with 200 ppm (I_3) IBA concentration resulted in minimum number of days taken for sprouting (8.33 days), maximum number (13.11 and 18.11) and percentage of cuttings sprouted (65.56 % and 90.56 %) at 30 and 45 DAP, respectively. Same concentration resulted in maximum length of longest shoot (72.90 cm, 108.89 cm and 140.02 cm) at 30, 45 and 60 DAP, fresh (18.98 g) and dry (2.15 g) weight of shoot, number of roots (5.57), length of longest root (10.58 cm), fresh (0.178 g) and dry (0.069 g) weight of root and survival percentage (93.43 %).

Cuttings planted in M_3 Soil + Sand + Vermicompost (1:1:1) media resulted in minimum number of days taken for sprouting (9.13 days), maximum number of shoots per cutting (1.39, 1.68 and 1.79) and number of leaves per cutting (11.33, 19.93 and 30.59) at 30, 45 and 60 DAP. Same media resulted maximum dry weight of shoot (1.96 g), number of roots (5.38), length of longest root (10.10 cm), fresh (0.163 g) and dry (0.060 g) weight of root. Whereas, maximum length of longest shoot (67.46, 106.16 and 132.31 cm) at 30, 45 and 60 DAP was found in M_2 Soil + Sand + FYM (1:1:1) media.

Interaction of IBA and media showed non-significant result with number of days taken for sprouting, number and percentage of sprouting, number of shoots per cutting and survival percentage. Whereas, significant with all other shoot and root parameters. Cuttings treated with 200 ppm IBA concentration and planted in M_3 Soil + Sand + Vermicompost (1:1:1) media resulted in better shoot and root growth.

68. Name of the student : Parikh Riddhesh P. (2020218025)

Year of completion of degree : 2020

Name of the major advisor : Dr. P. P. Bhalerao

Title of thesis : Effect of foliar application of organic liquid sources on growth, yield and quality of turmeric cv. GNT-2

Abstract

An experiment on "Effect of foliar application of organic liquid sources on growth, yield and quality of turmeric cv. GNT-2" was conducted during the year 2019-20 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. The experiment was laid out in Randomized Block Design with three replications and eleven treatments *viz.,Panchagavya* @ 4% (T_1), *Panchagavya* @ 5 % (T_2), Novel organic liquid nutrients

@ 4 % (T_3), Novel organic liquid nutrients @ 5 % (T_4), *Jeevamrut* @ 4 % (T_5), *Jeevamrut* @ 5 % (T_6), Humic acid @ 0.1 % (T_7), Humic acid @ 0.2 % (T_8), Cow urine @ 4 % (T_9), Cow urine @ 5 % (T_{10}) and control (T_{11}). The first spray was applied at 60 DAP, second spray at 120 DAP and third spray at 180 DAP. The effect of these treatments on plant growth, yield and quality parameters of turmeric cv. GNT-2 was examined. The growth parameters *viz.*, plant height, number of tillers per plant, number of leaves per plant, length of leaves and breadth of leaves were reported and has been affected profoundly due to different treatments. At 90 DAP found non significant result whereas, 150 and 210 DAP noted significantly maximum plant height (93.64 cm and 120.71 cm) with treatment T_4 (Novel organic liquid nutrients 5 %). Among the different treatments, application of humic acid 0.2 % (T_8) exhibited significant results with maximum number of tillers per plant at 90, 150 and 210 DAP (1.27, 2.53 and 3.50, respectively) whereas, significantly maximum number of leaves per plant (6.27, 6.83 and 8.33) at 90, 150 and 210 DAP, respectively found with Novel organic liquid nutrients 5 % (T_4). Maximum length of leaves at 90 DAP (46.22 cm) recorded in treatment T_8 (humic acid 0.2 %) whereas, 150 and 210 DAP recorded maximum values of 60.46 cm and 73.07 cm, respectively in treatment T_4 (Novel organic liquid nutrients 5 %). In case of breadth of leaves, maximum breadth (12.54 cm, 13.40 cm and 13.60 cm) in treatment T_4 (Novel organic liquid nutrients 5 %) at 90, 150 and 210 DAP, respectively. Substantial effect of foliar application of Novel organic liquid nutrients at 5 % (T_4) was detected higher in yield parameters *viz.*, number of mother rhizomes per plant (3.53), number of finger rhizomes per plant (18.20), weight of mother rhizome (52.73 g), weight of finger rhizomes (248.67 g) with lowest number of finger rhizomes: number of mother rhizomes ratio (5.15) as well as fresh rhizome (301.40 g) with fresh rhizomes yield (16.27 kg/net plot and 32.29 t/ha). Effect of foliar application of 0.2 % humic acid indicated notable effect on curcumin content of rhizomes (3.86 %) as well as essential oil of rhizomes (3.23 %) as compared to the rest of treatments. Based on the results obtained in the present investigation, it can be concluded that maximum net returns with maximum BCR was achieved with the treatment of foliar application of 5 % Novel organic liquid nutrients which was found economical, profitable and proved highly remunerative.

VEGETABLE SCIENCE

69. Name of the student : Chaudhari Varsha Ishwarbhai (2020214005)

Year of completion of degree : 2016

Name of the major advisor : Dr. Sanjeev Kumar

Title of thesis : Assessment of parthenocarpic cultivars of cucumber for horticultural traits under NVPH

Abstract

The present investigation entitled “Assessment of parthenocarpic cultivars of cucumber for horticultural traits under NVPH” was carried out at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat during *kharif*, 2014 and 2015. The experiment comprising sixteen different parthenocarpic cultivars, was laid out in a Randomized Block Design (RBD) with three replications. Most of cultivars behaved truly for the phenomenon of parthenocarpy over the years but 'JSCU 01' showed presence of staminate flowers in early growth stage of plants. The studies revealed significant variations among various cultivars for most of the vegetative, reproductive, yield and quality parameters except moisture content. Amongst the cultivars, 'CBA910569500' was significantly superior to other cultivars in respect to vine length at

30 (1.72 m, 1.51 m and 1.61 m) and 60 DAS (2.66 m, 2.14 m and 2.40 m) whereas, 'KUK 9' recorded significantly higher vine length at final harvest (4.56 m, 4.74 m and 4.65 m) compared to other cultivars in all the individual years as well as in pooled analysis. 'RS 03602833' expressed earliness in flowering as well as in picking, higher internodal length and number of nodes per vine in 2014, 2015 and in pooled analysis. 'KUK 6' exhibited superiority over remaining cultivars for node of first pistillate flower (4.60, 3.60 and 4.10) in all the individual years as well as in pooled analysis. Morphological characterization of fruits based on test guidelines did not reflect much variation among cultivars. Thus cultivars could be grouped into 1, 2 and 3 groups for fruit traits like fruit shape, fruit shape at peduncle end and colour, fruit shape at blossom end, respectively. Fruit set of 86.92, 83.67 and 85.29 per cent was observed in cultivar 'Multistar' during 2014, 2015 and in pooled analysis, respectively. Amongst the cultivars, 'JSCU 01' surpassed all other cultivars significantly for leaf area index at 60 DAS, fruit length, fruit weight, fruit firmness and overall acceptability in all the individual years as well as in pooled analysis. 'Kian' ranked first in displaying higher fruit diameter and minimum Physiological loss in weight in pooled analysis. Whereas highest shelf life of 8.5 days corresponded to cvs. 'KUK 6', 'Multistar' and 'Ronino'. 'Multistar' produced higher number of fruits per vine (34.77, 33.47 and 34.11), which could be attributed to significantly higher leaf area index at 30 DAS displayed by this cultivar in all the years of study. However, 'Valleystar' yielded maximum per vine to the tune of 4.51, 4.25 and 4.38 kg in all the years of experimentation as well as in pooled analysis and was highly enriched with total soluble solids. Nevertheless, 'Oscar' turned out to be the highest yielder per square meter producing 13.34, 12.29 and 12.81 kg in 2014, 2015 and in pooled analysis, respectively. 'Fantasy' also displayed the height value for ascorbic acid (3.05 mg) in pooled analysis. Subsequently, economic analysis of the study identified 'Oscar' as highly remunerative cultivar exhibiting BCR of 1.05 with net realization of Rs. 80518.00, which was immediately followed by 'KUK 9', 'RS 03602833' 'Kian' and 'Valleystar'. Furthermore, a higher BCR of 1.63 or 1.75 could be expected at farmers' level with 65 % or 75 % subsidy being disseminated by Govt. of Gujarat.

70. Name of the student : Desai Karamashibhai Malajibhai (2020214010)
Year of completion of degree : 2016
Name of the major advisor : Dr. S. N. Saravaiya
Title of thesis : Breeding investigations in brinjal (*Solanum melongena* L.)

Abstract

A field experiment was carried out with a view to estimate heterosis and combining ability and gene effects in brinjal (*Solanum melongena* L.). The experimental material comprised of 8 parents, 28 hybrids and one standard check (Surati Ravaiya) and was laid out in randomized block design with three replications at Regional Horticultural Research Station (R.H.R.S), Navsari Agricultural University, Navsari, Gujarat during *Rabi* 2014-15 (crossing programme) and *Rabi* 2015-16 (evaluation programme). The data were obtained for ten characters including fruit yield and its components.

Significant differences were observed among parents and hybrids, indicating considerable genetic variation among genotypes.

The crosses *viz.*, AB-09-1 × AB-12-10, AB-09-1 × AB-08-5, AB-08-5 × JBL-08-8, GJB-3 × AB-12-10, JBGR-1 × NSR-1, NSR-1 × AB-12-10 and AB-09-1 × NSRP-1 showed significant and desirable heterosis for fruit yield per plant over standard check. Whereas crosses *viz.*, AB-09-1 × NSR-1, AB-09-1 × AB-12-10, NSRP-1 × NSR-1,

JBGR-1 × NSR-1, JBGR-1 × JBL-08-8 and GJB-3 × JBL-08-8 showed significant and positive heterobeltiosis for fruit yield per plant.

Combining ability analysis revealed that both additive as well as non-additive gene effects were important in the inheritance of all the traits studied. However, magnitude of variances due to SCA were comparatively larger than those of GCA for days to fifty per cent flowering, plant height at harvest, number of branches per plant at harvest, fruit length, average fruit weight, number of fruit per plant and total soluble solids indicated preponderance of non-additive gene action. While, magnitude of variance due to GCA were comparatively larger than those of SCA for fruit diameter, fruit yield per plant and total phenol content indicated preponderance of additive component of genetic variance.

Among the parents, *viz.*, JBGR-1, NSR-1 and JBL-08-8 were found good general combiners for majority of the characters. Hybrids *viz.*, AB-09-1 × AB-12-10, AB-09-1 × AB-08-5, AB-08-5 × JBL-08-8, GJB-3 × AB-12-10, JBGR-1 × NSR-1, NSR-1 × AB-12-10 and AB-09-1 × NSRP-1 showed higher order *sca* effects for fruit yield and its component characters.

In the present investigation, entitled "Breeding investigations in brinjal (*Solanum melongena* L.)" the crosses *viz.*, AB-09-1 × AB-08-5, AB-09-1 × NSRP-1, AB-09-1 × JBGR-1, AB-09-1 × GJB-3, AB-09-1 × AB-12-10, JBGR-1 × GJB-3, JBGR-1 × JBL-08-8, NSR-1 × GJB-3, NSR-1 × JBL-08-8, GJB-3 × JBL-08-8, and GJB-3 × AB-12-10 as well as parent AB-09-1 recorded the lowest shoot and fruit borer infestation. All the parents (except JBGR-1) and all the crosses (except AB-09-1 × GJB-3, AB-08-5 × GJB-3, NSRP-1 × GJB-3, JBGR-1 × GJB-3 and NSR-1 × GJB-3) recorded the least.

71. Name of the student : Jadav Niteshbhai Karamchandbhai (2020214016)
Year of completion of degree : 2016
Name of the major advisor : Dr. S. Y. Patel
Title of thesis : Line x tester analysis for yield, quality and its component traits in tomato (*Solanum lycopersicum* L.)

Abstract

The present investigation was carried out to study the magnitude of *per se* performance, heterosis and combining ability for fruit yield, its related component traits and quality in tomato. The experimental material consisting of 11 parents (3 females and 8 males), its 24 hybrids produced through Line × Tester mating design and standard check (*Abhinav*). The experiment was laid out in a randomized block design with 3 replications at Regional Horticultural Research Station, Navsari Agricultural University, Navsari, during late *kharif* 2015. The data were obtained for 23 characters including fruit yield, its components and quality traits.

The analysis of variance indicated significant differences among parents and hybrids for the majority of the characters indicating presence of adequate genetic diversity in the materials under studied.

On the basis of *per se* performance and estimates of heterosis, the hybrids GT 2 × NTL 6, NTL 74 × NTL 50 and NTL 72 × NTL 20 were found to be most promising for fruit yield and other desirable traits hence, could be evaluated for heterosis or utilize in future breeding to obtain desirable segregants for the development of superior genotypes.

Combining ability analysis revealed that GCA variances higher than SCA variances indicated that the preponderance of additive gene effects for the inheritance of

most of the traits except equatorial diameter, number of fruits per plant, fruit yield per plant, fruit yield per hectare and non-reducing sugar for which non additive gene action was more important.

The estimates of GCA effects were indicates that the top ranking three hybrids involved parents NTL 6, GT 2, NTL 20, NTL 50, NTL 72 and NTL 74 emerged as good general combiners for majority of the characters. The estimates of specific combining ability effects indicated that cross combinations GT 2 × NTL 6, NTL 72 × NTL 20 and NTL 74 × NTL 50 were found best for fruit yield per plant.

Overall appraisal for present investigation indicated that the cross combination GT 2 × NTL 6 was found to be best *per se* performer, significant positive heterosis and best specific combiner.

The outcomes of research have been discussed in relation to its implications for tomato improvement programme. Present study revealed that breeding approaches like biparental mating followed by recurrent selection, diallel selective mating *etc.*, in addition to conventional methods are suggested to identify desirable transgressive segregants for further improvement of these traits.

72. Name of the student : Malviya Amit Vanrajbhai (2020214022)
Year of completion of degree : 2016
Name of the major advisor : Dr. D. R. Bhanderi
Title of thesis : Study of heterosis and combining ability for yield and its contributing traits in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.)

Abstract

The present investigation entitled "Study of heterosis and combining ability for yield and its contributing traits in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]" was carried out by using diallel analysis excluding reciprocal for different characters during late *kharif*- 2015 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, N.A.U., Navsari. The materials comprising 37 genotypes including eight parental lines and their 28 F_1s along with one commercial check (MGH-4). Different characters were studied in RBD design with three replications for *per se* performance, heterosis and combining ability of parents and hybrids.

Mean squares due to genotypic differences were found significant for different traits under study. This indicated that experimental material used for study had sufficient genetic diversity for different traits.

An examination of mean values of parents indicated that, parental line, JBOGL-01-2 was earlier in 50 % female flowering. With respect to fruit yield per plant the parents Priya PSPL, JBOGL-01-6 and Coimbatore-3 were found to be the best three high yielding parents. With respect to hybrids, the crosses *viz.*, Coimbatore-3 × JBOGL-01-6, JBOGL-01-6 × JBOGL-01-2 and Pusa Naveen × JBOGL-01-6 were the best performer for fruit yield per plant and its component characters.

The crosses *viz.*, Coimbatore-3 × JBOGL-01-6, JBOGL-01-6 × JBOGL-01-2 and Pusa Naveen × JBOGL-01-6 showed significant and desirable standard heterosis for fruit yield per plant and its contributing characters.

Combining ability studies revealed both additive and non additive type of gene action involved in the expression of traits. However, non-additive type of gene action was found predominant in the expression of the traits.

Among 8 parents, two parents *viz.*, Priya PSPL and JBOGL-01-6 were observed to be good general combiners for fruit yield per plant and its contributing characters. The

crosses *viz.,* Coimbatore-3 × JBOGL-01-6 and JBOGL-01-6 × JBOGL-01-2 showed higher order SCA effects for fruit yield per plant and its component characters.

73. Name of the student : Patel Dipt Anilkumar (2020214029)
Year of completion of degree : 2016
Name of the major advisor : Dr. S. N. Saravaiya
Title of thesis : Sweet potato response to plant growth retardants

Abstract

A field trial was conducted with a view to study the "Sweet potato response to plant growth retardants" at the RHRS of Navsari Agricultural University, Navsari, Gujarat, India during *rabi* season of the year 2014. There were 10 treatments *viz;* T_1: Ethrel 100 ml l^{-1}, T_2: Ethrel 200 ml l^{-1}, T_3: Ethrel 300 ml l^{-1}, T_4: Cycocel 250 ml l^{-1}, T_5: Cycocel 500 ml l^{-1}, T_6: Cycocel 750 ml l^{-1}, T_7: Paclobutrazol 25 ml l^{-1}, T_8: Paclobutrazol 50 ml l^{-1}, T_9: Paclobutrazol 75 ml l^{-1} compared with T_{10}: Absolute control; evaluated in a Randomized Block Design with three replications. The plant growth retardants *viz;* Ethrel, CCC and PBZ was applied in the form of three foliar spray at 30, 45 and 60 days after planting.

During the experiment, dry matter content of vine (23.36 %) was found significantly increased with the foliar application of ethrel 300 ml l^{-1} (T_3). The foliar application of ethrel 300 ml l^{-1} (T_3) had a minimum vine length (0.59 m). Significantly the leaf area index was recorded minimum (0.45) growth with foliar application of CCC 500 ml l^{-1} (T_5).

Interestingly the treatment of foliar application of cycocel 250 ml l^{-1} (T_4) favourably influenced the yield parameters registering the higher values of yield attributes *viz;* total tuber yield (8.87 kg $plot^{-1}$ and 30.79 t ha^{-1}) and marketable tuber yield (7.30 kg $plot^{-1}$ and 25.34 t ha^{-1}) and proved superior to all other treatments under studied.

Total Soluble Solids content of tuber were found higher (12.20 ^{0}Brix) in the treatment of (T_4) CCC 250 ml l^{-1}. During the observations, minimum acidity (1.06 %) was found with the foliar application of cycocel 500 ml l^{-1}. The total sugar was found higher (7.12%) in the treatment of (T_1) ethrel 100 ml l^{-1}. The reducing sugar was found maximum (2.50 %) in the treatment of (T_1) ethrel 100 ml l^{-1}. The dry matter content of tuber was found higher (46.36 %) in the treatment of (T_2) ethrel 200 ml l^{-1}.The starch content was found maximum (69.48 %) in the treatment of (T_7) PBZ 25 ml l^{-1}. The protein content was found higher (1.88 %) in the treatment of (T_3) ethrel 300 ml l^{-1}.

The character like fresh weight of vine (kg), harvest index, length and diameter of tuber (cm) and fresh weight of tuber were not significantly influenced by the foliar application of plant growth retardants treatments under study.

On the basis of experimentation as well as economic point of view, foliar application of ethrel @ 300 ml l^{-1} failed to produce its significance on yield attributes. The maximum net return with BCR value of 2.67:1 was achieved under the treatment T_4 (Cycocel 250 ml l^{-1}) followed by treatment T_5 (Cycocel 500 ml l^{-1}). Both these treatments (T_4 and T_5) were found economical, profitable and proved highly remunerative under South Gujarat conditions for growing sweet potato cv. Collection- 71.

74. Name of the student : Patel Utsav Vinodbhai (2020214032)
Year of completion of degree : 2016
Name of the major advisor : Dr. V. K. Paramar

Title of thesis : Genetic variability, correlation, path and D^2 analysis in cowpea (*Vigna unguiculata* (L.) Walp.)

Abstract

Genetic variability, correlation, path and D^2 analysis in cowpea [*Vigna unguiculata* (L.) Walp.] was studied in a set of thirty two genotypes of cowpea grown in a randomized block design with three replications during *summer* - 2015 at Regional Horticultural Research Station, NAU, Navsari.

Analysis of variance revealed significant genotypic differences for all the twelve quantitative characters under study. A wide range of variation was apparent for all the characters.

The genotypic coefficient of variation, heritability and genetic advance were observed highest for the characters *viz.*, number of pods per plant and green pod yield per plant. High heritability (77.44 %) coupled with high genetic advance (52.08) observed for green pod yield per plant, very high heritability (94.47 %) for plant height at final harvest indicate that phenotypic selection would be effective for genetic improvement in these traits.

Association analysis between green pod yield per plant and other eleven quantitative characters revealed that green pod yield per plant was highly significant and positively correlated with pod length (r_g= 0.456), (r_p= 0.312) and sugar content (r_g= 0.269), (r_p= 0.217) at both genotypic and phenotypic level. These yield contributing traits also possessed positive and highly significant association between themselves. The character days to 50 per cent flowering was negative and significantly correlated with green pod yield per plant at genotypic level only, but number of branches per plant, number of clusters per plant, number of pods per plant and shelling % exhibited negative correlation with green pod yield per plant.

Path coefficient analysis indicate the highest positive direct effect on green pod yield per plant by pod length (0.716) followed by days to 50 per cent flowering (0.645), shelling % (0.398), number of pods per plant (0.289), sugar content (0.219) and plant height at final harvest (0.204). The character crop duration (-0.527) exerted the highest negative direct effect on green pod yield per plant followed by number of clusters per plant and number of seeds per pod.

On the basis of these findings it can be concluded that for improving green pod yield per plant in cowpea due consideration should be given to characters pod length, days to 50 per cent flowering, number of pods per plant and number of clusters per plant while making selection.

Studies pertaining to genetic divergence were also carried out, using Mahalanobis's D^2 statistics, for 32 cowpea genotypes and 8 clusters were formed out of them. The clustering pattern of the genotypes was independent of their geographical distribution. On the basis of inter cluster distances, cluster VIII was found to be more divergent. Therefore, it was concluded that the genotypes belonging to these cluster should be inter-crossed in order to generate more variability.

The findings of the present investigation lead to the conclusion that the isolation of a high yielding type with earliness in maturity was possible amongst the genotypes studied. For this, emphasis should be given to number of pods per plant, pod length, number of seeds per pod and crop duration. Based on the mean performance, genotypes Kashi Kanchan, Arka Garima, PKB-4, GC-3 and GAC-19 were found elite genotypes for cultivation. However, these genotypes should be studied in detail over number of seasons and locations to get more precise estimates of variability and inter character association. These, varieties could be further exploited by employing mass selection and pedigree selection.

75. Name of the student : Sidagireppa Doni (2020214038)
Year of completion of degree : 2016
Name of the major advisor : Dr. D. R. Bhanderi
Title of thesis : A study of heterosis and combining ability in ridge gourd (*Luffa acutangula* (L.) Roxb.)

Abstract

The present investigation entitled "A Study of heterosis and combining ability in ridge gourd [*Luffa acutangula* (L.) Roxb.]" was carried out by using diallel analysis excluding reciprocal for different characters during late *kharif*- 2015 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, N.A.U., Navsari. The materials comprising 37 genotypes including eight parental lines and their 28 F_1s produced by half diallel crossing and along with one commercial check (MHRG-7). Different characters were studied in RBD design with three replications for *per se* performance, heterosis and combining ability of parents and hybrids.

Mean squares due to genotypic differences were found significant for different traits under study. This indicated that experimental material used under study had sufficient genetic diversity for different traits.

An examination of mean values of parents indicated that, parental lines *viz*., Jaipur Long, Pusa Nasadar, GARG-1, ARGS-07-40 and JARG-05-06 were found to be high yielding parents.

The mean values of different characters of the hybrids revealed that the crosses ARGS-07-40 × Jaipur Long, GARG-1 × Jaipur Long and ARGS-07-50 × ARGS-07-40 were good for fruit yield per plant and these crosses had also higher magnitude of *per se* performance for attributing characters.

The crosses viz., ARGS-07-40 × Jaipur Long, GARG-1 × Jaipur Long and ARGS-07-50 × ARGS-07-40 showed significant and desirable heterosis for fruit yield per plant over standard check.

Combining ability studies revealed both additive and non additive type of gene action involved in the expression of traits. However, non-additive type of gene action was found predominant in the expression of most of the traits.

Among 8 parents, two parents *viz*., ARGS-07-40 and Jaipur Long were observed to be good general combiners for fruit yield per plant. In addition to fruit yield per plant, parent ARGS-07-40 was also observed to be good general combiner for traits vine length, first male flower appearing node, first female flower appearing node, days 50 % flowering, days to first fruit harvest, days to last fruit harvest, fruit width, fruit length, number of fruits per plant, fruit yield per plant and hundred seed dry weight. The crosses identified to have high SCA effects for fruit yield per plant also had high SCA effects for at least one major yield components like number of fruits per plant and fruit length *etc*.

Among the hybrid, eight hybrids were moderately resistant and twenty hybrids were moderately susceptible for fruit fly infestation.

76. Name of the student : Solanki Bijalben Pramodbhai (2020214039)
Year of completion of degree : 2016
Name of the major advisor : Dr. A. I. Patel
Title of thesis : Assessment of genetic diversity in tomato (*Solanum lycopersicum* L.)

Abstract

Assessment of genetic diversity was studied in set of twenty-five genotypes of tomato (*Solanum lycopersicum* L.) grown in a randomized block design with three replications during *rabi* 2014-15 at Regional Horticultural Research Station, NAU, Navsari.

Analysis of variance revealed significant genotypic differences for all the fifteen characters indicated a wide range of variation was apparent for all the characters. The genotypic and phenotypic coefficient of variation, heritability and genetic advance were observed higher for number of branches plant^{-1} at final harvest followed by plant height at final harvest (cm), pericarp thickness (mm), ascorbic acid content (mg 100 g^{-1}), lycopene content (mg 100 g^{-1}), fruit yield plant^{-1} (kg), average fruits weight (g) and number of fruits plant^{-1} indicating that phenotypic selection would be effective for genetic improvement in these traits.

Association between fruit yield and other contributing characters revealed that fruit yield plant^{-1} had highly significant and positive correlation with number of fruits plant^{-1}, average fruit weight (g) and lycopene content (mg 100 g^{-1}) at genotypic and phenotypic levels. The number of fruits plant^{-1} had highly significant and negative correlation with average fruit weight (g) at both genotypic and phenotypic levels indicated that increased in one trait decreased the other and vice-versa.

Path coefficient analysis indicated that number of fruits plant^{-1} having highest positive direct effect on fruit yield plant^{-1} (kg) followed by average fruit weight (g). Based on these findings, it can be suggested that for improving fruit yield in tomato, more emphasis should be given to days to 50 % flowering, plant height, number of fruits per pant, number of branches per plant and average fruit weight.

Genetic divergence was carried out using Mahalanobis's D^2 statistic for twenty-five tomato genotypes were grouped in seven clusters. The clustering pattern of the genotypes was independent of their geographical distribution. On the basis of inter cluster distances, cluster V was found to be more divergent with cluster VI and VII. Therefore, it was concluded that the genotypes belonging to these clusters should be inter-crossed in order to generate more diversity and improving fruit yield in tomato. In the present study, pericarp thickness contributed maximum towards the divergence followed by ascorbic acid, lycopene content, total sugar, fruit yield plant^{-1}, TSS and plant height at final harvest.

77. Name of the student : Basavraj Balu Athani (2020215006)
Year of completion of degree : 2018
Name of the major advisor : Dr. D. R. Bhanderi
Title of thesis : Effect of foliar application of micronutriants in okra (*Abelmoschus esculentus* (L.) Moench)

Abstract

A field experiment was conducted, with a view to study the "Effect of foliar application of micronutrients in okra (*Abelmoschus esculentus*)" under field condition during *kharif* season of 2016 at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat, India.

The experiment was comprised of 7 treatments in a randomized block design with three replications, namely T_1: RDF (N: P: K 150:50:50 kg/ ha); T_2: (T_1 + Boric acid (0.2 %); T_3: (T_1 + Zinc sulphate (0.5 %); T_4: (T_1 + Copper sulphate (0.5 %); T_5: (T_1 + Ferrous sulphate (0.5 %); T_6: (T_1 + Manganese sulphate (0.5 %) and T_7: (T_1 + General

grade 1 % (Fe 2 %, Mn 0.5 %, Zn 4.0 %, Cu 0.3 % and B 0.5 %). Micronutrients *viz.*, Boric acid (0.2 %), Zinc sulphate (0.5 %), Copper sulphate (0.5 %), Ferrous sulphate (0.5 %), Manganese sulphate (0.5 %) and general grade 1 % (Fe 2 %, Mn 0.5 %, Zn 4 %, Cu 0.3 % and B 0.5 %) were used for foliar spraying. Total two sprays of micronutrients were given at an interval of 30 days and 45 days after sowing of okra.

The result of foliar application of micronutrients treatment was found significant for majority of the characters under study except first flowering node, stem diameter (cm) and days to last picking.

The vegetative parameters such as maximum number of branches per plant (1.77), maximum internodal length (11.40 cm) and maximum plant height (125.10 cm) were recorded under the treatment of T_7 (T_1 + Mixture of all micronutrients). Attractively the okra plants nourished with the RDF along with foliar spray of mixture of all micronutrients has also resulted improvement in the quality character of dietary fiber content (9.43 %). Fascinatingly the okra plants nourished with the RDF along with foliar spray of mixture of all micronutrients *i.e.* General grade 1 % (T_7) has resulted in the higher values of yield characters *viz.*, lower days to 50 % flowering (37 days), lower days to first picking (41 days), number of pod per plant (17.70), length of pod (11.90 cm), weight of pod (11.57 g), pod diameter (1.73 cm), yield of pods per plant (204.03 g) and number of seeds per plant (55.33) and economics.

On the basis of experimentation as well as economic point of view, treatment T_7 (T_1 + General grade 1 %) recorded the significant pod yield (15.11 t/ha) and recorded the higher net realization (Rs. 1,58,693), with the benefit: cost ratio of 1.61, which proved highly remunerative under the South Gujarat conditions for growing the okra during *kharif* season.

78. Name of the student : Chaudhari Vibhutiben Lavjibhai (2020215010)

Year of completion of degree : 2017

Name of the major advisor : Dr. N. K. Patel

Title of thesis : Growth and yield performance of cabbage (*Brassica oleracea* L. var. *Capitata*) influence through foliar spray of micronutrients

Abstract

The experiment was conducted during *rabi*, 2016-2017 at Regional Horticultural Research Station, Navsari Agricultural University, Navsari, Gujarat, India to evaluate the growth and yield performance of cabbage (*Brassica oleracea* L. var. Capitata) influence through foliar spray of micronutrients. The experiment was arranged over 9 treatments comprising, micronutrient sources T_1: Ammonium molybdate (0.1 %), T_2: Boric acid (0.2 %), T_3: Zinc sulphate (0.5 %), T_4: Copper sulphate (0.5 %), T_5: Ferrous sulphate (0.5 %), T_6: Manganese sulphate (0.5 %), T_7: 1 % General grade-1 (Fe-2.0, Mn- 0.5, Zn- 4.0, Cu-0.3, B- 0.5), T_8: 1 % General grade-1 + T_1 and T_9 (control) which was laid out in a Randomized Block Design with three replications.

The application of 1 % General grade-1 + T_1 had shown significant impact on growth parameters *viz*. plant height (28.54cm), number of wrapper leaves per plant (42.26), number of non -wrapper leaves per plant (21.93) and plant spread (N -S: 55.96 cm & E-W: 54.22 cm) at harvest. And treatment T_9 (control) showed significant impact on length of stalk (11.34 cm).

Highest marketable head yield per net plot (31.42 kg), marketable head yield per hectare (24.24 t) and other yield attributes *viz.* Polar diameter of head (15.46 cm), Equatorial diameter of head (13.35 cm), Gross weight of head (1.24 kg/plant) and Net

weight of head (748.00 g/plant) were recorded significantly highest in T_8 treatment. While days of first head initiation, days to first marketable head and head compactness did not show any significant differences.

The different micronutrient treatments were also profoundly influenced the gross and net returns in addition to benefit cost ratio. The treatment which received T_8 (1 % General grade-1 + T_1) realized the highest benefit cost ratio of 1.74 followed by the treatment received T_7 with 1.64 benefit cost ratio.

79. Name of the student : Chaudhari Vishvas Jitubhai (2020215011)
Year of completion of degree : 2017
Name of the major advisor : Dr. N. K. Patel
Title of thesis : Effect of foliar spray of micronutrients on growth and yield of cauliflower (*Brassica oleracea* L. var. Botrytis)

Abstract

The experiment was conducted during rabi, 2016-2017 at Regional Horticultural Research Station, Navsari Agricultural University, Navsari, Gujarat, India to evaluate the Effect of foliar spray of micronutrients on growth and yield of (*Brassica oleracea* L. var. Botrytis). The experiment was arranged over 9 treatments comprising, micronutrient sources T_1: Ammonium molybdate (0.1 %), T_2: Boric acid (0.2 %), T_3: Zinc sulphate (0.5 %), T_4: Copper sulphate (0.5 %), T_5: Ferrous sulphate (0.5 %), T_6: Manganese sulphate (0.5 %), T_7: 1 % General grade-1 (Fe- 2.0, Mn- 0.5, Zn- 4.0, Cu- 0.3, B- 0.5), T_8: 1 % General grade-1 + T_1 and T_9 (control- No Spray) laid out in a Randomized Block Design with three replications.

The application of General grade-1 (1 %) + T_1 (T_8) had significant impact on plant height (74.93 cm), number of leaves per plant (23.39), plant spread (N-S: 76.81 cm & E-W: 77.79 cm) which recorded maximum values given in the brackets at harvest respectively. These values were statistically remained at par with T_2, T_3 and T_7 treatments. And treatment T_9 (control) showed significant impact on length of stalk (12.40 cm).

Yield attributes *viz.,* curd diameter (19.16 cm), gross weight of curd per plant (2.65 kg), net weight of curd per plant (883.33 g), curd yield per plot (37.11 kg) and curd yield per hectare (28.64 t) were recorded highest with treatment T_8 and was also at par with T_2, T_3 and T_7 treatments.

The different micronutrient treatments were also profoundly influenced the gross and net returns in addition to benefit cost ratio. The treatment which received T_8 (1 % General grade- 1 + T_1) realized the highest benefit cost ratio of 1.59 followed by thetreatment receiving General grade-1 (1 %) which gave 1.53 benefit: cost ratio.

80. Name of the student : Chaudhary Kamleshkumar Vaktabhai (2020215013)
Year of completion of degree : 2017
Name of the major advisor : Dr. Sanjeev Kumar
Title of thesis : Seedling invigouration by halo priming for salt tolerance in tomato (*Solanum lycopersicum* L.)

Abstract

The present investigation entitled “Seedling invigouration by halo priming for salt tolerance in tomato (*Solanum lycopersicum* L.)” was conducted during May, 2016 at

Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat, India. The experiment involved three levels of halo-priming and two levels each of priming duration and salinity along with 3 additional treatments namely unprimed with 2.5 EC, unprimed with 5 EC and unprimed with normal water, thus constituting 15 treatments, which were laid in completely randomized design with 3 replications to draw conclusive inferences.

The study revealed significant differences among various treatments for majority of parameters, however interaction between and among halo-priming, priming duration and salinity was observed to be variable for various parameters under consideration.

It was obviously clear from the study that T_{15} (unprimed with normal water) was observed to display positive and maximum values for majority of traits. Taking into consideration the invigouration of tomato seedling against salt stress through halo-priming, it was observed that treatment T_4 expressed sufficiently good seedling survival (65.00 %), shoot dry weight (0.84 g), root fresh weight (0.44 g), root dry weight (0.31 g), fresh weight of seedlings (1.74 g), dry weight of seedlings (1.15 g) and total chlorophyll content (2.75 mg/g). T_6 showed good number of leaves (4.60), nitrogen (7.16 mg/g), potassium (31.18 mg/g) and protein content (0.61 mg/g) under higher salinity. Whereas T_8 showed sufficiently germination rate index (9.67), germination index (432.67), final germination percentage (87.00 %), shoot length (9.57 cm), root length (6.80 cm), soluble sugar content (20.78 mg/g), catalase (0.75 μg^{-1}), superoxide dismutase (50.67 μg^{-1}) and ascorbate peroxidase (4.49 μg^{-1}). Treatment T_{10} showed considerable value for leaf area index (0.62).

The main effect of P_2 level of halo-priming was observed to be positive and significant for majority of parameters except sodium content, which was otherwise found to be maximum in P_1 level of halo-priming. Main effect of D_2 level of priming duration was observed to be positive and significant for seedling survival, growth rate index, root fresh weight, root dry weight, dry weight of seedlings, protein content, catalase, peroxidase and ascorbate peroxidase activity, whereas number of leaves, leaf area index and potassium content were found to be maximum in D_1 level of priming duration (24 hrs). Main effect of S_1 level of salinity was observed to be positive and significant for seedling survival (75.89 %), growth rate index (8.72), germination index (377.89), final germination percentage (74.67 %), number of leaves (4.52), leaf area index (0.63), shoot length (12.32 cm), root length (7.25 cm), shoot dry weight (0.83 g), root fresh weight (0.43 g), root dry weight (0.29 g), fresh weight of seedlings (1.72 g), nitrogen (7.99 mg/g), potassium (32.40 mg/g), total chlorophyll content (2.65 mg/g), protein (0.44 mg/g), soluble sugar content (19.32 mg/g), catalase activity (0.56 μg^{-1}), superoxide dismutase activity (46.22 μg^{-1}) and ascorbate peroxidase (4.06 μg^{-1}), whereas the maximum root-shoot ratio (0.75) and peroxidase activity (0.41 μg^{-1}) were observed maximum under S_2 level (5 EC) of salinity.

The interaction between P_2 level of halo-priming and D_2 level of priming duration resulted in maximum germination rate index (10.88), root fresh weight (0.47 g), root dry weight (0.31 g), dry weight of seedlings (1.18 g), total chlorophyll content (2.87 mg/g), soluble sugar content (20.98 mg/g), catalase activity (0.78 μg^{-1}), peroxidase activity (0.53 μg^{-1}), superoxide dismutase activity (55.33 μg^{-1}) and ascorbate peroxidase activity (4.69 μg^{-1}), whereas maximum seedling survival; leaf area index and potassium, protein content were found to be maximum in P_1D_2; P_1D_1 and P_2D_1, respectively. Under higher salinity, P_1 level of halo-priming and S_2 level of salinity performed well for seedling survival (54.17 %), root fresh weight (0.41 g) and dry weight of seedlings (1.08 g), whereas P_2S_2 expressed sufficiently good germination rate index (7.87), germination index (431.67), final germination percentage (86.67 %), potassium (26.68 mg/g), protein content (0.59 mg/g) and catalase activity (0.65 μg^{-1}). The interaction between D_2 level (48 hrs) of priming duration and S_2 level of salinity was observed to be good for seedling

survival (52.33 %), germination rate index (8.03), sodium (14.92 mg/g), total chlorophyll content (2.12 mg/g), soluble sugar content (18.54 mg/g) and catalase activity (0.53 μg^{-1}), while, D_1S_2 expressed sufficiently good leaf area index (0.62) and potassium content (24.84 mg/g) under higher salinity.

The treatment combination $P_2D_2S_2$ performed well under higher salinity and showed sufficiently good germination rate index (12.09) and catalase activity(0.80 μg^{-1}), whereas good amount of protein content (0.68 mg/g) and chlorophyll content (3.42 mg/g) were observed in $P_2D_1S_2$ and $P_1D_2S_2$, respectively under higher salinity.

Hence, it can be concluded that halo-priming of tomato seeds either with 1 % or 2 % KNO_3 for 24 or 48 hrs of duration could invigourate tomato seedlings against salt stress and may be served as a better alternative for boosting up survival and performance of tomato seedlings under higher salinity conditions.

81. Name of the student : Chaudhary Lalabhai Rajabhai (2020215014)

Year of completion of degree : 2017

Name of the major advisor : Dr. S. S. Masaye

Title of thesis : Effect of different type of mulches on growth, yield and quality of brinjal (*Solanum melongena* L.)

Abstract

A field experiment was conducted, with a view to study the "Effect of different type of mulches on growth, yield and quality of brinjal (*Solanum melongena* L.)" during Rabi season of 2015-16 at Agriculture Experimental Station (AES), Navsari Agricultural University, Villege: Paria, Taluka: Pardi, District: Valsad, Gujarat, India.

The experiment was comprised of 8 treatments in a randomized block design with three replications, namely T_1: (Black polythene mulch: 25 micron), T_2: (Black polythene mulch: 50 micron), T_3: (Silver polythene mulch: 25 micron), T_4: (Silver polythene mulch: 50 micron), T_5: (Red polythene mulch: 25 micron), T_6: (Red polythene mulch: 50 micron), T_7: (Paddy straw mulch: 5 t/ha) and T_8: (Control).

The results of using different type of mulches treatments were found significant for majority of the characters under study except *viz.*, total phenol content (mg/100 g of edible portion).

The vegetative parameters such as maximum plant height (101.33 cm), number of branches per plant (6) and plant spread (N-S= 91.86 cm, E-W= 93.54 cm) as well as minimum days to first flowering (35.67 days) and days to first fruit set (42 days) were recorded under the treatment T_4 (Silver polythene mulch: 50 micron). Fascinatingly the brinjal plants with treatment T_4 (Silver polythene mulch: 50 micron) has resulted in the higher values of number of fruits per plant (24), fruit weight (81 g), fruit length (7.99 cm) and fruit diameter (81 cm). Attractively the brinjal plants nourished with treatment T_4 (Silver polythene mulch: 50 micron) has resulted in the higher values of remarkable improvement on the fruit yield parameters *viz.*, fruit yield (1.89 kg), fruit yield (34.91 t/ha) and economics. Interestingly brinjal plants nourished with using different type of mulches showed non-significant effect on total phenol content (mg/100 g of edible portion).

The soil parameter such as maximum water use efficiency (35.03 kg/ha/mm) and minimum weed density at 20, 40 and 60 DAT (21, 19 and 17.33 Nos./m^2, respectively) was recorded under treatment T_4 (Silver polythene mulch: 50 micron). However, the soil temperature was recorded from the applied treatment plots at 30, 60 and 90 DAT and treatment T_2 recorded maximum soil temperature *i.e.* 35.13 ºC, 33.90 ºC and 36.23 ºC, respectively.

With regard to the infestation of brinjal shoot and fruit borer the minimum value (1.33 %) was recorded in the plants treated with T_8 (Silver polythene mulch: 50 micron). Moreover, no little leaf incidence was observed during experimental period in brinjal.

Based on the results obtained in the investigation, it can be concluded that the maximum net return with BCR value of 1.86:1 was achieved under the treatment T_4 (silver polythene mulch: 50 micron), which was found economical, profitable and proved highly remunerative.

82. Name of the student : Golakiya Prayagbhai Dineshbhai (2020215021)
Year of completion of degree : 2017
Name of the major advisor : Dr. S. N. Saravaiya
Title of thesis : Evaluation of GA_3 on performance of cowpea (*Vigna unguiculata* (L.) Walp.)

Abstract

Research study entitled "Evaluation of GA_3 on performance of cowpea (*Vigna unguiculata* (L.) Walp.)" was conducted during the year 2016 in summer season at the Regional Horticultural Research Station (RHRS) of Navsari Agricultural University, Navsari, Gujarat, India. There were twelve treatment combinations comprising two levels of time of application *i.e.* A_1= Days to 50 % flowering, A_2= During pod development and six concentrations of GA_3 *i.e.* G_1= GA_3 50 mg L^{-1}, G_2= GA_3 100 mg L^{-1}, G_3 = GA_3 150 mg L^{-1}, G_4 = GA_3 200 mg L^{-1}, G_5= GA_3 250 mg L^{-1} and G_6 = GA_3 300 mg L^{-1} with an absolute control in a Randomized block design (Factorial) with three replications. Observations were recorded for different traits. For various growth parameters, the effect of time of application of GA_3 on days to 50 % flowering and during pod development stage was found non-significant for days to 50 % maturity and plant height at final picking. Significant results on primary branches per plant (4.13) under GA_3 50 mg L^{-1} was observed. For different yield parameters, the effect of time of application of GA_3 on days to 50 % flowering and during pod development stage was found significant on days to first picking (46.47 days), days to last picking (85.13 days), pod length (16.75 cm), no. of marketable pods $plant^{-1}$ (56.70), marketable pod weight $plant^{-1}$ (238.99 g), marketable pod yield $plot^{-1}$ (11.72 kg), no. of picking (7.83) and marketable pod yield (9.83 t ha^{-1}). Marketable pod yield $plant^{-1}$ and harvest index were found non-significant under treatment of GA_3 50 mg L^{-1} during the investigation. Regarding quality parameters, the effect of time of application of GA_3 on days to 50 % flowering and during pod development stage was found significant on protein content of immature pod (5.07 %), moisture content (83.49 %), crude fibre (12.19 %) and TSS (4.96 ^{0}Brix) under the treatment of GA_3 50 mg L^{-1} in statistical analysis. The effect of foliar application of GA_3 on growth parameters *viz.*, days to 50 % maturity (41.10 days), plant height at final picking (53.56 cm) and primary branches per plant at final picking (4.15) were found significant under the treatment of GA_3 50 mg L^{-1} during the period of investigation. The significant effect of foliar application of GA_3 on yield parameters *viz.*, days to first picking (46.23 days), days to last picking (88.62 days), pod length (17.24 cm), no. of marketable pods $plant^{-1}$ (59.16), marketable pod weight $plant^{-1}$ (250.06 g), marketable pod yield $plot^{-1}$ (11.91 kg), no. of picking (8.21), marketable pod yield $plant^{-1}$ (0.148 kg), marketable pod yield (9.99 t ha^{-1}) and harvest index (45.69 %) were observed under the treatment of GA_3 50 mg L^{-1} during the investigation. Effect of foliar application of GA_3 was found significant on quality parameters *viz.*, protein content of immature pod (5.13 %), moisture content (87.85 %), crude fibre (12.23 %) and TSS (4.92 ^{0}Brix) under the treatment of GA_3 50 mg L^{-1} in statistical analysis.

Interaction effect between time of application and foliar application of GA_3 on

various growth parameters like days to 50 % maturity, plant height at final picking and primary branches per plant at final picking were found non-significant in statistical analysis. Interaction effect between time of application and foliar application of GA_3 on various yield parameters like days to first picking, days to last picking, pod length, no. of marketable pods plant^{-1}, marketable pod weight plant^{-1}, marketable pod yield plant^{-1}, marketable pod yield plot^{-1}, marketable pod yield (t ha^{-1}), harvest index and no. of picking did not show any significant effect in statistical analysis. Interaction effect between time of application and foliar application of GA_3 on various quality parameters like protein content of immature pod, crude fibre, moisture content and TSS were found non-significant in statistical analysis. From the economic point of view and based on green pod yield, for securing maximum return, foliar application of GA_3 @ 50 mg L^{-1} at days to 50 % flowering stage was found superior with highest B:CR value of 1.64 which was followed by treatment GA_3 @ 100 mg L^{-1} at days to 50 % flowering stage recording B:CR value of 1.58. Both these treatment combinations were found economical, profitable and proved highly remunerative for growth, yield and quality traits of cowpea.

83. Name of the student : Habibullah (2020215022)

Year of completion of degree : 2017

Name of the major advisor : Dr. S. N. Saravaiya

Title of thesis : Effect of foliar application of micronutrients on tomato (*Solanum lycopersicum* L.) under protected culture

Abstract

A field experiment was conducted, with a view to study the "Effect of foliar application of micronutrients on tomato (*Solanum lycopersicum* L.) under protected culture" during *kharif* season of 2016 at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat, India.

The experiment was comprised of 7 treatments in a randomized block design with three replications,namely T_1: RDF (N: P: K 250:125:125 kg/ha); T_2: (T_1 + Boric acid (0.1%); T_3: (T_1 + Zinc sulphate (0.25 %); T_4: (T_1 + Copper sulphate (0.25 %); T_5: (T_1 + Ferrous sulphate (0.25 %); T_6: (T_1 + Manganese sulphate (0.25 %) and T_7: (T_1 + General grade 1 % (Fe 5 %, Mn 2.5 %, Zn 3.5 %, Cu 1 %, B 0.65 %, Mo 0.30 %). Micronutrients *viz.*, B as Boric acid (0.1 %), Zn as Zinc sulphate (0.25 %), Cu as Copper sulphate (0.25 %), Fe as Ferrous sulphate (0.25 %), Mn as Manganese sulphate (0.25 %) and general grade 1 % (Fe 5 %, Mn 2.5 %, Zn 3.5 %, Cu 1 %, B 0.65 %, and Mo 0.30 %) were used for foliar spraying. Total three sprays of micronutrients were given at an interval of 20 days, starting from 40 days, after transplanting to the respective treatments.

The result of foliar application of micronutrients treatment was found significant for majority of the characters under study except *viz.*, fruit volume (cm^3), Vitamin A (IU) and average fruit weight (g).

The vegetative parameters such as maximum plant height (3.61 m) as well as maximum leaf area (761.00 cm^2) were recorded under the treatment of T_7 (T_1 + Mixture of all micronutrients). Fascinatingly the tomato plants nourished with the RDF along with foliar spray of mixture of all micronutrients *i.e.* General grade 1 % (T_7) has resulted in the higher values of reproductive characters *viz.*, lower days to first flowering (27.33 days), lower days to 50 % flowering (30.67 days), numbers of fruits per cluster (4.67), lower days to first picking (60.00), number of fruits per plant (53.67) and No. of locules per fruit (3.07). Attractively the tomato plants nourished with the RDF along with foliar

spray of mixture of all micronutrients has also resulted remarkable improvement in the quality characters of fruit *viz.*, pericarp thickness of fruit (8 mm), equatorial diameter (6.83) cm, polar diameter (7.63 cm), fruit texture (4 kg/cm^2), shelf life (16.67 days), total soluble solids (4.33 ^{0}Brix), ascorbic acid (14.17 mg), lycopene content (5.01 mg) and physiological loss in weight (12.96 %). Interestingly tomato plants nourished with RDF along with foliar spray of mixture of all micronutrients *i.e.* General grade 1 % (T_7) has resulted in the higher values of remarkable improvement on the fruit yield parameters *viz.*, fruit yield per plant (5.48 kg), total fruit yield m^{-2} (14.60 kg), marketable fruit yield m^{-2} (14.56 kg) and economics.

With regard to the infestation of tomato fruit borer minimum value (5.77 %) was recorded in the plants fed with T_7: (T_1 + General grade 1 %) *i.e.* RDF + mixture of all micronutrients.

On the basis of experimentation as well as economic point of view, T_7 (T_1 + General grade 1 %) recoded the marketable fruit yield (14.56 t/ 1000 m^2) and recorded the higher net realization (1,64,452 Rs.): with the benefit: cost ratio of 1.07, which proved highly remunerative under the south Gujarat conditions for growing the tomato cv. “Bargad” under protected culture.

84. Name of the student : Lathiya Jasminkumar Bharatbhai (2020215028)

Year of completion of degree : 2017

Name of the major advisor : Dr. Sanjeev Kumar

Title of thesis : Influence of PGRs on fruit setting and other horticultural traits in tomato (*Solanum lycopersicum* L.) under NVPH

Abstract

The present investigation entitled “Influence of PGRs on fruit setting and other horticultural traits in tomato (*Solanum lycopersicum* L.) under NVPH” was carried out at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat during *kharif*, 2016. The whole experiment was arranged over fourteen treatments comprising of three levels each of three PGRs (4-CPA 20 ppm, 4-CPA 30 ppm, 4-CPA 40 ppm, 2,4-D 2.50 ppm, 2,4-D 5.00 ppm, 2,4-D 7.50 ppm, 4-CPA 20 ppm followed by GA_3 (30 ppm) within 24 hours, 4-CPA 30 ppm followed by GA_3 (30 ppm) within 24 hours, 4-CPA 40 ppm followed by GA_3 (30 ppm) within 24 hours, 2,4-D 2.50 ppm followed by GA_3 (30 ppm) within 24 hours, 2,4-D 5.00 ppm followed by GA_3 (30 ppm) within 24 hours, 2,4-D 7.50 ppm followed by GA_3 (30 ppm) within 24 hours (T_{12}), Control, 4-CPA 30 ppm (Inflorescence dipping) and laid out in a Randomized complete Block Design with three replications.

Among different levels of treatment, 30 ppm 4-CPA (Inflorescence dipping) exhibited maximum plant height of 203.47, 251.73 and 306.67 cm at 120, 180 days after planting and at final picking, respectively. Whereas, control had maximum leaf area (843.33 cm^2). Plants treated with 30 ppm 4-CPA (Inflorescence dipping) were found to be superior to all other treatments for majority of the reproductive parameters *viz.*, fruit set percent (72.50), fruits per cluster (5.80) and number of fruits per plant (58).

Tomato plants responded significantly to 30 ppm 4-CPA (Inflorescence dipping) treatment exhibiting maximum number of locules per fruit (2.83), fruit firmness (3.79 kg/cm^2), ascorbic acid (14.69 mg/100 g), vitamin A (1174.49 IU), shelf life (14.67 days), total soluble solids (4.40 ^{o}Brix) and lycopene content (2.70 mg/ 100 g). The minimum physiological loss in weight (15.69 %) was also observed in 30 ppm 4-CPA

(Inflorescences dipping). However, non-significant variations occurred among treatments for fruit volume, pericarp thickness, equatorial diameter and polar diameter.

The superiority of 4-CPA at the rate of 30 ppm (Inflorescences dipping) was also reflected by tomato plants. Significant maximum fruit yield per plant (4.95 kg) as well as fruit yield per m^2 (12.69 kg) except average fruit weight were recorded in 4-CPA at the rate of 30 ppm (Inflorescences dipping). Subsequently, economic analysis of present investigation revealed T_{14} (30 ppm 4-CPA-Inflorescences dipping) as highly remunerative treatment exhibiting B:C vratio of 0.85 with net realization of Rs. 116629.00.

85. Name of the student : Navya K. (2020215030)
Year of completion of degree : 2017
Name of the major advisor : Dr. K. D. Desai
Title of thesis : Effect of integrated nutrient management on growth, yield and quality of elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]

Abstract

The experiment was conducted during *kharif*, 2016 at Regional Horticultural Research Station (RHRS), Navsari Agricultural University, Navsari, Gujarat, India to evaluate the effect of different levels of integrated nutrient sources and bio-fertilizers on growth, yield and various quality parameters of elephant foot yam and also its impact on soil fertility status after harvesting the crop. The experiment was arranged over 8 treatment combinations comprising 4 levels of integrated nutrient sources (T_1: RDF- 100 : 50 : 150 NPK kg ha^{-1} + 25 t FYM ha^{-1}, T_2 : 50 % RDN + 50 % N from vermi-compost along with RDF of P & K, T_3 : 50 % RDN + 50 % N from FYM along with RDF of P & K and T_4 : 50 % RDN + 50 % N from bio-compost along with RDF of P & K) and 2 levels of bio-fertilizers (B_0: without bio-fertilizers and B_1: with bio-fertilizers *i.e.* combination of *AZ*, PSB and KMB each at 5 liters ha^{-1}) laid out in a Randomized Block Design (Factorial concept) with three replications.

The application of 50 % RDN through inorganic fertilizers + 50 % RDN through vermi-compost (T_2) had shown significant impact on plant height (73.02 cm and 78.87 cm), canopy spread E-W (88.17 cm and 90.27 cm) and N-S (88.87 cm and 89.82 cm), culm girth (15.06 cm and 15.74 cm), petiole length (49.33 cm and 56.75 cm) and number of leaflets per plant (362.07 and 318.90) which recorded maximum values given in the brackets at the age of 120 and 150 DAP, respectively. These values were statistically remained at par with T_3 treatment.

Yield attributes *viz.*, harvest index (51.77 %), fresh corm weight (1.267 kg) and yield per hectare (26.37 t) were recorded highest with treatment T_2 and were also at par with T_3 treatment.

The quality attributes like corm circumference (48.37cm) was highest in treatment T_2 while the starch content was highest (16.57 %) in T_3 treatment which was at par with T_2 and T_4 treatments. The other two quality characters i.e. calcium oxalate and β-carotene content were found to be non-significant irrespective of the different INM treatments imposed.

Among the parameters studied for soil fertility status after harvest only organic carbon content showed significant difference with highest value of 0.597 % in T_2 treatment but remained at par with T_3 and T_4 treatments. While the other parameters like bulk density, available N, P and K contents did not show any significant differences.

The application of bio-fertilizers produced significantly the highest plant height

(70.12 cm and 76.68 cm), canopy spread E-W (83.91 cm and 87.09 cm) and N-S (83.84 cm and 86.88 cm), culm girth (14.37 cm and 14.82 cm), petiole length (47.94 cm and 53.50 cm) and number of leaflets per plant (343.63 and 302.98) at 120 and 150 DAP, respectively. The other parameters like harvest index (48.51 %), fresh corm weight (1.186 kg), corm circumference (46.99 cm), yield (24.84 t ha^{-1}), and organic carbon content (0.588 %) were also significantly highest.

Combined effect of different levels of integrated nutrient sources and bio-fertilizers was significant only on plant height and petiole length at 150 days after planting. The treatment combination T_2B_1 (50 % RDN through inorganic fertilizers + 50 % RDN through vermi-compost along with bio-fertilizers) recorded the highest plant height and petiole length of 79.15 cm and 57.30 cm, respectively.

The different INM treatments were also profoundly influenced the gross and net returns in addition to benefit cost ratio. The treatment which received 50 % RDN through FYM along with combination of bio-fertilizers T_3B_1 realized highest benefit: cost ratio of 2.22 followed by the treatment receiving 50 % RDN through vermi-compost along with combination of bio-fertilizers (T_2B_1) with 2.03 benefit cost ratio.

86. Name of the student : Nikki Bharti (2020215031)

Year of completion of degree : 2017

Name of the major advisor : Dr. Sanjeev Kumar

Title of thesis : Studies on exogenous application of PGRs in bell pepper (*Capsicum annuum* L.) for various horticultural traits under NVPH

Abstract

The present investigation entitled “Studies on exogenous application of PGRs in bell pepper (*Capsicum annuum* L.) for various horticultural traits under NVPH” was carried out at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat during *rabi*, 2015. The whole experiment was arranged over ten treatments comprising of three levels each of three PGRs (NAA at 20, 40 and 60 ppm; GA_3 at 25, 50 and 75 ppm and 2,4- D at 2.5, 5 and 7.5 ppm) and laid out in a Randomized Block Design with three replications. The studies revealed significant variations among different treatments for most of the vegetative, reproductive, quality and yield parameters except ascorbic acid content.

Among different levels of treatment, 75 ppm GA_3 exhibited maximum plant height of 85.00, 154.67, 214.67 and 239.53 cm at 60, 90, 120 days after planting and at final picking, respectively whereas, control had maximum leaf area (150.03 cm^2). Plants treated with 20 ppm NAA was found to be superior to all other treatments for majority of the reproductive parameters like fruit set (77.62 %), days to first picking (71.67), number of fruits per plant (26.00) and number of pickings (33.33). Nevertheless, duration of crop was enhanced to maximum number of days (206.67) in plants sprayed with 75 ppm GA_3.

Response of bell pepper to various quality parameters on exogenous application of different PGRs was observed to be variable. The fruits harvested from plants sprayed with 20 ppm NAA exhibited significantly maximum fruit volume (281.21 cm^3) except control and 40 ppm NAA. However, maximum pericarp thickness of 6.5 mm was observed in 7.5 ppm 2,4-D whereas minimum physiological loss in weight (9.43 %) and (23.41%) at 6^{th} and 9^{th} day after picking, respectively was significantly favoured by 7.5 ppm 2,4-D and 20 ppm NAA. Ascorbic acid content remained unaffected by any of the treatments.

The superiority of NAA at the rate of 20 ppm was also reflected by bell pepper

plants in terms of maximum fruit breadth (7.95 cm), average fruit weight (185.00 g), fruit yield per plant (3.00 kg), marketable yield per m^2 (10.75 kg) and total yield per m^2 (11.44 kg) except fruit length (9.86 cm) which was observed to be maximum in plants treated with 75 ppm GA_3.

Subsequently, economic analysis of present investigation revealed T_1 (20 ppm NAA) as highly remunerative treatment exhibiting BCR of 1.22 with net realization of Rs. 188849.00.

87. Name of the student : Pankajkumar Dharva (2020215034)
Year of completion of degree : 2018
Name of the major advisor : Dr. A. I. Patel
Title of thesis : Genetic architecture of fruit yield and its attributes in tomato (*Solanum lycopersicum* L.)

Abstract

In the present investigation, information on magnitude of heterosis and combining ability were obtained for fruit yield and its related attributes by adopting half diallel analysis. The experimental materials consisting of seven genotypes and their resultant 21 F_1 hybrids with one commercial check (Abhinav) were tested at R.H.R.S., ASPEE College of Horticulture and Forestry, N.A.U., Navsari during 2016-17 in a randomized block design with three replications.

The analysis of variance for all the traits revealed presence of considerable genetic variability in the material studied. Highly significant and positive standard heterosis for fruit yield and its component characters in the hybrids involving elite lines as the parents suggested that there is a good option for exploiting heterosis commercially and also choice of isolating desirable segregants. The cross combinations *viz*., AVTO-2 x AT-4 and AVTO-3 x AVTO-4 exhibited higher standard heterosis in positive direction for fruit yield and its component traits in tomato.

Combining ability analysis revealed that both additive and non-additive gene actions were important for fruit yield and its related traits. However, magnitudes of non-additive variances were higher than additive variance for fruit yield and its contributing traits indicating predominance role of non-additive gene action in the inheritance of the traits. The estimates of GCA effects indicated that parent AVTO-4 were good general combiners for fruit yield and its contributing characters. The hybrids AVTO-2 x AT-4 and AVTO-3 x AVTO-4 had higher *per se* performance, SCA effect and standard heterosis for fruit yield.

Looking to the resistance level against pest and disease, none of the genotype found to be resistant against fruit borer, while two parents and thirteen hybrids found moderately resistant against ToLCV in field condition.

88. Name of the student : Patel Atishkumar Nareshbhai (2020215040)
Year of completion of degree : 2017
Name of the major advisor : Dr. V. K. Parmar
Title of thesis : Influence of pinching and plant growth regulators on growth, sex expression and yield of bottle gourd

Abstract

The present investigation on “Influence of pinching and plant growth regulators on growth, sex expression and yield of bottle gourd (*Lagenaria siceraria* L.)” cv. Anand

Bottle Gourd– 1 was conducted during the year 2016, at the Regional Horticultural Research Station (RHRS) farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The experiment was arranged over 10 treatment combinations comprising of 2 levels of pinching (P_0: no pinching and P_1: pinching at 6th node) and 5 levels of plant growth regulators (G_0: control, G_1: CCC @ 200 ppm, G_2: CCC @ 400 ppm, G_3: ethrel @ 300 ppm and G_4: ethrel @ 600 ppm) laid out in a Randomized Block Design (Factorial concept) with three replications.

The pinching treatment P_1 (pinching at 6th node) exerted great influence on various morphological parameters such as length of vine (139.73, 198.60, 224.80 and 240.80 cm), number of primary branches (6.03, 8.71, 9.37 and 9.67) at 60, 90, 120 DAS and at final harvesting respectively, number of nodes on main stem (164.10) and internodal distance (8.17 cm). It also improved the floral characters *viz.*, number of female flowers (36.70), number of male flowers (127.00) and sex ratio (3.57:1). Further it also recorded the maximum yield attributes such as maximum average length of fruit (30.96 cm), highest number of fruits per vine (12.31), maximum yield per vine (5.89 kg) and ultimately the highest yield per hectare (29460.00 kg). While, the pinching treatments did not exhibited any significant effect on the average fruit weight and fruit circumferences in bottle gourd.

Plant growth regulator treatment G_4 (ethrel @ 600 ppm) profoundly influenced the morphological attributes such as length of vine (150.83, 207.50, 239.33 and 253.83 cm) at 60, 90, 120 DAS and at final harvesting, number of nodes (164.21), internodal distance (8.72 cm). Similarly floral characters such as minimum days to first female flowering (54.28), maximum number of female flower per vine (38.43) and lowest sex ratio (2.97:1) were recorded in G_4. Likewise it also had significant impact on the yield parameters *viz.,* average length of fruit (32.13 cm), number of fruits per vine (12.76), yield per vine (6.14 kg) and yield per hectare (30691.67 kg). While, the number of primary branches per vine (5.91, 8.43, 9.06 and 9.27) at 60, 90, 120 DAS and at final harvesting respectively, days to first male flower appearance (50.25) and number of male flowers per vine (109.46) were found significantly affected by another plant growth regulator treatment *i.e.* G_2 (CCC @ 400 ppm). But all the plant growth regulator treatments failed to exhibit any noticeable effect on the average fruit weight and fruit circumferences.

The interaction effect of pinching and plant growth regulators was found to be non significant for all the characters studied.

From the economic point of view, for securing maximum return, treatment P_1G_4 (pinching at 6th node and foliar application of ethrel @ 600 ppm) was found superior at highest B:CR value of 2.71:1 which was followed by treatment P_1G_3 (pinching at 6th node and foliar application of ethrel @ 300 ppm) recording B:CR value of 2.55:1.

On the basis of the results obtained in present investigation it could be concluded that in order to obtain good growth, low M: F sex ratio and profitable yield in bottle gourd cv. Anand Bottle Gourd-1 either it should be pinched at 6th node or foliar application of ethrel @ 600 ppm at 2 and 4 true leaf stage.

89. Name of the student : Sagar Raj Nayak (2020215055)
Year of completion of degree : 2017
Name of the major advisor : Dr. V. K. Parmar
Title of thesis : Influence of pinching and plant growth regulators on morphological, physiological, floral and yield

characters of cucumber (*Cucumis sativus* L.) under open field condition

Abstract

The present investigation on "Influence of pinching and plant growth regulators on morphological, physiological, floral and yield characters of cucumber (*Cucumis sativus* L.) under open field condition" was conducted during the year 2016, at the Regional Horticultural Research Station (RHRS) farm, ASPEE College of Horticulture and forestry, Navsari Agricultural University, Navsari.

The experiment was arranged over 15 treatment combinations comprising of 3 levels of pinching (P_0: no pinching, P_1: pinching at 4th node and P_2: pinching at 6th node) and 5 levels of plant growth regulators (G_0: control, G_1: CCC @ 200 ppm, G_2: CCC @ 400 ppm, G_3: ethrel @ 300 ppm and G_4: ethrel @ 600 ppm) laid out in a Randomized Block Design (Factorial concept) with three replications.

The pinching treatment P_2 (pinching at 6th node) exerted great influence on various morphological and physiological parameters such as length of vine (142.47 cm), number of primary branches (7.66), number of nodes on main stem (112.48), internodal distance (8.88 cm), total leaf area (43500.08 cm^2/plant) and leaf area index (2.90). It also improved the floral characters *viz.*, number of female flowers (16.89), number of male flowers (89.64), sex ratio (5.43:1) and first female flowering node (8.27). Further, it also recorded the maximum yield attributes such as maximum average length of fruit (23.34 cm), highest number of fruits per vine (14.25), maximum yield per vine (3.15 kg) and ultimately the highest yield per hectare (21023.27 kg). While, the pinching treatments did not exhibited any significant effect on the average fruit weight in cucumber.

Plant growth regulator treatment G_4 (ethrel @ 600 ppm) profoundly influenced the morphological attributes such as length of vine (161.22 cm), number of nodes (107.94), internodal distance (9.47 cm). Similarly, floral characters such as minimum days to first female flowering (54.47), maximum number of female flower per vine (16.69), lowest sex ratio (5.06:1) and minimum value for first female flowering node (8.65) were recorded in G_4. Likewise, it also had significant impact on the yield parameters *viz.*, average length of fruit (23.39 cm), number of fruits per vine (14.33), yield per vine (3.18 kg) and yield per hectare (21223.28 kg). While, the number of primary branches per vine (6.71), days to first male flower appearance (49.72) and number of male flowers per vine (81.65) were found significantly affected by another plant growth regulator treatment *i.e.* G_2 (CCC @ 400 ppm). But all the plant growth regulator treatments failed to exhibit any noticeable effect on the average fruit weight and both the physiological characters *i.e.* total leaf area and leaf area index.

The interaction effect of pinching and plant growth regulators was found to be non significant for all the characters studied.

From the economic point of view for securing maximum return, treatment P_2G_4 (pinching at 6th node and foliar application of ethrel @ 600 ppm) was found superior with highest B:CR value of 2.44:1 which was followed by treatment P_2G_3 (pinching at 6th node and foliar application of ethrel @ 300 ppm) recording B:CR value of 2.27:1.

On the basis of the results obtained in present investigation it could be concluded that in order to obtain good growth, low M : F sex ratio and profitable yield in cucumber cv. Gujarat Cucumber-1 either it should be pinched at 6thnode or foliar application of ethrel @ 600 ppm at 2 and 4 true leaf stage.

90. Name of the student : Sheth Sachin Gautamkumar (2020215057)

Year of completion of degree : 2017

Name of the major advisor : Dr. K. D. Desai

Title of thesis : Effect of integrated nutrient management on growth, yield and quality of sweet potato [*Ipomoea batatas* (L.) Lam]

Abstract

The experiment was conducted during *Rabi*, 2016 at Regional Horticultural Research Station (RHRS), Navsari Agricultural University, Navsari, Gujarat, India to evaluate the effect of different levels of integrated nutrient sources and bio-fertilizers on growth, yield and various quality parameters of sweet potato and also its impact on soil fertility status after harvesting the crop. The experiment was arranged over 8 treatment combinations comprising, 4 levels of integrated nutrient sources (T_1: RDF- 75 : 50 : 75 NPK kg ha^{-1} + 15 t FYM ha^{-1}, T_2: 50 % RDN + 50 % N from vermi-compost along with RDF of P & K, T_3: 50 % RDN + 50 % N from FYM along with RDF of P & K and T_4: 50 % RDN + 50 % N from bio-compost along with RDF of P & K) and 2 levels of bio-fertilizers (B_0: without bio-fertilizers and B_1: with bio-fertilizers *i.e.* combination of *AZ*, PSB and KMB each at 5 liters ha^{-1}) which was laid out in a Randomized Block Design (Factorial concept) with three replications.

The application of 50 % RDN through inorganic fertilizers + 50 % N through vermi-compost (T_2) had shown significant impact on vine length at 60, 90 DATP and at harvest (78.98 cm, 120.17 cm, and 175.87 cm, respectively) and highest no. of leaves at harvest *i.e.* 138.80 per vine. Both these characters were found at par with T_3 treatment.

Highest total and marketable tuber yield per net plot (8.27 kg and 7.84 kg, respectively), total and marketable tuber yield per hectare (34.47 t and 33.34 t, respectively) and yield attributes *viz.* no. of tuberous roots per vine (5.10), fresh weight of tubers per vine (0.512 kg), average tuber weight (129.30 g), tuber girth (15.94 cm), tuber length (24.34 cm) and harvest index (43.52 %) were recorded significantly highest in T_2 treatment and were also at par with the treatment T_3. While dry matter content of vine and dry matter content of fibrous roots did not show any significant differences.

Application of different nutrient sources did not show significant influence on any of the quality parameters recorded. However, starch content (14.43 %) and total sugar content (2.97 %) was found higher in treatment T_2 while higher dry matter content of tuber (31.33 %) was recorded in treatment T_4 and lower moisture content of tuber (68.67 %) was found in T_3 treatment.

Among the parameters studied for soil fertility status after harvest only organic carbon content showed significant difference with highest value of 0.603 % in T_2 treatment but remained at par with T_3 treatment. While the other parameters like bulk density, available N, P and K contents did not show any significant difference.

The application of bio-fertilizers produced significantly the highest vine length at 60, 90 DATP and at harvest (76.83 cm, 117.03 cm, and 170.98 cm, respectively) and highest no. of leaves (133.06) per vine. Total and marketable tuber yield per net plot (7.89 kg and 7.45 kg, respectively) and per hectare (32.88 t and 29.85 t, respectively), no. of tuberous roots per vine (4.81), fresh weight of tubers per vine (0.495 kg), average tuber weight (126.73 g), tuber girth (15.47 cm), tuber length (23.15 cm) were also significantly highest. Combined effect of different levels of integrated nutrient sources and bio-fertilizers did not show significant influence on any of the parameters recorded.

The different INM treatments were also profoundly influenced the gross and net returns in addition to benefit cost ratio. The treatment which received 50 % RDN through FYM along with combination of bio-fertilizers (T_3B_1) realized the highest benefit cost ratio of 3.22 followed by the treatment received 50 % RDN through bio-compost along with bio-fertilizers (T_4B_1).

91. Name of the student : Avisha Ram Budhani (2020216001)

Year of completion of degree : 2018

Name of the major advisor : Dr. D. R. Bhanderi

Title of thesis : Effect of soil and foliar applied Fe on yield and quality of cowpea (*Vigna unguiculata* (L.) Walp.)

Abstract

Research study entitled "Effect of soil and foliar applied Fe on yield and quality of cowpea (*Vigna unguiculata* (L.) Walp.)" was conducted during the year 2017 in summer season at the Vegetable Research Scheme, Regional Horticultural Research Station (R.H.R.S.) of Navsari Agricultural University, Navsari, Gujarat, India. There were 9 treatments including an absolute control with two different methods for application of $FeSO_4$ *i.e.* soil and foliar in a Randomized Block Design with three replications.

The effect of Fe application on plant height was found to be significant. The soil application of $FeSO_4$ @ 12.5 kg ha^{-1} (T_5) gave significantly maximum increase in plant height (48.53 cm) over control, while the soil application of $FeSO_4$ @ 25 kg ha^{-1} (T_6) gave significantly maximum increase in number of branches (4.80) and number of pods $plant^{-1}$ (26.07) over control.

The soil application of $FeSO_4$ @ 25 kg ha^{-1} (T_6) gave significantly maximum increase in fresh pod yield (9475.33 kg ha^{-1}), dry matter yield of pod (7040.00 kg ha^{-1}) as well as dry haulm yield (5776.67 kg ha^{-1}) over control.

The treatment soil application of $FeSO_4$ @ 50 kg ha^{-1} (T_8) recorded maximum protein content of 24.03 % while the treatment soil application of $FeSO_4$ @ 25 kg ha^{-1} (T_6) recorded maximum protein yield of 1637.00 kg ha^{-1}.

The treatment T_8 (soil application of $FeSO_4$ @ 50 kg ha^{-1}) recorded maximum N content (4.05 %) in leaves and pods (3.84 %) of cowpea while the highest N content (3.99 %) in haulm was recorded in treatment T_7 (soil application of $FeSO_4$ @ 37.5 kg ha^{-1}). Similarly, the highest P (0.26 %) and K content (1.85 %) in pods were recorded with treatment T_6 (soil application of $FeSO_4$ @ 25 kg ha^{-1}).

The highest N uptake by pod (261.90 kg ha^{-1}) and haulm (226.67 kg ha^{-1}) were recorded with treatment T_6 (soil application of $FeSO_4$ @ 25 kg ha^{-1}). In case of phosphorous, maximum uptake by pod (18.23 kg ha^{-1}) and haulm (21 kg ha^{-1}) were also recorded with T_6. Similar trend was observed with potassium uptake and maximum uptake by pod (130.33 kg ha^{-1}) and haulm (76.67 kg ha^{-1}) were again recorded with treatment T_6.

Treatment T_8 (soil application of $FeSO_4$ @ 50 kg ha^{-1}) recorded maximum Fe content in 2^{nd} (243.33 mg kg^{-1}), 4^{th} (224.67 mg kg^{-1}) as well as 6^{th} picking (227.33 mg kg^{-1}) of cowpea pods while treatment T_4 (foliar spray of $FeSO_4$ @ 0.5 % at 45 and 60 DAS) recorded maximum Fe content in 2^{nd} picking (318.67 mg kg^{-1}) and 4^{th} picking (279.67 mg kg^{-1}) and treatment T_8 (soil application of $FeSO_4$ @ 50 kg ha^{-1}) recorded maximum Fe content of 214.33 mg kg^{-1}at 6^{th} picking in cowpea leaves.

The treatment T_6 (soil application of $FeSO_4$ @ 25 kg ha^{-1}) recorded maximum total Fe uptake (1441.33 g ha^{-1}).

From economic point of view and based on fresh pod yield for maximum returns, soil application of $FeSO_4$ @ 25 kg ha^{-1} (T_6) was found superior with the highest yield and B:C ratio of 1.42 and was followed by treatment T_5 (soil application of $FeSO_4$ @ 12.5 kg ha^{-1}) with B:C ratio of 1.19. Both these treatments were found beneficial and remunerative for the growth, yield and quality of cowpea.

92. Name of the student : Krishna Chotaliya (2020216005)

Year of completion of degree : 2018

Name of the major advisor : Dr. S. S. Masaye

Title of thesis : Effect of different levels of nitrogen and novel organic liqued fertilizer on growth, yield and quality of okra (*Abelmoschus esculentus* (L.) Moench) cv. GAO-5

Abstract

A field experiment was conducted, with a view to study the "Effect of different levels of nitrogen and novel organic liquid fertilizer on growth, yield and quality of okra {*Abelmoschus esculentus* (L.) Moench} cv. GAO-5" during summer season 2017 at Agriculture Experimental Station (AES), Navsari Agricultural University, Village: Paria, Taluka: Pardi, District: Valsad, Gujarat, India.

The experiment was laid out in Split Plot Design with comparing of two factors *viz.*, different levels of nitrogen (100 %, 80 % and 60 %) and Novel organic liquid fertilizer (0, 1 and 2 %) with six replications.

The result indicated that different nitrogen levels were significantly influenced the growth parameters of okra cv.GAO-5. Application of nitrogen @ 100 kg/ha was recorded significantly maximum plant height (40.23, 82.98 and 92.32) at 60, 90 DAS and at final harvest, maximum number of branches per plant at harvest stage (2.50) and total dry biomass (1297.85 g/plot). The same treatment was also found better with respect to yield parameters like, days to 50 % flowering (42.83 days), days to 1st picking (48.11days), number of pods per plant (15.93), pod length (11.36 cm), pod weight (11.18 g), pod yield per plant (0.148 kg/ha) and pod yield (10.93 t/ha). In case quality parameters like ascorbic acid (10.98 mg/100g) and fiber content (1.71 %) were found significant superior in treatment N_1 (100 % RDN) while TSS and protein content were found non-significant. Soil parameters found non significant like *viz*., available N, P_2O_5 and K_2O. Results indicated that different nitrogen levels maximum in 250.95 kg/ha nitrogen was found in treatment N_1. Highest P_2O_5 and K_2O was recorded 47.09 and 361.39 kg/ha.

The foliar application of 2 % novel organic liquid fertilizer (L_3) exhibited the significantly maximum plant height (40.58, 81.81 and 89.42 cm) at 60, 90 DAS and at final harvest of crop, number of branches per plant (2.56) and total dry biomass (1287.67 g/plot), reduced to days to 50 % flowering (41.02 days), days to 1st picking (47.33) consequently this treatment not only increased number of pods per plant (15.45), pod length (11.88 cm), pod weight (11.52 g), pod yield per plant (0.146 kg/ha) and pod yield (10.71 t/ha) but also produced favorable effect on pod quality in terms of ascorbic acid (11.00 mg/100 g) and fiber content (1.95 %) in okra pods while in TSS and protein content was found on non-significant effect. Soil parameters non significant like *viz*., available N, P_2O_5 and K_2O. Results indicated that different novel organic liquid fertilizers levels maximum in available N (248.22 kg/ha) was found in treatment L_3. Highest P_2O_5 was recorded (45.90 kg/ha) in treatment L_3 and K_2O was recorded (361.39 kg/ha) in treatment L_1 (Control).

From economics points of view and based on pod yield (11.52 t/ha), highest benefit cost ratio (1.93:1) and net realization (Rs.1, 51, 658 Rs./ha) were obtained with treatment combination N_1L_3 *i.e.* 100 % RDN with 2 % of novel organic liquid fertilizer. So, nitrogen fertilizer 100 % RDN and 2 % of novel organic liquid fertilizer successfully increased growth parameters, yield (t/ha) and exhibited the maximum net realization of okra cv. GAO – 5 under south Gujarat condition.

93. Name of the student : Goswami Rahulpuri Ashokpuri (2020216008)

Year of completion of degree : 2018

Name of the major advisor : Dr.V. K. Parmar

Title of thesis : Evaluation of sowing dates and varieties of vegetable amaranthus *(Amaranthus* spp.)

Abstract

The present investigation entitled "Evaluation of sowing dates and varieties of vegetable amaranthus (*Amaranthus spp.*)" was conducted during the year 2017, at Vegetable Research Scheme, Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The experiment was arranged over 15 treatment combinations comprising of 3 levels of sowing dates (D_1: 2nd fortnight of February, D_2: 2nd fortnight of March and D_3: 2nd fortnight of April) and 5 levels of varieties (V_1: Pusa Lal Chaulai, V_2: Arka Arunima, V_3: Arka Suguna, V_4: CO-1 and V_5: Local variety) laid out in a Randomized Block Design (Factorial concept) with three replications.

The 2nd fortnight of February (D_1) sowing was exerted significant influence on various growth attributes. The highest plant height at first cutting (23.49 cm) and final cutting (22.47 cm), maximum leaf area (11.04 cm^2), more number of branches per plant (4.71) and thickest stem girth at first and final cutting (1.55 cm and 3.06 cm, respectively) were found in treatment of 2nd fortnight of February (D_1) sowing. Significant influence on yield attributes was noted under different sowing dates. The yield attributes *viz.* fresh plant weight (13.51 g), fresh weight per plot (10.73 kg) and per hectare (21.04 t/ha), dry plant weight (1.83 g) and leaf: stem ratio (1.09) were highest under treatment of 2nd fortnight of February (D_1) sowing. Further also, the maximum quality parameters such as protein content (3.04 %), calcium (263.61 mg/100 g fresh wt), iron content (13.71 mg/100 g fresh wt) and moisture content (85.99 %) were observed under 2nd fortnight of February (D_1) sowing. Whereas, different sowing dates did not exhibit any significant influence on oxalate content.

Among the varietal treatments, Arka Suguna (V_3) variety was superior in all growth attributes *viz.* plant height at first cutting (23.40 cm) and final cutting (22.00 cm), leaf area (14.12 cm^2), number of branches (4.67) and stem girth at first (1.66 cm) and final cutting (3.27 cm). Similarly, yield attributes such as fresh plant weight (15.42 g), fresh plant weight per plot (12.27 kg) and per hectare (24.05 t/ha), dry plant weight (1.96 g) and leaf: stem ratio (1.55) were maximum in Arka Suguna (V_3) variety. Likewise, varietal treatments had significant impact on the quality parameters. The highest protein content (3.19 %), calcium content (297.11 mg/100 g fresh wt), iron (16.29 mg/100 g fresh wt) and moisture content (86.96 %) were reported in Arka Suguna (V_3) variety. Whereas, the minimum oxalate content (218.90 mg/100 g fresh wt) was found in Arka Arunima (V_2) variety.

The interaction effect between the sowing dates and varieties had a significant effect only on fresh plant weight per plot and per hectare. The maximum fresh plant weight per plot (14.75 kg) and fresh plant weight per hectare (28.90 t/ha) were observed in the treatment combination of D_1V_3 (2nd fortnight of February sowing and Arka Suguna).

From the economic point of view, for securing maximum return, treatment D_1V_3 comprising of 2nd fortnight of February sowing and Arka Suguna variety was found superior with highest B:CR value of 2.80:1.

On the basis of the results obtained in present investigation it could be

concluded that the Arka Suguna (V_3) variety of vegetables amaranthus was suitable and 2nd fortnight of February sowing was ideal time of sowing for vegetables amaranthus under south Gujarat condition.

94. Name of the student : Hiral Chaudhari (2020216010)
Year of completion of degree : 2018
Name of the major advisor : Dr. S. Y. Patel
Title of thesis : Response of different weed management practices on growth and yield of tomato (*Solanum lycopersicum* L.) cv. GT-2

Abstract

Field experiment was conducted during 2016-17 at Vegetable Research Scheme, Regional Horticultural Research Station, Navsari Agricultural University, Navsari to study the "Response of different weed management practices on growth and yield of tomato (*Solanum lycopersicum* L.) cv. GT-2".

The treatments comprised of twelve weed management practices *viz*., T_1: Weedy check, T_2: Weed free check - Pendimethalin 30 % EC 1.0 kg/ha as PE + IC & HW at 20 DATP + 2 HW at 40 & 60 DATP, T_3: IC & HW at 20 & 40 DATP, T_4: Pendimethalin 30 % EC @ 1.0 Kg/ha as PE, T_5: T_4 + IC & HW at 40 DATP, T_6: Metribuzin 70 % WP @ 0.5 Kg/ha as PE, T_7: T_6 + IC & HW at 40 DATP, T_8: Oxadiargyl 6 % EC @ 90 gm/ha as PE, T_9: T_8 + IC & HW at 40 DATP, T_{10}: T_4 + Quizalofop-ethyl 5 % EC @ 0.05 Kg/ha at 20 DATP, T_{11}: T_6 + Quizalofop-ethyl 5 % EC @ 0.05 Kg/ha at 20 DATP and T_{12}: T_8 + Quizalofop-ethyl 5 % EC @ 0.05 Kg/ha at 20 DATP arranged in Randomized Block Design with three replications. The soil of experimental site was clay in texture, low in total nitrogen, medium in available phosphorus and fairly rich in available potassium.

The treatment weed free check significantly influenced the growth characters like plant height and no. of branches per plant and it was remained at par with treatments T_3, T_5, T_7 and T_9 for both characters. Average weight of fruits was significantly higher with treatment T_5 but, it was at par with all the weed management practices except T_1. However, polar diameter was recorded significantly higher in treatment T_2 and it was remained at par with most of the weed management treatments except T_6, T_8 and T_1. Similarly, equatorial diameter was also found highest in treatment T_2 but statistically at par with the treatments T_3, T_5, T_7 and T_9.

The treatment weed free check (T_2) noted significantly the highest marketable fruit yield (31.67 t/ha) and statistically remained at par with treatments T_5 (29.03 t/ha) and T_3 (27.98 t/ha). Treatments T_2, T_5 and T_3 were recorded 69.81, 55.65 and 50.02 percent higher marketable fruit yield over weedy check, respectively.

Total weed count at 20 DATP was significantly lower in treatment T_5 (51.33 no./m^2) and remained at par with all the treatments of weed management except T_1 and T_3. However, lowest weed count was recorded with treatment T_2 (Weed free check) at 40 DATP and at harvest. However, it is noticed that herbicide treatment coupled with HW and IC not reached to the level of significant but over all reduced the weeds count winningly over herbicide alone and weed check treatment at 40 DATP and at harvest. The dry weight of weed was significantly influenced by all the weed management practices and more of less found similar trend that observed in weed count. Higher the WCE better is the effect of treatment. The highest WCE (52.77 %) was noted under the treatment T_5 at 20 DATP which was closely followed by the treatments T_{10} (50.69 %) and T_2 (50.24 %). While at40 DATP, treatment T_2 was reported the highest WCE (78.25

%) followed by treatment T_3, T_{10}, T_{11} and T_5. Similarly, treatment T_2 (78.22 %) also noted highest WCE, followed by T_3 (55.30 %) and T_5 (51.52 %) at harvest. Treatment T_5 recorded the lowest WI closely followed by treatment T_3. Lower the WI value better is the effect of treatments means treatment T_5 and T_3 reduced only 8.34 % and 11.65 % marketable yield, respectively over weed free check.

The N, P_2O_5 and K_2O content of fruit, plant and weed were differed non significantly due to various weed management practices. However, N, P_2O_5 and K_2O uptake (kg/ha) is significantly differed with different weed management practices. In case of uptake by tomato fruits, treatment T_2 reported significantly higher uptake of N and P_2O_5 but, it was at par with treatments T_5, T_3, T_{10}, T_9 and T_7 however, uptake of K_2O by fruits found significant higher in the treatment T_5 and remained at par with T_2, T_{10}, T_3, T_9, T_7 and T_6. Similarly, N and K_2O uptake by tomato plant was significantly higher with treatment T_2 and remained at par with treatment T_7, T_3, T_5 and T_9. While, P_2O_5 uptake by tomato plant was highest with treatment T_9, but remained at par with all the weed management practices except treatment T_4, T_6 and T_8. While, uptake of N, P_2O_5 and K_2O by weed was significantly lower in treatment T_2. Noticeable reduction of N, P_2O_5 and K_2O uptake by weed also through herbicidal treatments coupled with HW and IC over herbicide alone and weedy check treatments but not reached to the level of significant.

The T_2 treatment gave highest net return which was followed by the treatments T_5, T_3 and T_{10}. However, the B: C ratio of the treatment T_5 was work out higher, which was closely followed by the treatments T_2 and T_{10}. Effective and economical weed control in tomato crop might be secured through pre emergence application on pendimethalin 30 % EC @ 1.0 kg/ha coupled with IC and HW at 40 DATPis equally effective as weed free condition in the South Gujarat agro climatic condition.

95. Name of the student : Narasimhamurthy P N (2020216021)
Year of completion of degree : 2018
Name of the major advisor : Dr. N. B. Patel
Title of thesis : Morphological, biochemical and molecular characterization of sweet potato [*Ipomoea batatas* (L.) Lam.] genotypes

Abstract

The present investigation entitled "Morphological, biochemical and molecular characterization of sweet potato [*Ipomoea batatas* (L.) Lam.] genotypes" carried at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during Rabi 2017-18. The study included forty four genotypes of sweet potato, to study variability, correlation, path coefficient analysis, D^2 analysis and molecular diversity using RBD design with replication thrice.

The twelve morphological characters revealed high variation among the genotypes. Spreading plant type was observed in fifteen genotypes, thirteen genotypes were found to be green colour vine pigmentation and five leaf lobes. Green colour leaf vein pigmentation were observed in seventeen genotypes, whereas green colour mature leaf were observed in eighteen genotypes, seven genotypes exhibited slight and moderate leaf lobes. Nineteen genotypes showed green colour petiole and eleven genotypes showed round elliptic tuber shape. Purple colour and purple red tuber skin were observed in nine genotypes, ten genotypes showed cream colour tuber flesh.

The analysis of variance for all the characters indicated significant differences among the genotypes studied, indicating sufficient amount of variability present in the material. The genotypic as well as phenotypic variances were high for all the characters

except moisture content and dry matter (%).

High heritability coupled with high genetic advance as per cent mean for all the characters except moisture content indicated that the characters are controlled by additive gene action and selection would be effective.

A significant and positive association was noticed between yield per plot and traits like vine length, petiole length, number of branches per plant, leaf area, tuber length, tuber girth, number of tubers per plant, yield per plant and moisture content at both genotypic and phenotypic levels indicating that these attributes were mainly influencing the tuber yield in sweet potato.

Path coefficient analysis revealed that yield per plot had highest and positive direct effect on yield per plant followed by total sugars, number of tubers per plant, ash content and vine length, while the negative direct effect was exhibited through vine length followed by number of branches per plant, petiole length, tuber girth, non-reducing sugars, dry matter, starch, beta carotene, leaf area and tuber length.

The results of Mahalanobis's D^2 statistics revealed wider genetic diversity among 44 genotypes and grouped them into six clusters. The cluster I contained 36 genotypes followed by cluster V (3 genotypes) and cluster III (2 genotypes). On the other hand, the clusters II, IV to VI possessed only one genotype in each cluster.

Molecular study revealed the existence of considerable genetic diversity amongst different genotypes of sweet potato. RAPD markers were found more informative as compared to ISSR for discriminating different sweet potato genotypes; therefore, RAPD can be better exploited for identification of different genotypes of sweet potato, which will be ultimately useful in the improvement of the crop.

96. Name of the student : Patel Anjali (2020216022)

Year of completion of degree : 2018

Name of the major advisor : Dr. S. S. Masaye

Title of thesis : Effect of different type of mulches on growth, yield and quality of okra [*Abelmoschus esculentus* (L). Monch.] cv. GAO-5

Abstract

Field experiment was conducted during summer- 2017 at Agriculture Experimental Station (AES), Navsari Agricultural University, village: Paria, Taluka: Pardi, District: Valsad, Gujarat, India for evaluating the effect of different mulches treatment.

The experiment was laid out in three replication and nine treatment with Randomized Block Design. The treatments comprises different types of mulch, namely T_1 (Black polythene mulch: 25 micron), T_2 (Black polythene mulch: 50 micron), T_3 (Silver polythene mulch: 25 micron), T_4 (Silver polythene mulch: 50 micron), T_5 (Red Polythene mulch: 25 micron), T_6 (Red polythene mulch: 50 micron), T_7 (Paddy straw mulch: 5 tonnes/ha), T_8 (Sugarcane trash: 10 tonnes/ha) and T_9 (Control).

Different type of mulches treatment were found significant for growth and yield character except *viz.*, marketable pod diameter, ascorbic acid, fiber content and organic carbon (%).

The growth parameter such as germination per cent (89.87 %), no. of branches per plant (3.13), plant height at final picking (114.93 cm) and total dry biomass (123.67 g/plant and 3463 g/plot) were record the highest in treatment T_4 (Silver polythene mulch: 50 micron).

Yield and yield attributes were significantly affected by different mulch

treatments. Treatment T_4 (Silver polythene mulch: 50 micron) has resulted in the higher values of yield attributes *viz.*, marketable pod length (11.01 cm), numbers of pod/plant (15.15), pod weight (12.30 g), pod yield/plant (0.188 kg) and pod yield/ha (13.81 tons). While, minimum days required to 50 % flowering (37.00 days) and first picking (42.00 days) were noted under treatment T_4 (Silver polythene mulch: 50 micron). While marketable pod diameter did not show any significant difference by mulching.

The quality parameters such as ascorbic acid (mg/100g) and fibre content (%) were found non-significant by different mulching treatments.

Soil parameters were significantly affected by different mulches compared to control treatment. The maximum soil temperature at 30, 60 and 90 DAS (35.17 °C, 33.93 °C and 36.27 °C, respectively) were recorded in treatment T_2 (Black polythene mulch: 50 micron). However, the treatment T_4 (Silver polythene mulch: 50 micron) was recorded maximum soil moisture content at 30 and 60 DAS (16.33 and 18.33, respectively), water use efficiency (32.54 kg/ha/mm) and minimum weed biomass (19.27 g/m^2).

Thus, mulching with silver polythene mulch: 50 micron increase the growth, yield and quality of okra with maximum net return and B:C ratio.

97. Name of the student : Punna Samatha Sree (2020216028)

Year of completion of degree : 2018

Name of the major advisor : Dr. K. D. Desai

Title of thesis : Effect of chemicals on growth, yield and quality of elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]

Abstract

The experiment was conducted during Summer-*kharif*, 2017-18 at AICRP on Tuber Crops, Regional Horticultural Research Station (RHRS), Navsari Agricultural University, Navsari, Gujarat, India to evaluate the effect of soaking setts in different chemicals with different concentrations on growth, yield and quality characters of elephant foot yam, its impact on weight loss and sprouting of corms under ambient storage condition after harvesting the crop. The experiment was arranged with 11 treatments [T_1: Thiourea - 200 ppm, T_2: Thiourea - 300 ppm, T_3: KNO_3 - 500 ppm, T_4: KNO_3 - 750 ppm, T_5: GA_3 - 100 ppm, T_6: GA_3 - 200 ppm, T_7: CCC - 50 ppm, T_8: CCC - 75 ppm, T_9: MH - 250 ppm, T_{10}: MH - 500 ppm, T_{11}: Control (water soaked)] laid out in a Randomized Block Design with three replications.

Soaking treatment of Thiourea - 200 ppm (T_1) had shown significant impact on number of days required for first and 50 per cent emergence (20.00 days and 31.33 days, respectively), plant height at 120 DAP and 150 DAP (63.73 cm and 63.29 cm, respectively). Canopy spread at all growth stages and in both directions was found non-significant except at 120 DAP in E-W direction (72.13 cm). At the age of 120 and 150 days culm girth (15.57 cm and 16.29 cm, respectively) and petiole length (52.80 cm and 53.67 cm, respectively) recorded maximum values with significant difference. These values were statistically remained at par with T_2, T_3, T_4, T_5 and T_6 treatments. Thiourea, irrespective of its concentration, produced maximum number of leaflets *i.e.* 297.53 and 311.93 at 90 DAP and 150 DAP, respectively with 200 ppm and 310.80 at 120 DAP with 300 ppm concentration. The longest crop period (205.00 days) was also observed with thiourea - 200 ppm.

Treatment T_1 recorded significantly, higher corm diameter (14.83 cm), corm yield per plant (1.315 kg/plant) and yield (30.15 t) per hectare over control. The quality attributes like starch content (17.80 %) were maximum in treatment T_1 while the dry

matter content (32.60 %) and β-carotene content (147.13 IU) were maximum in T_2 treatment. Treatment T_3 recorded the highest number of cormels (3.13) per corm whereas, calcium oxalate content (0.0200 %) was found lowest in T_{10} treatment.

Among the parameters studied for observations under ambient storage condition *i.e.* weight loss percentage and days required for sprouting did not show any significant differences.

The different soaking treatments profoundly influenced the gross and net returns as well as benefit cost ratio. The treatment with thiourea - 200 ppm (T_1) realized the highest gross return (Rs. 6,03,00 /ha), net return (Rs. 3,83,659/ha) with 1.75 benefit: cost ratio.

98. Name of the student : Adarsh Guddadamath (2020217001)
Year of completion of degree : 2019
Name of the major advisor : Dr. D. R. Bhanderi
Title of thesis : Effect of foliar application of zinc and iron on growth, yield and quality of cucumber (*Cucumis sativus* L.)

Abstract

A field experiment was conducted, with a view to study the "Effect of foliar application of zinc and iron on growth, yield and quality of cucumber (*Cucumis sativus* L.)" under field conditions during summer season of 2018 at Vegetable Research Scheme, Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat, India.

The experiment was comprised of two factors and four levels each with three replications in a randomized block design with factorial concept, namely $ZnSO_4$ at 0 %, 0.50 %, 0.75 % and 1.0 %. While, the second factor $FeSO_4$ at 0 %, 0.50 %, 0.75 % and 1.0 % were used in foliar application. Total three sprays were given at 20, 35 and 50 days after sowing.

The growth parameters such as length of main axis recorded maximum (134.17 cm) at 1.0 % $ZnSO_4$, 1.0 % $FeSO_4$ (133.05 cm) and their combination (139.99 cm). In flowering parameters, days taken to first male flower appearance sole application of $ZnSO_4$ and $FeSO_4$ was found non-significant and in interactionfirst male flower appeared (21.68 DAS) in treatment combination $ZnSO_4$ 0.75 % and $FeSO_4$ 0.50 %.While, days taken to first female flower appearance sole application of $ZnSO_4$ and $FeSO_4$ found non-significant and in interaction first female flower appeared (30.3 DAS) with $ZnSO_4$ 0.50 % and $FeSO_4$ 0.50 %. The node of first pistillate flower found in node (2.29) at $ZnSO_4$ 0.50 % and $FeSO_4$ 0.50 %.

Regarding yield parameters, fruit set was maximum at $ZnSO_4$ 0.75 % (61.32 %), $FeSO_4$ 0.50 % (62.25 %) and in interaction maximum fruit set was (64.52 %) was recorded in combination of $ZnSO_4$ 0.50 % and $FeSO_4$ 0 %. Number of fruits per vine was achieved maximum in $ZnSO_4$ 0.75 % (14.13) and in interaction higher number of fruits per vine (15.98) under treatment combination $ZnSO_4$at 0.50 % and $FeSO_4$ at 0 %. Fruit length was recorded maximum (21.16 cm) with sole application of $ZnSO_4$ 1.0 %. Fruit width was non-significant for sole application of micronutrients. The interaction effect for maximum fruit width was recorded (2.64 cm) in $ZnSO_4$ 1.0 % and $FeSO_4$ 0.50 %. In average fruit weight there was no effect of sole micronutrients and in interaction effect average fruit weight was maximum (238.39 g) with treatment combination $ZnSO_4$ 0.75 % and $FeSO_4$ 0 %. Attractively, in individual effectfor fruit yield per ha was achieved maximum (24.26 t) in $ZnSO_4$ 1.0 % and $FeSO_4$ 0.75 % (24.37 t), as well as in interaction

effect (27.56 t) treatment combination $ZnSO_4$ 1.0 % and $FeSO_4$ 0.50 %.

Fascinatingly in quality parameters, fruit firmness (7.02 kg/cm^2) recorded highest in combination $ZnSO_4$ 0.50 % and $FeSO_4$ 0.50 %.

99. Name of the student : Gadhiya Dhara Pravinbhai (2020217008)
Year of completion of degree : 2019
Name of the major advisor : Dr. N. K. Patel
Title of thesis : Influence of growth regulators on growth and yield attributes of cauliflower

Abstract

The experiment on "Influence of growth regulators on growth and yield attributes of cauliflower" was conducted during Rabi, 2017-18 with cv. Pusa Snowball KT 25 at Vegetable Research Scheme, Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat. The experiment was laid out in randomized block design with 9 treatments *viz.*, GA_3 50 mg l^{-1} (T_1), GA_3 75 mg l^{-1} (T_2), GA_3 100 mg l^{-1} (T_3), GA_3 125 mg l^{-1} (T_4), GA_3 150 mg l^{-1} (T_5), NAA 60 mg l^{-1} (T_6), NAA 80 mg l^{-1} (T_7), NAA 100 mgl^{-1} (T_8), No spray (T_9). The treatments were replicated three times. Growth regulators were sprayed at two times *i.e.* 40 and 60 days after transplanting. Among different concentration of growth regulators, application GA_3 @ 150 mg l^{-1} (T_5) exhibited maximum plant height (69.26 cm), number of leaves plant^{-1} (29.67), length of stalk (6.54 cm), plant spread in N-S (69.48 cm) and E-W (71.70 cm) directions, curd diameter (17.80 cm), gross weight of curd (2.88 kg plant^{-1}), net weight of curd (789.59 g plant^{-1}), yield plot^{-1} (20.23 kg) and yield hectare^{-1} (31.22 t), which was at par with NAA @ 80 mg l^{-1} (T_7). Whereas, days to 50 % curd initiation and days to first marketable curd were not significantly affected due to any of the growth regulator treatments. From the economic point of view, NAA @ 80 mg l^{-1} was found more profitable due to higher B: C Ratio as compared to the rest of the treatments.

100. Name of the student : Goswami Mayurgiri Jagdishgiri (2020217011)
Year of completion of degree : 2019
Name of the major advisor : Dr. V. K. Parmar
Title of thesis : Integrated nutrient management in vegetable amaranthus (*Amaranthus tricolor* L.) under south Gujarat condition

Abstract

The present investigation entitled "Integrated nutrient management in vegetable amaranthus (*Amaranthus tricolor* L.) under south Gujarat condition" was conducted during summer 2018 at Vegetable Research Scheme, Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The experiment was arranged within 9 treatment combinations comprising of 3 levels of inorganic fertilizer (A_1: 100 % RDN, A_2: 80 % RDN and A_3: 60 % RDN) and 3 levels of organic fertilizer (B_1: Vermicompost @1 t ha^{-1}, B_2: Biocompost @5 t ha^{-1} and B_3: FYM @5 t ha^{-1}) laid out in a randomized block design (Factorial concept) with three replications.

Plant height (24.32 cm) and leaf area (14.66 cm^2) at first cutting, number of primary branches (5.02) per plant at second cutting and stem girth (1.68 cm) at first cutting,

weight of plant (19.51 g plant^{-1}, 24.34 kg plot^{-1} and 26.01 t ha^{-1}) and dry weight (2.47 g plant^{-1}) were recorded higher in treatment A_1 (100 % RDN). The protein content (3.20 %) in leaf, calcium content in leaf (292.13 mg 100 g^{-1}) and iron content in leaf (16.59 mg 100 g^{-1}) were higher in A_1 (100 % RDN) while, lower nitrate content (181.12 mg 100 g^{-1}) and oxalic acid (319.58 mg 100 g^{-1}) in treatment A_3 (60 % RDN). Higher N, P and K content (0.19, 0.11 and 0.24 %, respectively) and uptake (50.67, 4.23 and 64.71 kg ha^{-1}, respectively) by plant was recorded under treatment A_1 (100 % RDN). Highest available N, P_2O_5 and K_2O (182.29, 22.88 and 356.22 kg ha^{-1}, respectively) was recorded in treatment A_1 (100 % RDN).

Plant height (23.38 cm) and leaf area (13.57 cm^2) at first cutting, number of primary branches per plant (4.51) at second cutting, fresh weight of plant (17.97 g plant^{-1}, 22.70 kg plot^{-1} and 24.25 t ha^{-1}) and dry weight of plant (2.23 g) were higher in biocompost @ 5 t ha^{-1} (B_3). The maximum protein content (3.02 %), calcium content (285.37 mg/100 g) and iron content in leaf (15.92 mg 100 g^{-1}) was reported in bio-compost @ 5 t ha^{-1} (B_3). The minimum oxalic acid content (334.99 mg 100 g^{-1}) was found in FYM @ 5 t ha^{-1} (B_3). The highest N, P and K content (0.18, 0.09 and 0.21%, respectively) and uptake (42.79, 3.77 and 53.70 kg ha^{-1}, respectively) by plant was observed in bio-compost @5 t ha^{-1} (B_2). The highest available N, P_2O_5 and K_2O in soil after experiment (177.06, 21.17 and 353.70 kg ha^{-1}, respectively) was recorded under treatment B_2 (bio-compost @ 5 t ha^{-1}).

The treatment combination A_1B_2 (100 % RDN + bio-compost @ 5 t ha^{-1}) had recorded the best performance in growth and yield parameters *i.e.* plant height (25.97 cm) at first cutting, fresh weight of plant (22.02 g), fresh weight of plant per plot (25.90 kg), fresh weight of plant (27.67 t) per hectare and dry weight of plant (2.89 g). The highest number of primary branches per plant (5.27) was noted in A1B3 (100 % RDN + FYM @ 5 t ha^{-1}).

From the economic point of view, maximum net return revealed in treatment combination A_1B_2 (100 % RDN + bio-compost @ 5 t ha^{-1}) with highest B:CR value of 4.83:1.

101. Name of the student : Manani Nishant Prafulkumar (2020217015)
Year of completion of degree : 2019
Name of the major advisor : Dr. V. K. Parmar
Title of thesis : Integrated nutrient management in cluster bean [*Cyamopsis tetragonoloba* (L.) Taub]

Abstract

An experiment on "Integrated nutrient management in cluster bean [*Cyamopsis tetragonoloba* (L.) Taub]" was conducted during summer 2018 on cv. Pusa Navbahar at Vegetable Research Scheme, Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat. The experiment was laid out in randomized block design with 10 treatments *viz.*, Control (T_0), Recommended dose of fertilizers *i.e.* 25:50:00 NPK kg ha^{-1} + 10 t FYM ha^{-1} (T_1), 75 % RDF (T_2), 50 % RDF (T_3), 100 % RDF + bio-fertilizers (T_4), 75 % RDF + bio-fertilizers (T_5), 50 % RDF + bio-fertilizers (T_6), 100 % RDF (75 % RDN through chemical fertilizer + 25 % RDN through vermicompost) + biofertilizers (T_7), 100 % RDF (50 % RDN through chemical fertilizer + 50 % RDN through vermicompost) + bio-fertilizers (T_8), Vermicompost @ 2 t ha^{-1} + bio-fertilizers (T_9). The treatments were replicated three times. The bio-fertilizers *viz.*, Rhizobium, PSB and KMB were applied as seed treatment each @ 20 ml kg^{-1} seed.

Among different INM treatments, application of 100 % RDF (75 % RDN through chemical fertilizer + 25 % RDN through vermicompost) + bio-fertilizers (T_7)

exhibited maximum plant height at 60, 75 and 90 DAS (74.47, 98.87 and 118.20 cm, respectively), number of trifoliate leaves at 60, 75 and 90 DAS (14.13, 19.80 and 23.07, respectively), leaf area of 3543.79 cm^2 per plant, leaf area index (2.62), fresh weight of plant (5.72 kg $plot^{-1}$ and 17657.41 kg ha^{-1}), dry weight of plant (1.84 kg $plot^{-1}$ and 5688.59 kg ha^{-1}), number of clusters per plant (20.33), number of pods per plant (114.87), green pod yield (3.66 kg $plot^{-1}$ and 11290.12 kg ha^{-1}), nitrogen and phosphorous uptake by plants (54.90 kg ha^{-1} and 21.19 kg ha^{-1}, respectively).

The lowest crude fiber content (2.45 %) in pod was recorded in plant which received 100 % RDF + bio-fertilizers (T_4). Maximum protein content of pod (4.23 %) was observed in the plant treated with 100 % RDF + bio-fertilizers (T_4).

The application of 100 % RDF (50 % RDN through chemical fertilizer + 50 % RDN through vermicompost) + biofertilizers (T_8) found best with respect to organic carbon content of soil (0.635 %). Whereas, number of pods per cluster, average pod length, average pod weight, potassium uptake, bulk density and available N, P_2O_5 and K_2O were not significantly affected.

The highest net return of 232611 Rs. ha^{-1} with maximum BCR value of 2.19 was obtained with treatment 100 % RDF (75 % RDN through chemical fertilizer + 25 % RDN through vermicompost) + bio-fertilizers.

Thus, application of 100 % RDF (75 % RDN through chemical fertilizer + 25 % RDN through vermicompost) + biofertilizers improved growth, yield and quality parameters as well as increased nutrient uptake by plant and BCR.

102. Name of the student : Modi Shivani Rajendra (2020217016)

Year of completion of degree : 2019

Name of the major advisor : Dr. Sanjeev Kumar

Title of thesis : Effect of Nano-NPK fertilizers on various growth, yield and quality parameters of greenhouse cucumber

Abstract

The present investigation entitled "Effect of Nano-NPK fertilizers on various growth, yield and quality parameters of greenhouse cucumber" was carried out at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat during *kharif*, 2018.The experiment was planned with six treatments *viz.*, 100 % RDF through WSF (T_1), 60 % RDF as nanofertilizer (T_2), 50 % RDF as nanofertilizer (T_3), 40 % RDF as nanofertilizer (T_4), 30 % RDF as nanofertilizer (T_5) and absolute control (T_6) in Randomized Block Design (RBD) with four replications.

The study revealed significant variations among different treatments for majority of vegetative, reproductive, qualitative and yield parameters of greenhouse cucumber as well as nutrient uptake and nutrient use efficiency.

Amongst all the treatments, T_2 showed superiority over other treatments for vine length and leaf area at 30, 60 DAS and final harvest. The treatment T_4 took minimum number of days to 50 % flowering (30.75), correspondingly responded to achieve earliest picking (41.00). T_4 also produced first pistillate flower at lowest node and highest number of pickings during the cropping span of greenhouse cucumber.

Response of cucumber to various quality parameters on application of nanofertilizers was observed to be variable. All the treatments showed non-significant differences for total soluble solids and sensory parameters. The treatment T_4 displayed significantly higher mean fruit volume, dry matter and fibre content. Mean fruit firmness and total chlorophyll content were found to be maximum in T_1. All the treatments

stipulated non-significant differences for mean fruit diameter and average fruit weight at all the stages of observation. However, treatment T_5 recorded significantly higher mean fruit length and the treatment T_3 produced highest number of fruits per plant. During the period of experimentation, T_4 produced maximum marketable yield per plant (4.30 kg), total yield per plant, marketable yield per m^2 (12.39 kg) and total yield per m^2.

The treatment T_1 recorded highest nitrogen uptake and treatment T_4 exhibited maximum phosphorous and potassium uptake. The treatment T_4 obtained highest apparent nutrient recovery efficiency for nitrogen, phosphorous and potassium. Maximum physiological nutrient use efficiency for nitrogen was obtained in T_5 while, that of phosphorous and potassium in T_3. However, agronomic nutrient use efficiency for nitrogen, phosphorous and potassium was obtained in greenhouse cucumber administered with treatment T_4. With regard to incidence of pest and diseases, greenhouse cucumber fertigated with treatment T_5 showed minimum leaf miner infestation. The minimum mite population was observed in T_6. Amongst all the treatments, T_3 showed minimum incidence of powdery mildew.

On the basis of present investigation, T_4 emerged out to be the best treatment recording maximum yield per unit area with higher apparent nutrient recovery efficiency and agronomic use efficiency. Nanofertilizers exerted a profound influence on various horticultural traits differentially in the study, hence offers a lot of scope to exploit their potential invariably for protected cultivation.

103. Name of the student : Parmar Manishkumar Narsinhbhai (2020217018)

Year of completion of degree : 2019

Name of the major advisor : Dr. S.Y. Patel

Title of thesis : Effect of organic spray on growth, yeild and quality attributes of tomato (*Solanum lycopercicum* L.) cv. GT 2 under south Gujarat condition

Abstract

The experiment entitled “Effect of organic spray on growth, yield and quality attributes of tomato (*Solanum lycopersicum* L.) cv. GT 2 under south Gujarat condition” was carried out during *rabi* season 2017-18 at the Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat. The experiment was conducted with a set of twelve treatments *viz.*, T_1 (Control or No spray), T_2 (Water spray at 25 DATP), T_3 (Water spray at 25 and 50 DATP), T_4 (Novel spray 2 % at 25 DATP), T_5 (Novel spray 1 % at 25 and 50 DATP), T_6 (Vermiwash 3 % at 25 DATP), T_7 (Vermiwash 1.5 % at 25 and 50 DATP), T_8 (*Panchagavya* 3 % at 25 DATP), T_9 (*Panchagavya* 1.5 % at 25 and 50 DATP), T_{10} (Moringa extract 3 % at 25 DATP), T_{11} (Moringa extract 1.5 % at 25 and 50 DATP) and T_{12} (Moringa extract 1 % at 25, 50 and 75 DATP). The experiment was conducted in a randomized block design (RBD) with three replications.

Among different organic spray treatments, *panchagavya* 3 % at 25 DATP gave significantly higher values of growth parameters *viz.*, plant height at 50, 75, 105 DATP and final harvest (82.16, 94.13, 104.94 and 111.31 cm, respectively), number of branches at 75 DATP and final harvest (6.07 and 9.00, respectively), minimum days to first and fifty percent flowering (26.00 and 29.67 days, respectively), minimum days to first marketable fruit harvest and maximum days to last marketable fruit harvest (45.67 and 154.33 days, respectively) as well as crop span (108.67 days) as compare to other treatments.

The marketable fruit yield (1.37 kg $plant^{-1}$), total fruit yield (332.38 q ha^{-1}),

number of marketable fruit per plant (31.33) and average fruit weight (43.64 g) were significantly increased in the treatment received liquid organic spray of *panchagavya* 3 % at 25 DATP. The remarkable rise in values of fruit characteristics *viz.*, polar and equatorial diameter (4.46 and 3.90 cm, respectively) as well as pericarp thickness (4.43 mm) of tomato fruit was observed by same treatment, too.

The total soluble solids (4.46 ^{0}Brix) of fruit were significantly increased in the treatment receiving *panchagavya* 3 % at 25 DATP (T_8). While, treatments T_8 (*Panchagavya* 3 % at 25 DATP) and T_9 (*Panchagavya* 1.5 % at 25 and 50 DATP) recorded maximum acidity (0.54 %) of tomato fruit. Whereas, significantly maximum lycopene contents (4.29 mg 100 g^{-1}) noted into treatment receiving novel spray 2 % at 25 DATP (T_4). The significantly maximum shelf life (7.67 days) of tomato fruit reported in the treatments *panchagavya* 3 % at 25 DATP (T_8), vermiwash 3 % at 25 DATP (T_6) and novel spray 1 % at 25 and 50 DATP (T_5).

The maximum gross return, net return and B:C ratio (3,32,370, 2,17,546 Rs. ha^{-1} and 1.89, respectively) was achieved in the treatment T_8 (*Panchagavya* 3 % at 25 DATP), which was found economical, profitable and proved highly remunerative.

104. Name of the student : Patel Jesalben Rajeshbhai (2020217021)

Year of completion of degree : 2019

Name of the major advisor : Dr. Sanjeev Kumar

Title of thesis : Effect of silicic acid and novel organic liquid fertilizer on growth, yield and quality parameters of greenhouse tomato

Abstract

The present investigation entitled "Effect of silicic acid and novel organic liquid nutrient on growth, yield and quality parameters of greenhouse tomato" was carried out at Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University (NAU), Navsari, Gujarat during *Rabi* 2017-18. The experiment was arranged over sixteen treatments comprising of four levels each of silicic acid (S_0: 0.0 %, S_1: 0.1 %, S_2: 0.2 % and S_3: 0.3 %) and Novel organic liquid nutrient (NOVEL) (N_0: 0.0 %, N_1: 1.0 %, N_2: 1.5 % and N_3: 2.0 %) and laid out in a Randomized block design (factorial concept) with three replications.

The analysis of data revealed significance of individual effect either of silicic acid or NOVEL levels on majority of the parameters except fruit firmness, TSS, vitamin A, lycopene content, physiological loss in weight and leaf miner where combinations of both the factors had significant effect. However, results on plant height, days to 50 % flowering, days to first picking, fruit volume, number of locules, acidity and average fruit weight were found to be non-significant. Among different levels of silicic acid, S_3 (0.3 %) recorded higher leaf area at final harvest (593.35 cm^2), fruit setting (59.86 %), number of fruits per plant (49.68), days to last picking (186.16 days), marketable yield per plant (3.76 kg), total yield per plant (3.99 kg), marketable yield per m^2 (10.82 kg) and total yield per m^2 (11.48 kg) and equatorial diameter (5.64 and 5.57 cm at 5th and final picking). However, S_2 (0.2 %) level of silicic acid recorded maximum leaf area at 120 DAP (525.93 cm^2). The N_2 (1.5 %) level of NOVEL showed maximum number of pickings (29.92) and pericarp thickness (6.82and 6.68 mm), polar diameter (6.31 and 5.56 cm) and shelf life (16.51 and 14.50 days) at 5th and final picking, respectively.

The treatment combination S_3N_2 (0.3 % silicic acid + 1.5 % NOVEL) showed significantly maximum fruit firmness (4.24 kg cm^{-2}) at 5th picking, maximum TSS (4.93 ^{o}Brix) at final picking and minimum PLW (1.05 and 1.52 % 2.84 and 3.31 %, 3.62 % and

4.21, 10.71 and 11.06 %, respectively) on 3rd, 6th, 9th day and last day (based on palatability of fruits) at 5th and final picking. The S_2N_2 (0.2 % silicic acid + 1.5 % NOVEL) recorded maximum TSS (4.97 ^oBrix), vitamin A (1255.78 IU) and lycopene content (5.12 mg 100 g^{-1}) at 5th picking. While S_1N_1 (0.1 % silicic acid + 1.5 % NOVEL) showed maximum lycopene content (4.27 mg 100 g^{-1}) at final picking and minimum leaf miner infestation (8.22 %). Economic analysis of the study revealed higher net return (Rs. 63896/1000 m^2) in treatment combination (0.3 % silicic acid + 1.5 % NOVEL) with maximum BCR (1.38).

105. Name of the student : Smit Shah (2020217032)

Year of completion of degree : 2019

Name of the major advisor : Dr. K. D. Desai

Title of thesis : Response of sweet potato [*Ipomoea batatas* (L.) Lam.] to fertilizer levels and novel organic liquid nutrient

Abstract

The experiment was conducted during *Rabi*, 2017-18 at AICRP on Tuber Crops, Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India to evaluate the Response of sweet potato [*Ipomoea batatas* (L.) Lam.] to fertilizer levels and Novel organic liquid nutrient on growth, yield and various quality parameters of sweet potato and also its impact on soil fertility status after harvesting the crop. The experiment was arranged over 12 treatment combinations comprising, 3 levels of RDF (F_1: 100 % RDF, F_2: 80 % RDF and F_3: 60 % RDF) and 4 levels of spraying 2 % Novel (S_1: No spray, S_2: spraying 2 % Novel at 30 and 45 DAP, S_3: Spraying 2 % Novel at 30, 45 and 60 DAP and S_4: spraying 2 % Novel at 30, 45, 60 and 75 DAP) which was laid out in a randomized block design (with factorial concept) and replicated thrice.

Application of four sprays (at 30, 45, 60 and 75 DAP) of 2 % Novel (S_4) recorded maximum increment of 35.35 cm vine length at harvest and statistically remained at par with S_3 treatment while other growth parameters failed to exert significant impact, irrespective of individual and combined effects of both the factors.

Application of 100 % RDF (F_1) recorded higher average tuber weight of 186.87 g with minimum number of tuberous roots (3.03) and statistically remained at par with F_2 treatment. Other yield parameters did not show significant effect due to different levels of fertilizers. Maximum tuber yield (0.513 kg $vine^{-1}$) and average tuber weight (189.69 g) was obtained in S_4 treatment (spraying 2 % Novel at 30, 45, 60 and 75 DAP) and statistically remained at par with S_3 treatment. Significantly higher total tuber yield (5.872 kg net $plot^{-1}$ and 30.58 t ha^{-1}), marketable tuber yield (4.867 kg net $plot^{-1}$ and 25.35 t ha^{-1}), and harvest index (46.14 %) with lower number of tuberous roots (2.92) was recorded in the S_4 treatment. F_1 and S_4 treatments recorded higher total sugars content of 2.62 per cent and 2.64 per cent, respectively. Individual as well as combined effect of levels of fertilizers and spraying 2 % Novel showed non-significant influence on soil nutrient status after harvest.

The different levels of fertilizers and spraying 2 % Novel profoundly influenced benefit: cost ratio. F_1S_4 treatment combination (100 % RDF along with four sprays of 2 % Novel) realized maximum benefit: cost ratio (2.10) followed by F_2S_4 treatment combination.

106. Name of the student : Vasava Chetna Kanubhai (2020217037)

Year of completion of degree : 2019

Name of the major advisor : Dr. N. K. Patel

Title of thesis : Effect of spacing and foliar spray of micronutrients on cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.)

Abstract

The present investigation entitled "Effect of spacing and foliar spray of micronutrients on cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.)" was carried out at Vegetable Research Scheme, Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University (NAU), Navsari, Gujarat during Summer 2017-18. The experiment was arranged in twelve treatments combination *i.e.* three levels of spacing (S_1: 45 cm × 20 cm, S_2: 45 cm × 25 cm and S_3: 45 cm × 30 cm), four levels of foliar spray of Micronutrient (F_0: Control, F_1: 0.5 % $FeSO_4$, F_2: 0.5 % $ZnSO_4$ and F_3: 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$) and laid out in Randomized block design (factorial concept) with three replications.

The analysis of data revealed significant difference for individual effect either of spacing or foliar spray of micronutrients levels on majority of the parameters *viz.*, plant height, stem diameter, fresh weight, dry weight, number of pods per plant and only for pod yield per hectare the combinations of both the factors had significant effect. However, results on pod length, pod width and pod weight were found to be non-significant. Among different levels of spacing, S_3 (45 cm × 30 cm) recorded maximum fresh weight (151.23 g), dry weight (18.42 g), number of clusters per plant (27.92), number of pods per cluster (6.96), number of pods per plant (86.38), total yield per plant (159.66 g), pod yield per ha^{-1} (11.83 t). However, S_1 (45 cm × 20 cm) level of spacing gave maximum plant height and stem diameter. Foliar spray of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ showed maximum stem diameter (1.78 cm) at 90 DAS, number of clusters per plant (30.84), number of pods per cluster (6.58), number of pods per plant (87.42), fresh weight of plant (148.64 g), crude fiber (15.94 %), crude protein (26. 92 %), total pod yield per plant (150.56 g) and (13.19 t ha^{-1}), respectively.

The treatment combination S_3F_3 {(45 cm × 30 cm) + (0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$)} showed significantly maximum number of pods per plant (123), pod yield per plant (221.40 g) and pod yield per hectare (16.40 t). On economic point of view study revealed higher net return (Rs. 14, 7, 432) in treatment combination {(45 cm × 30 cm) + (0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$)} with maximum BCR ratio (1.50).

107. Name of the student : Bambhaniya Kinjal Kalubhai (2020218004)

Year of completion of degree : 2020

Name of the major advisor : Dr. Sanjeev Kumar

Title of thesis : Effect of plant spacing and nutrient spray on growth, yield and quality of kale (*Brassica oleracea* var. *acephala* DC) under different growing environments

Abstract

The present investigation entitled "Effect of plant spacing and nutrient spray on growth, yield and quality of kale (*Brassica oleracea* var. *acephala* DC) under different growing environments" was carried out at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment consisted of 18 treatment combinations involving 2 growing environments (C_1: NVPH, C_2: open condition), 3 levels of plant spacing (S_1: 45 cm x 40

cm, S_2: 45 cm x 30 cm, S_3: 45 cm x 20 cm) and NOVEL (N_1: 1.0 %, N_2: 1.5 %, N_3: 2.0 %,), which was laid out in Completely Randomized Design with factorial concept with three replications.

The study revealed significant differences for majority of growth, yield and quality parameters due to growing environments, plant spacings and NOVEL spray in kale. NVPH proved to be the best environment for getting significantly maximum display for all the growth and yield parameters of kale. However, kale raised under open condition manifested significantly maximum total chlorophyll, dry matter content, β-carotene, vitamin C, crude fibre, antioxidant activity, total phenolic content and total glucosinolate content, while NVPH evinced to reveal maximum values for leaf water content, Ca, Fe, Mg, P and K minerals in kale compared to open condition. The kale spaced at wider spacing (S_1: 45 cm x 40 cm) took minimum number of days to first cut as well as recorded maximum number of leaves plant^{-1}, leaf blade breadth, total number of leaves plant^{-1}, leaf yield plant^{-1} and highest chlorophyll, Ca, Mg, Mn and P content. Kale at narrow spacing (S_3: 45 cm x 20 cm) exhibited superiority in displaying maximum leaf petiole length, leaf blade length, leaf length, plant height, leaf yield 1000 m^2, leaf dry matter content, β-carotene, vitamin C, crude fibre, antioxidant activity, total phenolic content and total glucosinolate content, Fe and Ca. Kale sprayed with 2.0 % NOVEL (N_3) was found to record minimum days to first cut and maximum leaf, leaf area, leaf petiole length, leaf blade length, leaf blade breadth, leaf length, plant height at each cut, total number of leaves plant^{-1}, leaf yield plant^{-1} and leaf yield 1000 m^{-2} and maximum total chlorophyll, leaf water content, leaf dry matter content, β-carotene, vitamin C, crude fibre, total phenolic content, total glucosinolate content, P, K, Fe, Mg, Mn and Ca.

The treatment combination C_2S_3 (Open field + 45 cm x 20 cm spacing)exhibited higher dry matter content and total glucosinolate content at first cut, crude fibre at final cut, totalphenolic content both at first and final cut. Treatment combinations C_2S_1, C_1S_1 and C_1S_3were found to reveal higher total chlorophyll, magnesium, potassium and leaf yield 1000m^{-2} respectively. Treatment combination C_1S_1 recordednumber of leaves plant^{-1} at 3rd (7.50) and 5th cut, while leaf yield 1000m^{-2} in C_1S_3.Treatment combination C_2N_3exhibited higher dry matter content, total phenolic content, β-carotene, vitamin C, total glucosinolate content, crude fibre and potassium, while C_1N_3 exhibited higher Fe and Mg, Mn, P, K, leaf area and number of leaves plant^{-1}.

Treatment combination S_3N_3 exhibited higher vitamin C, total phenolic content, total glucosinolate content, Fe, K at both first and final cut and crude fibre at final cut. Treatment combination S_1N_3 recorded higher β-carotene and Mg. While Mn was found to be higher in S_1N_2 and S_1N_1 higher P was recorded in S_1N_1 at final cut.

Treatment combinations $C_2S_3N_3$ exhibited higher total phenolic content and total glucosinolate content at both the cuts while $C_1S_1N_3$ and $C_1S_1N_1$recorded higher P. Higher Fe, Mn, K at final cut were recorded in $C_1S_1N_2$, $C_1S_1N_3$ and $C_1S_2N_2$, respectively. Maximum K content was recorded in $C_1S_3N_1$.

The economic analysis of the study revealed maximum BCR (2.60) in combination $C_2S_3N_3$, however maximum net return (Rs. 272580) was obtained in $C_1S_3N_3$ combination (NVPH + 45 cm x 20 cm + 2.0 % NOVEL).

108. Name of the student : Bangoria Urvi Vishvashbhai (2020218005)

Year of completion of degree : 2020

Name of the major advisor : Dr. N. B. Patel

Title of thesis : Effect of plant spacings on performance of varieties with respect to growth, yield and quality of broccoli (*Brassica oleracea* var. *italic* Plenck.)

Abstract

Research study entitled "Effect of plant spacings on performance of varieties with respect to growth, yield and quality of broccoli (*Brassica oleracea* var. *italic* Plenck.)" was conducted during winter season of the year 2019 at Vegetable Research Farm, Regional Horticultural Research Station, Navsari Agricultural University, Navsari, Gujarat, India. There were nine treatment combinations comprising three levels of plant spacings *i.e.* S_1: 30 cm × 30 cm, S_2: 45 cm × 30 cm, S_3: 45 cm × 45 cm and three varieties *i.e.*V_1: Pusa KTS 1, V_2: Palam Samridhi and V_3: Ganesh Broccoli in a Randomized Block Design (Factorial) with three replications.

Effect of plant spacings was found significant and results showed that minimum days to first curd initiation (52.33), minimum days taken for curd harvesting (60.67), maximum plant height (30.18 cm at 30 DATP and 58.56 cm at the time of harvesting), curd yield (10.73 t ha^{-1}), harvest index (19.62 %) and vitamin C (26.22 mg 100 g^{-1}) were observed at spacing S_1 (30 cm × 30 cm). Highest values for plant spread (N-S) (30.53 cm at 30 DATP and 52.64 cm at the time of harvesting), plant spread (E-W) (30.93 cm at 30 DATP and 54.16 cm at the time of harvesting), number of leaves $plant^{-1}$ (9.97 at 30 DATP and 24.12 at the time of harvesting), length of leaf (14.07 cm at 30 DATP and 33.07 cm at the time of harvesting), curd length (11.20 cm), curd diameter (10.73 cm), stalk diameter (36.05 mm), gross curd weight (stalk + curd) (154.38 g), net curd weight (129.29 g), dry matter content of curd (10.75 %) and minimum value of stalk length (3.22 cm) were recorded with spacing S_3 (45 cm × 45 cm).

Varieties showed significant difference in all parameters. The maximum plant height (29.86 cm at 30 DATP and 56.42 cm at the time of harvesting), plant spread (N-S) (34.84 cm at 30 DATP and 56.42 cm at the time of harvesting), plant spread (E-W) (34.76 cm at 30 DATP and 52.76 cm at the time of harvesting), number of leaves $plant^{-1}$ (9.91 at 30 DATP and 22.51 at the time of harvesting), length of leaf (14.40 cm at 30 DATP and 35.37 cm at the time of harvesting), curd diameter (10.58 cm), stalk diameter (28.51 mm), gross curd weight (stalk + curd) (161.39 g), net curd weight (133.43 g), curd yield (11.64 t ha^{-1}), harvest index (18.76 %) and minimum stalk length (3.24 cm) were recorded with variety V_2 (Palam Samridhi). The minimum days to first curd initiation (47.33), days taken for curd harvesting (56.89), highest curd length (10.68 cm) and vitamin C (32.44 mg 100 g^{-1}) were observed with variety V_3 (Ganesh Broccoli). Maximum values of dry matter content of curd (10.94 %) and vitamin A (49.22 mg 100 g^{-1}) were recorded from variety V_1 (Pusa KTS 1).

The combined effect of plant spacings and varieties were found significant. The maximum plant height (35.07 cm) at 30 DATP, at the time of harvesting (67.67 cm) and yield (13.86 t ha^{-1}) was recorded with combination of V_2S_1 (Palam Samridhi at 30 cm × 30 cm). Combination of V_2S_3 (Palam Samridhi at 45 cm × 45 cm) recorded highest values for plant spread (N-S) (59.67 cm), plant spread (E-W) (61.20 cm) and number of leaves $plant^{-1}$ (27.33) at the time of harvesting; length of leaf (18.70 cm) at 30 DATP and at the time of harvesting (39.78 cm); curd diameter (12.79 cm), stalk diameter (36.05 mm), gross curd weight (stalk + curd) (202.80 g), net curd weight (173.23 g) and minimum value of stalk length (2.40 cm).

The results of the study inferred that maximum values for growth, yield and quality parameters were observed at 45 cm × 45 cm. Plant spacing of 30 cm × 30 cm gave maximum yield (10.73 t ha^{-1}) of broccoli. Among the all varieties Palam Samridhi performed best and recorded highest values for growth, yield and quality parameters and gave yield (11.64 t ha^{-1}). Broccoli variety Palam Samridhi at plant spacing of 30 cm × 30 cm found best for securing higher yield (13.86 t ha^{-1}) and higher BCR (1.91) ratio of broccoli.

109. Name of the student : Champaneri Dushyant Dipakkumar (2020218007)

Year of completion of degree : 2020

Name of the major advisor : Dr. N. K. Patel

Title of thesis : Response of novel and novel plus organic liquid nutrients on growth and yield of Indian bean [*Lablab purpureus* (L.) Sweet]

Abstract

The present investigation entitled "Response of Novel and Novel Plus organic liquid nutrients on Indian bean [*Lablab purpureus* (L.) Sweet]" was carried out at Vegetable Research Farm, Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India during *Rabi*, 2018 to 19. The experiment was carried out under Randomized Block Design along with 7 treatments *viz.*, No spray (T_1), 0.5 % Novel organic liquid nutrient (T_2), 1.0 % Novel organic liquid nutrient (T_3), 1.5 % Novel organic liquid nutrient (T_4), 0.5 % Novel Plus organic liquid nutrient (T_5), 1.0 % Novel Plus organic liquid nutrient (T_6) and 1.5 % Novel Plus organic liquid nutrient (T_7). All the treatments were replicated three times for pertinent experiment. The treatments were given as foliar spray on Indian bean plant in count of two sprays. The first and second spray were done at 30 DAS and 60 DAS, respectively.

In the midst of various organic nutrient sprays, application of 1.0 % Novel Plus organic liquid nutrient (T_6) exhibits significant impact on growth parameter *viz.* plant height, number of branches per plant, fresh and dry weight of plant as well as yield parameter *viz.* pod weight, number of pods per plant, yield per plant, yield per plot and yield per hectare.

The maximum plant height (16.27 cm, 33.57 cm and 47.43 cm) and number of branches per plant (7.67, 12.00 and 16.00) at 40 DAS, 70 DAS and at the time of final harvesting, respectively were noted under the treatment T_6. The same treatment T_6 had the maximal fresh weight (30.87 g) and dry weight (8.01 g) of plant after final harvesting.

The maximum pod weight (2.13 g at first picking, 2.22 g at second picking), number of pods per plant (16.93, 18.00, 17.73, 17.60 and 14.33) at the time of first, second, third, fourth and final picking, respectively were also registered under the treatment T_6. The same treatment T_6 secured the utmost pod yield per plant (28.83 g, 32.96 g, 35.33 g, 31.67 g and 22.92 g) and pod yield per plot (692.00 g, 791.00 g, 848.00 g, 760.00 g and 550.00 g) at first, second, third, fourth and final picking, respectively. Treatment T_6 (1.0 % Novel Plus organic liquid nutrient spray) also recorded the apex total pod yield per plot and pod yield per hectare *i.e.* 3,641 g and 5,619 kg, respectively which were at par with T_3, T_5 and T_7. Maximum net income and BCR *i.e.* Rs. 99,810 and 1.54 per ha, respectively were found under treatment T_5 (0.5 % Novel Plus organic liquid nutrient spray). While, T_6 (1.0 % Novel Plus organic liquid nutrient spray) had second higher net income (Rs. 98,656) and BCR (1.41).

Thus, application of 1.0 % Novel Plus organic liquid nutrient spray (T_6) influenced the growth and yield parameter at the most. Along with this, T_6 had no incidence of pest and disease amongst all other treatments. However, higher net income and BCR were recorded under treatment T_5. So, economically treatment T_5 considered as viable and best treatment for Indian bean cultivation as per research.

110. Name of the student : Chaudhari Ritaben Ranjitbhai (2020218008)

Year of completion of degree : 2020

Name of the major advisor : Dr. D. R. Bhanderi

Title of thesis : Performance of different organic manures on growth, yield, quality and uptake of nutrients by organically produced vegetable cow pea [*Vigna unguiculata* (L.) Walp.] cv. GDVC-2

Abstract

An experiment entitled "Performance of different organics on growth, yield, quality and uptake of nutrients by vegetable cowpea [*Vigna unguiculata* (L.) Walp.] cv. GDVC-2" was conducted at Vegetable Research Farm, Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. The experiment was laid out in randomized block design with three replications and nine treatments *viz.*,T_1: FYM based on RDN (20 kg N ha^{-1}), T_2: Bio compost based on RDN (20 kg N ha^{-1}), T_3: NADEP compost based on RDN (20 kg N ha^{-1}), T_4: T_1 + *Rhizobium* + PSB, T_5: T_2 + *Rhizobium* + PSB, T_6: T_3 + *Rhizobium* + PSB, T_7: 1/3 of (T_1 + T_2 + T_3), T_8: T_7 + *Rhizobium* + PSB and T_9: RDF (20:40:00 NPK kg ha^{-1}).

The growth parameters *viz.*, plant height, branches $plant^{-1}$, number of pods $plant^{-1}$ and pod length of cowpea were affected significantly due to various organic treatments. Among the different treatments, T_5 (T_2 + *Rhizobium* + PSB) recorded highest plant height (48.45 cm at final harvest), branches $plant^{-1}$ (4.87), pod length (17.00 cm) and number of pods $plant^{-1}$(60.00).

Effect of different organic sources on fresh pod yield (12178.42 kg ha^{-1}), dry matter yield of pod (1461.41 kg ha^{-1}) and dry matter yield of plant (5614.48 kg ha^{-1}) were also found maximum in treatment T_5 (T_2 + *Rhizobium* + PSB). Quality parameters *viz.*, protein content (24.06 %) and protein yield (351.64 kg ha^{-1}) noted maximum in treatment T_5 (T_2 + *Rhizobium* + PSB).

Effect of different organic sources on major nutrient (N, P and K) content in pod and plant were not affected due to different organic treatments except N content in pod of cowpea. Treatment (T_5) registered highest N content (3.86 %) in pod.

Individual uptake of major nutrient (N, P and K) by pod and plant of cowpea were affected due to different organic treatments except P uptake in pod and plant of cowpea. Treatment T_5 registered higher uptake of N (56.37 and 216.08 kg ha^{-1}) and K (26.99 and 74.84 kg ha^{-1}) by pod and plant, respectively.

Among the soil properties after final harvest of cowpea, chemical properties (pH and SOC) and available major nutrient (N, P_2O_5 and K_2O) were recorded. Treatment T_5 reported higher availability of soil organic carbon content (0.85 %), N (298.00 kg ha^{-1}), P_2O_5 (62.49 kg ha^{-1}) and K_2O (419.63 kg ha^{-1}).

Economically, higher net profit of 1,75,493 Rs. $ha^{-1}$and BCR value of 2.58 was recorded in treatment T_5 (T_2 + *Rhizobium* + PSB).

111. Name of the student : Monu Kumari (2020218020)

Year of completion of degree : 2020

Name of the major advisor : Dr. N. B. Patel

Title of thesis : Effect of molybdenum and rhizobium on growth and yield of vegetable cowpea (*Vigna unguiculata* L.)

Abstract

Research study entitled "Effect of molybdenum and *Rhizobium* on growth and yield of vegetable cowpea [*Vigna unguiculata* (L.) Walp.] cv. AVCP 1" was conducted during the year 2020 in summer season at Vegetable Research Farm, Regional Horticultural Research Station (R.H.R.S.), Navsari Agricultural University, Navsari, Gujarat, India. There were twelve treatment combinations comprising six concentrations of molybdenum *i.e.* M_0: control, M_1: soil application of molybdenum @ 200 g ha^{-1}, M_2: soil application of molybdenum @ 300 g ha^{-1}, M_3: seed treatment of molybdenum 25 g ha^{-1} seeds, M_4: seed treatment of molybdenum 50 g ha^{-1} seeds and M_5: seed treatment of molybdenum 6 ml kg^{-1} seeds and two levels of *Rhizobium i.e.* R_0: without *Rhizobium* seed treatment, R_1: with *Rhizobium* seed treatment in a Randomized Block Design (Factorial) with three replications.

Effect of application of molybdenum was found significant on growth and pod attributes *viz.*, minimum days to 50 % flowering (63.83), days to first picking (70.63), maximum plant height (90.47 cm), days to last picking (103.17) at final picking, total number of pods $plant^{-1}$ (49.83), pod length (14.14 cm) and number of cluster $plant^{-1}$(17.61), as well as various yield, quality attributes and available nitrogen in soil (kg ha^{-1}), namely maximum total pod yield t ha^{-1}(4.92), marketable pod yield kg $plot^{-1}$ (1.59), marketable pod yield t ha^{-1}(4.80), harvest index (46.11 %), TSS content in pod (7.10 ^{0}Brix) and available nitrogen in soil (286.37 kg ha^{-1}) under the treatment of M_2 (soil application of molybdenum @ 300 g ha^{-1}). While, number of nodules $plant^{-1}$ (170.33), fresh weight of nodules $plant^{-1}$ (1.77 g) and dry weight of nodules $plant^{-1}$ (0.42 g) under the treatment M_1 (soil application of molybdenum @ 200 g ha^{-1}). Whereas, protein content in pod (21.87 %) under the treatment of M_5 (seed treatment of molybdenum 6 ml kg^{-1} seeds). Whereas, number of pods $cluster^{-1}$, moisture content in pod (%), available P_2O_5 and K_2O in soil were found non-significant during the investigation.

The effect of application of *Rhizobium*on growth and pod attributes *viz.*, minimum days to 50 % flowering (65.88), maximum plant height (84.21 cm), days to last picking (101.06), primary branches $plant^{-1}$ (6.61) at final picking, number of nodules $plant^{-1}$ (166.22), fresh weight of nodules $plant^{-1}$ (1.73 g), dry weight of nodules $plant^{-1}$ (0.30 g), pod length (13.19 cm), total number of pods $plant^{-1}$ (49.17) and number of cluster $plant^{-1}$ (16.80) were found significant, as well as yield and quality attributes *viz.*, total pod yield t ha^{-1} (4.83), marketable pod yield kg $plot^{-1}$ (1.57), marketable pod yield t ha^{-1} (4.75), harvest index (44.64 %), protein content in pod (21.74 %), TSS content in pod (7.20 ^{0}Brix) and available N kg ha^{-1} (285.48 kg ha^{-1}) were found significant under the *Rhizobium* seed treatment *i.e.* R_1 10 ml kg^{-1} seeds. Whereas, days to first picking, number of pods $cluster^{-1}$, moisture content in pod (%), available P_2O_5 and K_2O (kg ha^{-1}) were found non significant during the period of investigation.

Interaction effect between application of molybdenum and *Rhizobium* on various growth and pod attributes *viz.*, minimum days to 50 % flowering (60.60), maximum days to last picking (112.10) and fresh weight of nodules $plant^{-1}$ (3.0 g), total number of pods $plant^{-1}$ (60.67) were found significant under the treatment combination of M_2R_1 (soil application of molybdenum @ 300 g ha^{-1} with *Rhizobium* seed treatment 10 ml kg^{-1} seeds). The treatment combination of M_1R_1 (soil application of molybdenum @ 200 g ha^{-1} with *Rhizobium* seed treatment 10 ml kg^{-1} seeds) was recorded significantly higher number of nodules $plant^{-1}$ (260.00) and dry weight of nodules $plant^{-1}$ (0.73 g). Days to first picking, plant height (cm), primary branches $plant^{-1}$ at final picking, pod length (cm), number of cluster $plant^{-1}$ and number of pods $cluster^{-1}$ were found non-significant in statistical analysis.

Interaction effect between application of molybdenum and *Rhizobium* on yield, quality attributes and soil available N, P_2O_5 and K_2O, like maximum total pod yield t

ha^{-1} (5.97), marketable pod yield kg $plot^{-1}$ (1.94), marketable pod yield t ha^{-1} (5.86) and TSS content in pod (8.40 ^{0}Brix) were found significant under the treatment combination of M_2R_1 (soil application of molybdenum @ 300 g ha^{-1} with *Rhizobium* seed treatment 10 ml kg^{-1} seeds) while, protein content in pod (%), moisture content in pod (%), soil available N, P_2O_5 and K_2O (kg ha^{-1}) were found non-significant in statistical analysis.

It was evident from the economics based on cowpea marketable pod yield, the maximum return was obtained under the treatment combination of M_2R_1 *i.e.* soil application of molybdenum @ 300 g ha^{-1} with *Rhizobium* seed treatment 10 ml kg^{-1} seeds) registered the highest net profit 101323 Rs. ha^{-1} with BCR value of 1.36 followed by treatment combination of M_5R_1 (1.12).

112. Name of the student : Nagendra (2020218022)
Year of completion of degree : 2020
Name of the major advisor : Dr. K. D. Desai
Title of thesis : Heterosis and combining ability studies in okra [*Abelmoschus esculentus* (L.) Moench]

Abstract

A field experiment was conducted with a view to study the heterosis and combining ability in okra during summer 2020 at Vegetable Research Farm, Regional Horticultural Research Station (RHRS), ASPEE College of Horticulture and Forestry (ACHF), Navsari Agricultural University, Navsari, Gujarat.

A set of 28 genotypes involving 18 F_1 hybrids along with their six female and three male parental lines and one commercial check (GJOH-4) were evaluated in a randomized block design with three replications for 12 characters *viz*., days to 50 per cent flowering, plant height (cm), number of branches $plant^{-1}$, internodal length (cm), pod length (cm), pod diameter (cm), number of pods $plant^{-1}$, pod weight (g), pod yield $plant^{-1}$ (g), number of dry seeds pod^{-1}, 100 dry seeds weight (g) and fibre content (%).

Significant differences existed among the parents and hybrids for majority of traits under study except days to 50 % flowering, pod length, pod diameter and fiber content indicating considerable genetic variation among these genotypes for pod yield and its components.

Highly significant and desirable heterosis over commercial check for pod yield and its component traits suggested that there is an ample scope of exploiting heterosis commercially and possibility of isolating desirable segregants. The cross HRB-55 × Parbhani Kranti manifested the highest heterosis (25.75 %) over commercial check for pod yield $plant^{-1}$ followed by JOL-13-05 × Arka Anamika (24.64 %), JOL-13-05 × GAO-5 (21.11 %) and HRB-55 × Arka Anamika (15.53 %). Heterotic effect for pod yield $plant^{-1}$ was found to be associated with heterosis for its related traits in above crosses.

Combining ability studies revealed that the *SCA* variance was higher than *GCA* variance for all the characters except days to 50 % flowering, pod length, number of dry seeds pod^{-1} and 100 dry seeds weight indicating preponderance of non-additive gene action for characters under study. Among parents *viz*., JOL-13-05 and HRB-55 exhibited higher *GCA* effects in desirable direction for plant height, number of branches $plant^{-1}$ and number of pods $plant^{-1}$. Among hybrids, HRB-55 × Parbhani Kranti showed highly significant and desirable *SCA* effects for pod yield $plant^{-1}$, number of pods $plant^{-1}$ and number of branches $plant^{-1}$ while cross JOL-13-05 × Arka Anamika showed significant and desirable *SCA* effects for pod yield $plant^{-1}$ and number of pods $plant^{-1}$.

Out of 28 genotypes, none of the genotypes were free from infection of YVMV, ELCV and OSFB infestation. Four parents and 18 hybrids were found highly tolerant

against ELCV. Five parents and 11 hybrids were recorded fairly resistant against shoot damage whereas, two parents and two hybrids recorded fairly resistant for fruit damage of OSFB. The high yielding hybrids *viz.*, HRB-55 × Parbhani Kranti, JOL-13-05 × Arka Anamika, JOL-13-05 × GAO-5 and HRB-55 × Arka Anamika reported as highly tolerant for YVMV and ELCV.

113. Name of the student : Patel Jinal Bharatbhai (2020218029)
Year of completion of degree : 2020
Name of the major advisor : Dr. S. S. Masaye
Title of thesis : Effect of different type of mulches on growth, yield and quality of broccoli var. Pusa KTS-1

Abstract

The present experiment entitled "Effect of different type of mulches on growth, yield and quality of broccoli var. Pusa KTS 1" was conducted during winter 2019-20 at Polytechnic in Horticulture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Village: Paria, Taluka: Pardi, District: Valsad, Gujarat, India.

The experiment was conducted in Randomized Block Design (RBD) with three replications, which include nine treatments namely, T_1: Black polyethylene mulch (25 µm), T_2: Black polyethylene mulch (50 µm), T_3: Silver and black polyethylene mulch (25 µm), T_4: Silver and black polyethylene mulch (50 µm), T_5: Red polyethylene mulch (25 µm), T_6: Red polyethylene mulch (50 µm), T_7: Paddy straw mulch (8 t ha^{-1}), T_8: Sugarcane trash (8 t ha^{-1}) and T_9: Control (Without mulch).

The result revealed that application of black polyethylene mulch (50 µm) recorded higher values for growth characters namely, plant height (22.36 cm and 60.94 cm); plant spread (N-S = 22.56 cm, E-W = 20.68 cm and N-S = 53.34 cm, E-W = 52.05 cm); number of leaves $plant^{-1}$ (12.47 and 24.13); length of leaf (16.93 cm and 42.43 cm) at 30 DATP and at curd harvest, respectively and stalk length (18.03 cm) at curd harvest. While, stalk diameter did not show any significant difference by mulching at curd harvest.

Yield and yield attributes were significantly affected by different mulch treatments. Among nine treatments, black polyethylene mulch (50 µm) found best for curd length (13.55 cm), curd diameter (15.31 cm), marketable curd weight (333.72 g), net curd weight (277.00 g), marketable and total curd yield $plot^{-1}$ (6.26 kg and 6.57 kg, respectively), marketable and total curd yield ha^{-1} (11.60 t and 12.16 t, respectively) and harvest index (38.40 %). While, minimum days to first curd initiation (47.00 days) and days to 50 % curd initiation (55.33 days) were recorded with silver and black polyethylene mulch (50 µm).

The quality parameters such as curd colour and vitamin C (mg 100 g^{-1}) were not affected by different mulch treatments under study. While, medium compact curds were observed in different mulch treatments.

Soil parameters were positively affected by different mulches as compared to control. The maximum soil temperature at morning (26.8 °C, 25.6 °C, 26.7 °C, 23.7 °C, 25.6 °C, 26.2 °C and 26.8 °C), afternoon (34.9 °C, 34.4 °C, 30.5 °C, 30.7 °C, 32.00 °C, 36.4 °C and 36.8 °C) and evening (32.7 °C, 32.8 °C, 27.9 °C, 27.7 °C, 31.7 °C, 33.4 °C and 33.9 °C) at 14, 28, 42, 56, 70, 84 and 98 DATP, respectively, soil moisture content at 10, 20, 30 DATP and at first harvest (22.60, 20.97, 22.25 and 21.58 %, respectively) and minimum weed biomass at 20, 40 DATP and at first harvest (5.25, 6.49 and 7.20 g m^{-2}, respectively) were recorded with black polyethylene mulch (50 µm).

The different mulch treatments were also profoundly influenced the gross and net returns in addition to higher benefit cost ratio. The higher benefit cost ratio (1.27) was obtained with treatment T_2 (Black polyethylene mulch: 50 µm).

Based on the research result obtained, it can be concluded that black polyethylene mulch (50 µm) recorded higher values for growth, yield and quality of broccoli with maximum net return in South Gujarat conditions.

114. Name of the student : Rathod Vrushabh Pravinbhai (2020218043)

Year of completion of degree : 2020

Name of the major advisor : Dr. S. Y. Patel

Title of thesis : Effect of integrated nutrient management in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.)

Abstract

The experiment entitled "Effect of integrated nutrient management in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.)" was carried out during Summer, 2019 at the Vegetable Research Farm, RHRS, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat. The experiment was conducted in a Randomized Block Design (RBD) with three replications consist a set of ten treatments *viz*., 100 % RDF along with *Azotobacter* and PSB 5 kg ha^{-1} each and RDF reduced 25 and 50 % by RDN based vermicompost, FYM, biocompoast and castor cake as well as 100 % RDF alone as control.

The treatment combination of 75 % RDF + 25 % RDN based vermicompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1} (T_3) gaves ignificantly higher value of growth parameters *viz.*, the minimum days to first female flower (49.67), days to 50 % flowering (53.33), maximum main vine length (298.17 cm) at 60 DAS and number of primary branches (12.07 $plant^{-1}$)as compared to other treatments while, the treatment T_5 (75 % RDF + 25 % RDN based biocompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}) was statistically at par to them with (50.00, 54.00, 296.31 cm and 11.67 $plant^{-1}$, respectively).

Among treatments,75 % RDF + 25% RDN based vermicompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1} (T_3) detected significant higher yield traits *viz.*, number of fruits (7.87 $plant^{-1}$), fruit yield (3.92 kg $plant^{-1}$), total yield (16.94 t ha^{-1}), length of fruit at 2^{nd}, 3^{rd}, 7^{th} harvest and mean value (24.85; 26.10; 25.53 and 25.95 cm, respectively) except, at 2^{nd} harvest. Whereas, the 75 % RDF + 25 % RDN based biocompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1} (T_5) was closely at par to them for above all the yield characters. While length of fruit (27.47 cm) at 6^{th} harvest noted under treatment (T_5). The significantly maximum girth of fruit at 2^{nd} (21.95 cm), 3^{rd} (23.33 cm) harvest and mean value (22.62 cm) recorded by 50 % RDF + 50 % RDN based FYM + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1} (T_8) as well as at 6^{th} (24.12 cm) and 7^{th} (23.60 cm) harvest noted under 50 % RDF + 50 % RDN based biocompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1} (T_9). While, the significantly higher average fruit weight (550.53 g) was obtained under the treatment 50 % RDF + 50 % RDN based vermicompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1} (T_7).

The reducing sugar content (3.50 %), carbohydrate content (3.47 g 100 g^{-1}) and calcium content (19.20 mg 100 g^{-1}) of bottle gourd were maximum in the treatment T_3 over rest treatments. The T_5 was at par to them for all the quality characters of bottle gourd. The maximum non reducing sugar (1.80 %) was observed under the treatment T_3.

The maximum gross income (Rs. 2,54,160 ha^{-1}) was achieved in the treatment T_3 (75 % RDF + 25 % RDN based vermicompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}). Whereas, maximum net income (1,69,208 ha^{-1}) and B : C ratio (2.06) was noted under

the treatment 75 % RDF + 25 % RDN based biocompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1} (T_5) which were found economical and proved highly remunerative.

115. Name of the student : Savaliya Pallavkumar Jayendrabhai (2020218044)
Year of completion of degree : 2020
Name of the major advisor : Dr. V. K. Parmar
Title of thesis : Effect of foliar application of organic and inorganic nutrients on growth, yield and quality of vegetable cowpea

Abstract

An experiment entitled "Effect of foliar application of organic and inorganic nutrients on growth, yield and quality of vegetable cowpea" was conducted during summer 2019 on var. GDVC 2 at Vegetable Research Farm, Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. The experiment was laid out in randomized block design with three replications and nine treatments *viz.,* Control (T_1), 2 % *Panchagavya* (T_2), 3 % *Panchagavya* (T_3), 0.5 % Novel plus organic liquid nutrients (T_4), 1 % Novel plus organic liquid nutrients (T_5), 1.5 % Novel plus organic liquid nutrients (T_6), 0.5 % Micronutrient grade IV (T_7), 1 % Micronutrient grade IV (T_8) and 1.5 % Micronutrient grade IV (T_9). The first spray was applied at 30 DAS and second spray at 60 DAS. The effect of these treatments on plant growth, yield, quality parameters and nutrient contents in cowpea pods were examined.

The growth parameters *viz.,* plant height, number of leaves per plant, leaf area and number of primary branches per plant were reported to have affected profoundly due to different treatments. Among different treatments, application of 1 % Novel plus organic liquid nutrients (T_5) exhibited maximum plant height at 60 and 90 DAS (35.73 and 56.93 cm, respectively), number of leaves per plant at 60 and 90 DAS (39.27 and 52.73, respectively) and leaf area (162.14 cm^2).

Substantial effect of foliar application of 1 % Novel plus organic liquid nutrients (T_5) was detected in yield parameters *viz.,* number of clusters per plant (12.07), number of pods per plant (58.00), marketable pod yield (6.04 kg $plot^{-1}$ and 9.33 t ha^{-1}) and total pod yield (6.72 kg $plot^{-1}$ and 10.37 t ha^{-1}). Although, number of pods per cluster, average pod length and average pod weight were found non significant.

Effect of foliar application of 1 % Novel plus organic liquid nutrients indicated notable effect on protein content of pods (24.04 %). Whereas, crude fibre content of pods was not significantly affected by any treatments. Likewise, the same treatment has noted higher Fe content (220.12 ppm) and Zn content (62.76 ppm) of cowpea pods.

The highest net return (Rs. 1,19,734 per hectare) with maximum BCR value (1.80) was obtained with 1 % Novel plus organic liquid nutrients (T_5).

Hence, application of 1 % Novel plus organic liquid nutrients at 30 and 60 DAS proved its upper class amongst other treatments in terms of economic and higher BCR of cowpea.

FLORICULTURE AND LANDSCAPE ARCHITECTURE

116. Name of the student : Chaudhari Bindukumar Bachhubhai (2020214004)
Year of completion of degree : 2016
Name of the major advisor : Dr. Dipal S. Bhatt
Title of thesis : Effect of different concentration of IBA and rooting

media on root induction of poinsettia (*Euphorbia pulcherrima* Willd.)

Abstract

The present investigation entitled "Effect of different concentration of IBA and rooting media on root induction of poinsettia (*Euphorbia pulcherrima* Willd)" was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Completely Randomized Design with Factorial concept with sixteen treatments, consisting four levels of IBA *i.e.* 2000 ppm, 3000 ppm, 4000 ppm and 5000 ppm and four different types of media *i.e.* Sand, Red soil, Cocopeat and Red soil + Cocopeat. The treatments were repeated thrice. Among the various levels of IBA, 4000 ppm IBA (C_3) was most effective for obtaining number of sprouts per cutting (2.29), number of roots per cutting (16.42), length of shoot (6.85 cm), length of root (20.25 cm), number of leaves per cutting (14), fresh weight of root (1.56 g), dry weight of root (3.58 g), fresh weight of shoot (11.98 g), dry weight of shoot (5.13 g), rooting percentage (76.40 %) and survival percentage (74.19 %) of rooted cuttings. Consequently, Red soil + Cocopeat (M_4) media was found most promising for finding number of sprouts per cutting (3.30), number of roots per cutting (16.30), length of shoot (7.86 cm), length of root (23.02 cm), number of leaves per cutting (14.96), fresh weight of root (1.72 g), dry weight of root (3.58 g), fresh weight of shoot (12.52 g), dry weight of shoot (5.49 g), rooting percentage (86.84 %) and survival percentage (85.83 %) for rooting cuttings while cuttings planted in sand noted early sprouting as compared to other media. Interaction effect of different levels of IBA and rooting media was found non significant for all the characters. Although, 4000 ppm IBA recorded maximum induction in respect of all the parameters with Red soil + Cocopeat media. On the basis of the result obtained from the investigation, it can be concluded that the poinsettia (*Euphorbia pulcherrima* Willd.) can be propagated through soft wood cuttings soaked for quick dip method in the solution of IBA at 4000 ppm and planted in Red soil + Cocopeat under net house which was the most effective to increasing rooting percentage as well as no. of roots. Consequently, 4000 ppm IBA and Red soil + Cocopeat were found promising for survival percentage as well as quality of shoots.

117. Name of the student : Devdhara Utsav R. (2020214012)
Year of completion of degree : 2016
Name of the major advisor : Dr. Shivam T. Bhatt
Title of thesis : Intercropping of annual flowers in *Rosa indica*

Abstract

The present investigation entitled 'Intercropping of annual flowers in *Rosa indica*' was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2014-15 to study the suitable intercrop in rose. The intercrops grown were African marigold, French marigold and Gaillardia.

The experiment was laid out in Randomized Block Design with 10 treatments*viz.* T_1 = Rose + African marigold (1:1), T_2 = Rose + African marigold (1:2), T_3 = Rose + Gaillardia (1:1), T_4 = Rose + Gaillardia (1:2), T_5= Rose + French marigold (1:1), T_6= Rose + French marigold (1:2), T_7 = Rose sole, T_8 = Gaillardia sole, T_9 = African marigold sole, T_{10} = French marigold sole.

The result on effect of intercrops on the vegetative parameters of rose was significant result in different stage. Among the vegetative character plant height was

recorded significant at the end of experiment. Moreover, plant spread were shown non-significant at the time of planting of first intercropping season while at the end of first intercropping season, at the time of planting of second intercropping season and at the end of experiment it was recorded significant. As usually the no. of branches were exhibited non-significant result during all stages. While days taken for first flower bud initiation recorded non-significant and flower diameter was also found non-significant. In case of yield, the highest yield was obtained from sole rose (6.79 t/ha) and least was found in Rose + Gaillardia 1:2 (4.77 t/ha).

Intercropping systems also had profound effect on different intercrops. On the basis of t-test, during first intercropping season all the growth and yield parameters of African marigold, French marigold and Gaillardia were noted non-significant while during second intercropping season, all the parameters of intercrops were also noted non-significant in comparison of sole cropping with 1:1 planting ratio of corresponding intercrops. But all the growth and yield parameters were significantly altered in comparison of 1:2 planting ratio with sole cropping as well as 1:1 planting ratio of corresponding intercrops.

The highest rose equivalent yield (11.2 t/ha) was observed from the treatment T_2 (Rose + African marigold 1:2). Whereas, the lowest (6.79 t/ha) was observed from the treatment T_7 (Rose sole).

In view of the LER, highest value was recorded from intercropping Rose + French marigold 1:2 (1.54). However, lowest (1.0) from sole rose. This shows profitability of intercropping over sole cropping.

Economic point of view, highest net income per ha was obtained from Rose + African marigold 1:2 (Rs. 7,11,980/ha) followed by Rose + French marigold 1:2 (Rs. 6, 65,802/ha) while lowest (Rs. 3,61,930/ha) was recorded from sole cropping of rose. Maximum BCR (4.32) was noted from Rose + African marigold 1:2 followed by Rose + French marigold 1:2 (3.77) while least BCR (2.50) was obtained from sole rose. In terms of performance on the basis of LER and profitability, Rose + African marigold (1:2) was found best intercrops. Profitability of African marigold can be attributed to its quality in combination with market price of the flowers.

118. Name of the student : Dodiya Truptiben Pareshbhai (2020214013)
Year of completion of degree : 2016
Name of the major advisor : Dr. G. D. Patel
Title of thesis : Intercropping of annual flowers in *Jasminum sambac* L.

Abstract

The present investigation entitled ‘Intercropping of annual flowers in *Jasminum sambac*’ was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2014-15 to study the suitable intercrops in jasmine. The intercrops grown were African marigold, French marigold and Gaillardia.

The experiment was laid out in Randomized Block Design with ten treatments *viz.*T_1 = Jasmine + African marigold (1:1), T_2 = Jasmine + African marigold (1:2), T_3 = Jasmine + French marigold (1:1), T_4 = Jasmine + French marigold (1:2), T_5 = Jasmine + Gaillardia (1:1), T_6 = Jasmine + Gaillardia (1:2), T_7 = Jasmine sole; T_8 = African marigold sole, T_9 = French marigold sole; T_{10} = Gaillardia sole.

The results on effect of intercrops on the vegetative parameters of jasmine were significantly maximum under sole jasmine during both the intercropping season. Leaf

temperature and PAR (Photosynthetically Active Radiation) of jasmine was found to be non significant during first intercropping season while significant effect was noted with different intercrops during second intercropping season. Maximum bud diameter and bud length was recorded from intercropped jasmine though it was found to be non-significant. In case of yield, the highest yield was obtained from sole jasmine (2.80 t/ha) and least was noted in Jasmine + Gaillardia 1:2 (2.10 t/ha).

Intercropping systems also had profound influence on different intercrops. On the basis of t-test, during first intecropping season all the growth and yield parameters of African marigold, French marigold and Gaillardia were found non-significant except crop duration while during second intercropping season, all the parameters of intercrops were also not found significant in comparison of sole cropping with 1:1 planting ratio of corresponding intercrops. But all the growth and yield parameters were significantly altered in comparison of 1:2 planting ratio with sole cropping as well as 1:1 planting ratio of coressponding intercrops.

The highest jasmine equivalent yield (9.67 t/ha) was recorded from the treatment T_4 (Jasmine + French marigold 1:2). However, the lowest (2.80 t/ha) was obtained from the treatment T_7 (Jasmine sole).

In view of the LER, significantly highest value was recorded from intercropping Jasmine + French marigold 1:2 (1.47) whereas lowest (1.0) from sole Jasmine. This shows profitability of intercropping over sole cropping.

From the economic point of view, highest net income per ha was recorded from Jasmine + French marigold 1:2 (Rs. 461460.53/ha) followed by Jasmine + African marigold 1:2 (Rs. 454066.12/ha) while the lowest was noted from sole cropping of Jasmine (Rs. 131464.97/ha). Maximum BCR (2.46) was recorded from jasmine + African marigold 1:1 followed by Jasmine + African marigold 1:1 (2.28), Jasmine + African marigold 1:2 and Jasmine + African marigold 1:2. The BCR of Jasmine + Gaillardia (1:1) and Jasmine + Gaillardia (1:2) was less than sole jasmine. In terms of performance on the basis of LER and profitability, Jasmine + French marigold (1:2) was found to be the best intercrop during first year of plantation. Profitability of french marigold can be attributed to its quality in combination with market price of the flowers.

119. Name of the student : Maluguri Sree devi (2020214021)
Year of completion of degree : 2016
Name of the major advisor : Dr. S. L. Chawla
Title of thesis : Response of different varieties of carnation (*Dianthus caryophyllus* L.) to pinching and boron

Abstract

The present investigation entitled “Response of different varieties of carnation (*Dianthus caryophyllus* L.) to pinching and boron” was carried out at Greenhouse Complex, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari during 2014-2015.

The experiment was laid out in Completely Randomized Design (CRD) having three factors *viz.*, variety, pinching and boron. The varieties under evaluation were Baltico (V_1), Domingo (V_2), Penelope (V_3) and Kiro (V_4); four levels of pinching were no pinch (P_0), single pinch (P_1), single and half pinch (P_2) and double pinch (P_3). Three levels of boron were control (B_0), 0.05 % (B_1) and 0.1 % (B_2).

The experimental results revealed that all the recorded parameters were significantly influenced by variety, pinching and boron.

Variety Baltico recorded significantly highest plant height, number of shoots

and internodal length, while flowering parameters like days to first flower bud initiation, days to 50 per cent flowering were significantly minimum in Penelope. The maximum stalk length, stalk girth, highest diameter of flower and bud; *in situ* longevity and vase life of flowers; number of petals per flower, minimum calyx split flowers per plot was recorded in variety Domingo. Maximum duration of flowering, yield per plant and net plot were observed in variety Penelope.

Pinching showed prominent influence on all vegetative parameters. Unpinched plants showed significantly maximum plant height both at three months after transplanting and at final harvest, number of internodes and internodal length, while significantly highest number of shoots was observed in double pinch. Days to first flower bud initiation and days to 50 per cent flowering were significantly minimum in no pinching. Diameter of flower, bud length, bud diameter, stalk girth, length of flower stalk, fresh weight of cut flower, number of petals per flower, *in situ* longevity and vase life were significantly highest in no pinching.

Spray of 0.1 per cent boron recorded significantly highest plant height, number of shoots, number of internodes and internodal length. Significantly minimum days to first flower bud initiation, days to 50 per cent flowering and percentage of calyx splitting was also recorded with application of 0.1 per cent boron. Significantly maximum duration of flowering, diameter of flower, bud length, fresh weight of cut flower, number of petals per flower bud diameter, highest stalk girth, length of flower stalk, *in situ* longevity, vase life, number of flowers per plant and net plot were also evident by spray of boron @ 0.1 %.

Treatment V_1P_0, exhibited significantly highest plant height, number of internodes per stem and internodal length, while V_4P_3 showed significantly highest number of shoots per plant. Significantly highest plant height, internodes per stem and internodal length were recorded in V_1B_2, V_4B_2 and V_1B_2, respectively. Number of internodes per stem and internodal length were significantly highest in P_0B_2 while the numbers of shoots per plant were highest in P_3B_2.

Significantly minimum number of days to first flower bud initiation and days to 50 per cent flowering were recorded by V_4P_0, P_0B_2, V_4B_2 and $V_4P_2B_0$. Longest duration of flowering was exhibited by V_4P_2, V_4B_2, P_2B_2 and $V_4P_2B_2$. P_0B_2, P_0V_2 and V_2B_2 showed highest flower bud diameter, length of flower stalk and stalk girth, while V_1B_2, V_1P_0 and P_0B_2 recorded highest bud length. Plants of variety Domingo that haven't been sprayed with boron (V_2B_0) showed highest percentage of calyx split flowers. Significantly highest flower and bud diameter, stalk girth, highest weight of flower, number of petals per flower, *in situ* longevity of flowers and vase life were found in $V_2P_0B_2$ and bud length in $V_1P_0B_2$.

Treatments V_4P_3, P_3B_2, V_4B_2 and $V_4P_3B_2$ recorded highest number of flowers per plant and plot. As per economic point of view, spray of 0.1 % boron on single and half pinched plants of variety Penelope ($V_4P_2B_2$) recorded maximum BCR of 0.38.

120. Name of the student : Patel Kavan J. (2020214030)
Year of completion of degree : 2016
Name of the major advisor : Dr. Shivam T. Bhatt
Title of thesis : Effect of different IBA concentration and rooting media on cutting of *Hibiscus rosa-sinensis* L.

Abstract

The present investigation entitled "Effect of different IBA concentration and rooting media on cutting of *Hibiscus rosa-sinensis* L." was carried out at Floriculture

Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The experiment was laid out in Completely Randomized Design with Factorial concept along with sixteen treatment combination consisting four levels of IBA *i.e.* 2000 ppm, 3000 ppm, 4000 ppm and 5000 ppm and four different types of media *i.e.* Sand, Red soil, Cocopeat and Red soil + Cocopeat. The treatments were repeated thrice.

Among the various levels of IBA, 4000 ppm IBA (C_3) was most effective for obtaining early sprouting, (10.23 days), number of sprouts per cutting (2.66), length of longest shoot per cutting at 30 and 60 days (7.14 cm and 10.71 cm), fresh weight of shoot per cutting (3.43 g), dry weight of shoot per cutting (1.60 g), number of roots per cutting at 30 and 60 days (7.61 and 12.01), length of longest root per cutting at 30 and 60 days (3.32 cm and 8.95 cm), fresh weight of root per cutting (3.18 g), dry weight of root (1.47 g), number of leaves per cutting at 30 and 60 days (2.88 and 12.50), rooting percentage (78.75 %) and survival percentage (74.19 %) of rooted cuttings.

Consequently, Red soil + Cocopeat (M_4) media was found most promising for length of longest shoot per cutting at 30 (7.50 cm) and 60 days (11.31 cm), fresh weight of shoot per cutting (3.37 g), dry weight of shoot per cutting (1.63 g), maximum number of roots per cutting at 30 and 60 days (8.37 and 13.55 respectively), length of longest root per cutting at 30 and 60 days (3.46 cm and 9.07 cm), fresh weight of root per cutting (3.31 g), dry weight of root per cutting (1.44 g), number of leaves per cutting at 30 (3.69) and 60 days (13.56), rooting percentage (88.29 %) and survival percentage (85.83 %) for rooted cuttings while cuttings planted in Sand noted early sprouting (8.88 days) and number of sprouts per cutting (3.31) as compared to other media.

Interaction effect of different levels of IBA and rooting media was found non-significant for all the characters. Although, 4000 ppm IBA recorded maximum induction in respect of all the parameters with Red soil + Coco peat media.

On the bases of the result obtained from the investigation, it can be concluded that the *Hibiscus rosa-sinensis* L. can be propagated through semi hardwood cuttings soaked for quick dip method in the solution of IBA at 4000 ppm and planted in Red soil + Coco peat under net house which was the most effective to increasing rooting percentage as well as no. of roots. Consequently, 4000 ppm IBA and Red soil + Coco peat was found promising for survival percentage as well as quality of shoots.

121. Name of the student : Patel Mukund Girdharbhai (2020214031)
Year of completion of degree : 2016
Name of the major advisor : Dr. R. B. Patel
Title of thesis : Effect of plant growth regulators on growth and yield of limonium var. Misty Blue and Misty White

Abstract

The present investigation to study the "Effect of plant growth regulators on growth and yield of limonium var. Misty Blue and Misty White" was carried out at Greenhouse Complex, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, during September 2014- May- 2015.

The experiments were laid out in Randomized Block Design (RBD) with eleven treatments and repeated thrice. Two different varieties of limonium (Misty Blue and Misty White) were treated with different concentrations of GA_3 and SA in separate experiments.

The result revealed that spray of GA_3 @ 200 mg/l (T_6) on limonium plants was most effective in respect to number of shoots early flowering, long flowering duration,

inflorescence weight, number of inflorescence per plant and per plot and vase life of both varieties of limonium. However, SA @ 150 mg/l (T_3) found promising for plant height, plant spread and in florescence length.

Economic point of view, spray of GA_3 @ 200 mg/l *i.e.* T_6 gave highest net return per 560 m^2 for limonium var. Misty Blue and Misty white, with similar maximum benefit cost ratio.

122. Name of the student : Desai Maitri Yagneshchandra (2020215017)
Year of completion of degree : 2017
Name of the major advisor : Dr. G. D. Patel
Title of thesis : Management of *Cyperus rotundus* L. in turf

Abstract

The research endeavor entitled "Management of *Cyperus rotundus* L. in turf" was conducted during 2016-17 at Regional Horticultural Research Station, ACHF, NAU, Navsari, Gujarat to study the effective method to control *Cyperus rotundus* L. with appropriate concentration.

The experiment was laid out in Randomized Block Design with ten treatments *viz.*, T_1= Halosulfuron Methyl 75% WG @ 2.4 g/10 l foliar spray, T_2= Halosulfuron Methyl 75 % WG @ 3.3 g/10 l foliar spray, T_3= Ammonium Salt of Glyphosate 71 % SG @ 75 g/10 l foliar spray, T_4= Ammonium Salt of Glyphosate 71 % SG @ 100 g/10 l foliar spray, T_5= Glyphosate 41 % SL @ 110 ml/10 l foliar spray, T_6= Glyphosate 41 % SL @ 150 ml/10 l foliar spray, T_7= 2,4-D Ammonium Salt @ 30 g/10 l foliar spray, T_8= 2,4-D Ammonium Salt @ 40 g/10 l foliar spray, T_9= Manual Management and T_{10}= Control with three replications.

The results on growth attributes of lawn *viz.* number of leaf, leaf width (mm), leaf length (cm), number of runners per 100 cm^2 area, number of leaf on runner and diameter of runner (mm) were found maximum with T_9 (Manual Management) which was statistically at par with treatment T_2 (Halosulfuron Methyl 75 % WG @ 3.3 g/10 l) and T_1 (Halosulfuron Methyl 75 % WG @ 2.4 g/10 l). In case of chlorophyll content (chlorophyll-a, chlorophyll-b and total chlorophyll), it was also recorded higher in treatment T_9 which were statistically on the same bar of T_2 and T_1.

As per the ranking of aesthetic value of lawn, treatment T_9, T_2 and T_1 found more effective while, the lowest ranking was recorded in T_6 (Glyphosate 41 % SL @ 150 ml/10 l foliar spray). On the basis of visual phytotoxicity symptoms, treatment T_9, T_2 and T_1 was not observed with any phytotoxicity whereas, highest phytotoxicity and least visual ranking was observed in plot treated with Glyphosate 41 % SL @ 150 ml/10 l foliar spray (T_6).

Minimum weed biomass and maximum weed control efficiency with low re-emergence of *Cyperus rotundus* L. was found in treatment T_2- Halosulfuron Methyl 75% WG @ 3.3 g/10 l foliar spray. In case of chlorophyll content of *Cyperus rotundus* L., all herbicides were effective to reduce the chlorophyll content (chlorophyll-a, chlorophyll-b and total chlorophyll).

The overall impact of the present research work, the garden amateurs, gardeners and people associated with turf industries are advised to use Halosulfuron Methyl 75 % WG @ 3.3 g/10 l as foliar application at 4 to 6 leaf stage of *Cyperus rotundus* L. for better control in lawn for achieving better aesthetic appeal without any phytotoxicity symptoms.

123. Name of the student : Eerati Sathyanarayana (2020215019)

Year of completion of degree : 2017

Name of the major advisor : Dr. Sudha Patil

Title of thesis : Response of gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty to integrated nutrient management

Abstract

The present investigation on "Response of gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty to integrated nutrient management" conducted at Floriculture Research Farm, Navsari Agricultural University, Navsari (Gujarat) during the year 2015-16. The experiment was laid out in a Randomized Block Design (RBD) with three replications and ten treatments *viz.*,T_1 (100 % recommended dose of fertilizers), T_2 (50 % RDF + FYM @ 15 t/ha), T_3 (75 % RDF + FYM @ 7.5 t/ha), T_4 (100 % RDF + FYM @ 7.5 t/ha), T_5 (50 % RDF + FYM @ 15 t/ha + *Azotobacter* + PSB + KMB), T_6 (75 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB), T_7 (100 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB), T_8 (T_1 + *Azotobacter* + PSB + KMB), T_9 (T_1 + 1 % foliar spray of *Nauroji* Novel Organic Liquid Fertilizer, T_{10} (T_7 + 1% foliar spray of *Nauroji* Novel Organic Liquid Fertilizer). The plants were planted with spacing of 30 cm x 20 cm, and 10 plants were randomly selected to record observation on vegetative, flowering, corm and cormel characters with soil and plant analysis and finally abstract of results are outlined here.

Among different treatments, an application 100 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1 % foliar spray of *Nauroji* Novel Organic Liquid Fertilizer (T_{10}) recorded significantly maximum height of plant at 60 and 120 days (59.73 cm and 84.00 cm, respectively) as well as number of leaves/plant (19.87) as compared to treatment T_1 (100 % RDF 200: 200: 200 NPK kg/ha).

Observations were recorded on flowering, corm and cormel characters and significantly minimum days taken to spike initiation (48.10), days to harvesting of spike from initiation of spike (16.57) with maximum spike length (66.63 cm), rachis length (39.53 cm), number of florets per spike (11.30), diameter of 2nd floret from base (8.50 cm), vase life of flowers (14.93 days), number of spikes per plant (2.50), number of spikes per plot (86.67) and number of spikes per hectare (401234.57), corms per plant (2.43), weight of corms per plant (76.00 g), weight of cormels per plant (12.67 g) and size of the corm (5.67 cm) were registered with treatment T_{10} (T_7 + 1 % foliar spray of *Nauroji* Novel Organic Liquid Fertilizer). Moreover, T_7 *i.e.* 100 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB and T_6 *i.e.* 75 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB were found at par to T_{10} with respect to all flower, corm and cormel characters.

An application of treatment T_{10} (T_7 + 1 % foliar spray of *Nauroji* Novel Organic Liquid Fertilizer) recorded significantly maximumnitrogen (1.53 %), phosphorus (1.07 %) and potash (1.93 %) content in leaf, minimum soil electrical conductivity (0.67 dS m^{-1}) with, highest available nitrogen (178.73 kg/ha), available phosphorus (19.48 kg/ha), available potash (314.13 kg/ha), soil organic carbon (0.80 %) and microbial population (90.67 x 10^{-7} CFU/g soil) as compared to treatment T_1 (100 % RDF *i.e.* 200: 200: 200 NPK kg/ha). As per economics point of view, highest net realization Rs. 644435.42/ha along with BCR 1: 1.02 was recorded with the treatment T_{10} (100 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB + 1 % foliar spray of *Nauroji* Novel Organic Liquid Fertilizer) followed by T_7 *i.e.* 100 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (Rs. 553989.29 with BCR 1: 0.88) and T_6 *i.e.* 75 % RDF + FYM @ 7.5 t/ha + *Azotobacter* + PSB + KMB (Rs. 519461.13 with BCR 1: 0.83).

124. Name of the student : Padhiyar Bipinkumar Manubha (2020215033)
Year of completion of degree : 2017
Name of the major advisor : Dr. Dipal S. Bhatt
Title of thesis : Influence of different potting media on growth and flowering of pot chrysanthemum var. Ajina Purple

Abstract

The present investigation on "Influence of different potting media on growth and flowering of pot chrysanthemum var. Ajina Purple" conducted at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) during the year 2016-17. The experiment was laid out in a Completely Randomized Design (CRD) with eleven treatments of different growing media and their combinations *viz*. Soil (T_1), Soil + Sand + Vermicompost (1:2:1 v/v) (T_2), Soil + Sand + Bio compost (1:2:1 v/v) (T_3), Soil + Sand + Poultry manure (1:2:0.5 v/v) (T_4), Soil + Sand + Vermicompost + Bio compost (1:2:1 v/v) (T_5), Soil + Sand + Vermicompost + Bio compost + Poultry manure (1:2:1:1:0.5 v/v) (T_6), Cocopeat + Vermicompost (2:1 v/v) (T_7), Cocopeat + Bio compost (2:1 v/v) (T_8), Cocopeat + Poultry manure (2:0.5 v/v) (T_9), Cocopeat + Vermicompost + Bio compost (2:1:1 v/v) (T_{10}) and Cocopeat + Vermicompost + Bio compost + Poultry manure (2:1:1:0.5 v/v) (T_{11}). The treatments were replicated thrice. Influence of different growing media and their combinations on growth, flowering and physico-chemical properties of each medium including bulk density, field capacity, particle density, pH, EC, organic carbon, available N, P and K of growing media were studied. The vigorous growth in terms of plant height (30.87 cm), plant spread (N-S and E-W) (28.15 and 28.93 cm, respectively), number of branches per plant (16.40), fresh weight of plant (342.80 g) and dry weight of plant (170.87 g) was noted significantly in plants grown in combined media of Cocopeat + Vermicompost + Bio compost (2: 1: 1 v/v) (T_{10}). Consequently, these plants produced early flowering (45.43 days). Maximum flower diameter (37.42 mm), longest blooming period (94.67 days) and duration of flowering (126.33 days) with highest no. of flowers (66.61) were also significantly influenced in the plant grown with the same medium. This media having good physico-chemical properties like low bulk density (0.29) and particle density (0.73), appropriate water holding capacity (330.33 %) and field capacity (198.65 %), high N (1186.86 kg/ha), P (95.67 kg/ha), K (2745.67 kg/ha) in media maximum organic carbon (22.70 %), suitable EC (1.69 ds m^{-1}) and pH (6.05) as required by pot chrysanthemum. On the basis of the results obtained in present investigation, it can be concluded that Cocopeat + Vermicompost + Biocompost (2:1:1 v/v) was found best potting media for vigorous growth of plant and more number of flowers in pot chrysanthemum var. Ajina Purple.

125. Name of the student : Parmar Nilamben Galabhai (2020215036)
Year of completion of degree : 2017
Name of the major advisor : Dr. Sudha Patil
Title of thesis : Standardization of drying approaches for annual flowers of asteraceae family

Abstract

The present investigation entitled "Standardization of drying approaches for annual flowers of Asteraceae family" was conducted in the Laboratory, Department of Floriculture and Landscape Architecture, Navsari Agricultural University, Navsari

during the year 2015-16. The experiments were laid out for three flower crops *viz.* calendula, cosmos and coreopsis. Completely Randomized Design with Factorial concept (FCRD) was applied and replicated thrice. Further, an experiment was divided in two experiments and observations were recorded on the quantitative as well as qualitative parameters.

Experiment 1: "Standardization of drying techniques and embedding media for annual flowers of Asteraceae Family". In this experiment, two drying conditions (Room and Sun) and three embedding media (Silica gel, Borax and Sand) were used. Flowers exposed to room and sun drying conditions recorded significant effect on flower quality after drying. Significantly minimum dry weight (476.36, 108.91 and 243.70 mg), maximum weight loss (768.01, 151.10 and 380.60 mg), moisture loss (61.71, 58.10 and 60.96 %) with minimum time taken for drying (4.60, 2.42 and 2.60 days) was observed in flowers of calendula, coreopsis and cosmos, respectively which were dried in sun drying condition. But minimum reduction in diameter (5.47, 3.85 and 4.23 mm, respectively) during drying was recorded in room drying condition.

Among all embedding media, significantly minimum dry weight (462.71, 108.47 and 238.52 mg), maximum increase in weight loss (781.14, 152.41 and 384.07 mg) and moisture loss (62.79, 58.42 and 61.69 %) was recorded in M_1 *i.e.* silica gel for calendula, coreopsis and cosmos, respectively. Flowers embedded in silica gel also recorded minimum time taken for drying (4.30, 2.74 and 3.36 days) while it was maximum in flowers embedded with sand. The minimum reduction in diameter of flowers of calendula (5.43 mm), coreopsis (4.00 mm) and cosmos (4.06 mm) was recorded in flowers dried with silica gel.

Interaction of drying conditions and embedding media was found non significant for all parameters but the flowers dried in silica gel in room condition were recorded maximum scores for appearance after six months of storage life and just after drying in calendula (18.20), coreopsis (17.80) and cosmos (18.00).

Experiment 2 was designed on "Standardization of embedding media under oven drying condition with varies degree of temperature". The flowers of calendula, coreopsis and cosmos were dried by embedding in desiccants *viz.,* silica gel, borax and sand. Aluminum tray was used for drying at 30 ^{o}C, 35 ^{o}C and 40 ^{o}C temperature in hot air oven.

Among all desiccants, significantly minimum dry weight of calendula, coreopsis and cosmos (1207.95, 106.45 and 212.73, respectively) was recorded in silica gel (M_1). Significantly maximum weight loss (840.11, 152.07 and 411.22 mg) and moisture loss (67.60, 58.82 and 65.90 %) was observed in calendula, coreopsis and cosmos flowers which were embedded in Silica gel. The same embedded flowers took minimum time for drying of flowers (3.03, 2.53 and 3.35 days, respectively). But the minimum reduction in diameter in calendula (7.27 mm), coreopsis (6.67 mm) and cosmos (7.27 mm) was recorded in M_3 *i.e.* sand embedding while maximum reduction of flower diameter was recorded in silica gel embedding treatment.

Hot air oven temperature had significant influence on flowers of calendula, coreopsis and cosmos. Minimum dry weight (409.99, 104.86 and 227.83 mg), maximum weight loss (833.94, 154.35 and 397.30 mg) and moisture loss (67.04, 59.54 and 63.79 %) with minimum time required for drying of flowers (3.43, 2.95 and 3.65 days) were recorded in T_3 (40 ^{o}C) while in case of reduction in flower size after drying, minimum reduction in diameter of calendula, coreopsis and cosmos was recorded in T_1 - 30 ^{o}C (7.60, 7.36 and 7.60 mm, respectively). There was no significant difference observed on all parameters due to combination of embedding media and varying degree of temperatures. The maximum quality score of calendula (17.80), coreopsis (17.80) and cosmos (17.20) were observed in silica gel embedded flowers dried at 30 ^{o}C.

126. Name of the student : Parmar Swati Johnbhai (2020215037)

Year of completion of degree : 2017

Name of the major advisor : Dr. R. B. Patel

Title of thesis : Effect of bio-fertilizers on golden rod (*Solidago canadensis* L.) cv. Local

Abstract

The present investigation entitled "Effect of bio-fertilizers on golden rod (*Solidago canadensis* L.) cv. Local" was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, during 2015-2016.

The experiment was laid out in Randomized Block Design (RBD) with factorial concept having eight treatment combinations, comprising of two levels of RDF (75 % and 100 % RDF) and four levels of bio-fertilizers (No bio-fertilizers, Azotobacter, Azotobacter + PSB and Azotobacter + PSB + KMB). The treatments were replicated thrice. The response of golden rod to the treatments was evaluated on the basis of growth, flowering and yield characteristics.

Among two levels of RDF, application of 100 % RDF (150:100:100 NPK kg/ha) significantly increased all growth parameters like plant height (94.26 cm), leaf area (20.02 cm^2), number of suckers per plant (6.66), fresh weight of plant (159.07 g) and dry weight of plant (70.92 g).

In flowering, minimum number of days taken for panicle intiation (112.92 days), highest length of panicle (73.90 cm) and vase life of panicle (6.72 days) while in yield, maximum number of panicle per plant (3.98), plot (321.98) and hectare (662.50) and maximum SOC (0.700 %) and microbial population (53.48 x 10^{-6} CFU/ml) in soil.

In case of bio-fertilizers, application of B_3 (Azotobacter + PSB + KMB) significantly increased the growth to plant height with panicle (101.32 cm), leaf area (22.45 cm^2), number of suckers per plant (7.43), fresh weigth (185.81 g) and dry weight of plant (82.50 g). The minimum number of days taken for panicle initiation (108.14) and maximum length of panicle (79.89 cm) and vase life (7.10 days) and yield like number of panicle per plant (4.23), per plot (342.23) and hectare (704.17) were also recorded in B_3 (Azotobacter + PSB + KMB), while nitrogen content (190.05 kg ha^{-1}), potassium content (297.11 kg ha^{-1}), SOC (0.718%) and microbial population (56.90 x 10^{-6} CFU/ ml) was recorded in B_3 (Azotobacter + PSB + KMB) as compared to other levels.

The experimental results revealed that combined application of chemical fertilizers and bio-fertilizers (F_2B_3) recorded significantly effect on yield parameters like maximum number of panicle per plant (4.63), plot (376.42), hectare (722.47) and soil parameters like microbial population (62.10 x 10^{-6} CFU/ml).

Application of RDF @ 100 % along with Azotobacter + PSB + KMB (F_2B_3) was found superior and gave maximum yield of panicle 4.53 per plant, 367.20 per plot and 755.56 thousand per ha (estimated).

As far as economics is considered, it is clear that application of 100 % RDF along with Azotobacter + PSB + KMB bio-fertilizers (F_2B_3) gave the highest net return of Rs. 524324.76 per ha with BCR of 5.79.

127. Name of the student : Parvathi Bennurmath (2020215038)

Year of completion of degree : 2017

Name of the major advisor : Dr. Dipal S. Bhatt

Title of thesis : Assessment of genetic diversity in chrysanthemum (*Chrysanthemum morifolium* Ramat)

Abstract

The present investigation entitled "Assessment of genetic diversity in chrysanthemum (*Chrysanthemum morifolium* Ramat)" was conducted during 2015 – 2016, at the Floriculture Research farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Randomized Block Design with fifteen different chrysanthemum varieties as a treatment. The treatments were replicated thrice. The rooted cuttings were planted at 30 x 30 cm distance. The vigorous growth in terms of plant height (54.87 cm) was noted significantly in variety 'Maghi' (T_4) while plant spread was found significantly maximum in variety 'Ratlam Selection' (T_9) (29.63 cm) and in 'Maghi' (T_4) (40.09 cm) in North-South and East-West directions, respectively. Significantly maximum leaf size was observed in variety 'Thai Chen Queen' (T_{15}) (5.61 cm), in variety 'Harvest' (T_{12}) (4.25 cm) and in variety 'Flirt' (T_3) (3.10 cm) with respect to leaf length, leaf width and petiole length, respectively. A thorough glance of leaf area was found significantly maximum (17.50 cm^2) in variety 'Dolly White' (T_{13}). On the subject to early flower bud initiation (63.99 days) and flower opening (71.73 days) were recorded in variety 'Red-2' (T_7). However, biggest flower (12.65 cm) and highest flower weight (9.78 g) were noted in variety 'Thai Chen Queen' (T_{15}). Number of ray florets per flower was found significantly maximum in variety 'Maghi' (T_4). With respect to flower duration, significantly longest duration of flower (56.67 days) was resulted in variety 'Ratlam Selection' (T_9). Consequently, yield contributing characters *i.e.* number of flowers (99.67 per plant and 1898.94 per plot) was found significantly maximum in variety 'Maghi' (T_4). The yield of flowers (199.33 g per plant and 4330.27 g per plot) was observed significantly highest in variety 'Thai Chen Queen' (T_{15}). Association between yield of flower per plot and other contributing characters revealed that yield of flowers per plot was noted highly significant and positive correlation with plant height (cm), plant spread (cm), days to bud initiation, flower diameter, number of ray florets per flower, flower weight, number of flowers per plant per plot and yield of flowers per plant at both genotypic and phenotypic levels. Whereas, significant and positive correlation was observed with leaf length and days to flowering only at genotypic level. Path coefficient analysis indicated that number of flowers per plant has highest positive direct effect on yield of flowers per plot followed by leaf area (cm^2). Based on these findings, it can be suggested that for improving flower yield in chrysanthemum, more emphasis should be given to days to flowering, flower diameter, number of flowers per pant, plant height and flower weight. The results of the present investigation suggested that the chrysanthemum varieties could be effectively categorized and characterized based on morphological characters and as such, these traits could be utilized as good descriptors in the identification and maintenance of chrysanthemum varieties. This existed ample variation and diversity in chrysanthemum could be utilized for cut flower, loose flower and pot mum purpose. The varieties Ravi Kiran, Shyamal, Flirt, Neelima, Ratlam Selection and Thai Chen Queen are best suitable for cut flower purpose, whereas varieties Jaya, Pancho, Maghi can be selected for loose flower purpose because of attaining more number of flowers per plant. However, varieties Red-2, Ajina Purple, Pancho, Lalpari, Dolly White and Mayur are best suitable for pot mums.

128. Name of the student : Patel Dishaben K.(2020215041)
Year of completion of degree : 2017
Name of the major advisor : Dr. S. L. Chawla

Title of thesis : Effect of nitrogen and phosphorus on growth, flowering and yield of bird of paradise (*Strelitzia reginae*) under 50 per cent shade net house

Abstract

The present investigation to study the "Effect of nitrogen and phosphorus on the growth, flowering and yield of bird of paradise (*Strelitzia reginae*) under 50 per cent shade net house" was carried out at Floriculture Research Farm, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari in the year 2015-2016.

The experiment was laid out in Large Plot Technique and data were analyzed in Completely Randomized Design with Factorial concept (FCRD) with three replications and nine treatment combinations, comprising of three levels of nitrogen (N_1= 20, N_2= 30 and N_3= 40 g/plant/year) and three levels of phosphorus (P_1= 10, P_2= 15 and P_3= 20 g/plant/year).

Result revealed that the nitrogen and phosphorus application significantly influenced the vegetative growth, flowering and flower production of bird of paradise.

The result showed that among different levels of nitrogen *i.e.* N_2 was found better for all vegetative growth attributes like plant height (162.61 cm), leaf length (48.17 cm), leaf width (18.22 cm), number of leaves per clump (28.33) and number of suckers per plant (5.64) of bird of paradise.

An advance flowering from initiation of inflorescence (41.56 days), more number of florets per bract (8.69), maximum length of bract (20.58 cm), stalk length (102.11 cm), stalk diameter (0.54 cm), longevity of inflorescence (26.31 days), number of inflorescences per plant per year (3.50) and vase life (13.17 days) was recorded in 30 g N per plant per year (N_2). While maximum nitrogen content in leaf (2.81 %) and soil (228.83 kg/ha) was recorded in 40 g N per plant per year (N_3).

In case of phosphorus application, 15 g P/plant/year (P_2) significantly increased the growth to plant height (163.25 cm), leaf length (48.53 cm), leaf width (17.97 cm), number of leaves per clump (28.33), sucker per plant (5.69) at 12th month. The minimum days taken for flowering from initiation of inflorescence (41.72 days), maximum number of florets per bract (8.81), length of bract (20.64 cm), stalk length (102.25 cm), stalk diameter (0.54 cm), longevity of inflorescence (26.25 days), inflorescence per plant per year (3.58) and vase life (13.25 days) were also recorded in 15 g P per plant per year (P_2). While, maximum phosphorus content in leaf (0.32 %) and phosphorus content in soil (72 kg/ha) was recorded in 20 g P/plant/year as compared to other levels.

The experimental results revealed that combined application of nitrogen @ 30 g and phosphorus @ 15 g/plant/year (N_2P_2) recorded significantly higher growth, flowering and yield parameters as compared to other levels. The maximum plant height (171.50 cm), leaf length (53.42 cm), leaf width (19.67 cm), number of leaves per clump (32.08), number of sucker per plant (6.42), minimum days to flowering from initiation of inflorescence (40.75), maximum number of florets per bract (9.75) and inflorescence (4.08) per plant per year, maximum stalk length (104.92 cm) and stalk diameter (0.56 cm) with better longevity of inflorescence (27.92 days) and vase life (14. 17 days) were recorded with the application of 30 g N and 15 g P/plant/year (N_2P_2).

As far as economics is concerned, application of 30 g N/plant/year along with 15 g P/plant/year (N_2P_2) recorded maximum BCR (0.78) and net realization of Rs. 40783.39 in 1000 m^2 area of net house.

129. Name of the student : Patel Khyatikumari Mahendrabhai (2020215042)

Year of completion of degree : 2017

Name of the major advisor : Dr. R. B. Patel

Title of thesis : Standardization of drying technology for different annual flowers (dianthus, annual chrysanthemum, China aster)

Abstract

The present study entitled "Standardization of drying technology for different annual flowers (dianthus, annual chrysanthemum, China aster)" was carried out in the year 2016 at the Laboratory, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Completely Randomized Design (CRD) and repeated for five times.

Two experiments were conducted during the research work, experiment 1 and experiment 2. Experiment 1 entitled "Standardization of drying method for annual flowers" was conducted to employing different drying treatments like without embedding (T_1) sand embedding (T_2), silica gel embedding (T_3) and sand + borax (1:1) mixture embedding (T_4) under ambient temperature *i.e.* room condition and experiment 2 entitled, "Standardization of dehydration method for annual flowers was conducted to employing different drying treatments like without embedding (T_1), sand embedding (T_2), silica gel embedding (T_3) and sand + silica gel (1:1) mixture embedding (T_4) under 45 ^{o}C temperature in oven drying condition. Observations were recorded before and after drying.

In room drying condition, minimum partial dry weight of dianthus (0.091 g), annual chrysanthemum (0.333 g), and China aster (0.655 g) was observed in without embedding method while maximum partial dry weight of dianthus (0.107 g), annual chrysanthemum (0.402 g) and China aster (1.7 g) were observed in sand embedding treatment. Maximum total dry weight of dianthus (0.010 g), annual chrysanthemum (0.042 g) and China aster (0.105 g) were observed in the treatment of without embedding. Loss in fresh weight percentage and moisture percentage were respectively significantly maximum in dianthus (64.34 % and 88.93 %), annual chrysanthemum (82.86 % and 87.27 %) and China aster (74.89 % and 85.41 %) observed in silica gel embedding method. Flower diameter reduction were significantly recorded minimum in dianthus (0.3 cm), annual chrysanthemum (0.3 cm) and China aster (0.5 cm) in sand embedding treatment followed by silica gel embedding while maximum flower diameter reduction was recorded in without embedding. Time taken for drying found significantly minimum in silica gel embedding in the dianthus (4.3 days), annual chrysanthemum (4.5 days) and China aster (6 days) while, without embedding took maximum time for drying in dianthus (8.3 days), annual chrysanthemum (8.3days) and in China aster (12 days). Maximum quality score on visual basis of colour, texture and appearance in dried flowers of dianthus (15.5), annual chrysanthemum (15.3) and China aster (15) were recorded in silica gel embedding treatment.

In hot air oven drying, minimum partial dry weight in flowers of dianthus (0.051 g), annual chrysanthemum (0.322 g) and China Aster (0.793 g) were observed in without embedding. Similarly, the minimum total dry weight of dianthus (0.008 g), annual chrysanthemum (0.067 g) and China aster (0.102 g) were observed in without embedding method. Loss in fresh weight percentage and moisture percentage were respectively significantly maximum in dianthus (72.37 % and 89.12 %), annual chrysanthemum (84.42 % and 85.37 %) and China aster (73.82 % and 88.00 %) observed in silica gel embedding method. Minimum flower diameter reductions in the flowers of

dianthus (0.4 cm), annual chrysanthemum (0.5 cm) and China aster (0.7 cm) were recorded in sand embedding treatment. Significantly minimum time taken for drying was recorded in silica gel embedding in dianthus (1.4 days). Quality score of dried flowers with regard to colour, texture and appearance were recorded significantly maximum in silica gel embedding treatment in dianthus (15.7), annual chrysanthemum (15.8) and China aster (15.8).

130. Name of the student : Patel Unnatiben Rameshbhai (2020215045)
Year of completion of degree : 2017
Name of the major advisor : Dr. Sudha Patil
Title of thesis : Post harvest studies of different varieties of heliconia

Abstract

The present investigation entitled "Post harvest studies of different varieties of heliconia" was carried out at Laboratory, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari in the year 2015- 2016.

The experiments were laid out in Completely Randomized Design with Factorial concept (FCRD) and replicated thrice to study the post harvest life of heliconia inflorescence. Experiment 1 entitled ''Standardization of harvesting stage for different varieties of heliconia'' was conducted to standardize harvest stages for different varieties of heliconia. There were twelve combinations comprising of four varieties (V_1- Red Torch, V_2- Golden Torch, V_3- Kenea Red and V_4- Orange) and three stages of harvesting (S_1- First bract open, S_2- Second bract open and S_3- Third bract open).

Varieties of heliconia significantly influenced at all post harvest quality and vase life parameters except number of bracts open and flower opening percentage. Variety V_2 (Golden Torch) recorded maximum water uptake with higher fresh weight retention and maximum useful vase life of 12.00 days.

Harvesting stages had significant influence on all parameters recorded during post harvest life in heliconia inflorescence. Harvesting stage S_3 (3 bract open) was found most appropriate with respect to maximum water uptake and higher fresh weight retention on alternate day with extended useful vase life (12.04 days). An interaction effect of varieties and harvesting stages was found non significant for all parameters but the maximum score (3.78) for appearance was recorded in flowers of Golden Torch harvested at 3rd bract open stage (V_2S_3).

In experiment 2, study was carried out to standardize pulsing solutions for different varieties of heliconia. There were sixteen combinations including four varieties (V_1- Red Torch, V_2- Golden Torch, V_3- Kenea Red and V_4- Orange) and four pulsing solutions (P_1- control, P_2- 15 % sucrose, P_3- 15 % sucrose + 250 ppm 8-HQC and P_4- 15 % sucrose + 250 ppm BA).

Significant influence of all varieties was noted for all quantitative and qualitative parameters. Among all varieties, Golden Torch (V_2) recorded significantly maximum water uptake with fresh weight retention on alternate day, TSS, flower opening percentage, number of bracts open, carotene content and useful vase life (14.60 days).

Pulsing solutions had significant influence on all parameters studied during post harvest life of heliconia. Treatment P_3 containing 15 % sucrose + 250 ppm 8- HQC recorded significantly maximum water uptake with higher fresh weight retention on alternate day, TSS, flower opening percentage, number of bracts open, carotene content and useful vase life (14.94 days).

The results revealed that significantly highest flower opening percentage and useful vase life (15.72 days) was recorded in flowers of Golden Torch variety pulsed with 15 % sucrose + 250 ppm 8-HQC. Moreover, the appearance (4.06) was also found maximum in V_2P_3.

In experiment 3, thirty two combinations comprising of four varieties (V_1- Red Torch, V_2- Golden Torch, V_3- Kenea Red and V_4- Orange) and eight treatments of vase solutions (T_1- control, T_2- 3 % sucrose, T_3- 50 mg GA_3, T_4- 100 mg GA_3, T_5- 200 ppm $Al_2(SO_4)_3$, T_6- 300 ppm $Al_2(SO_4)_3$, T_7- 200 ppm 8-HQC and T_8- 300 ppm 8-HQC) were taken to standardize the vase solution for different varieties of heliconia.

Significant influence of varieties was observed for all parameters studied during post harvest life of heliconia. Significantly maximum water uptake and higher fresh weight retention on alternate day with maximum TSS, flower opening percentage, number of bracts open, carotene content and useful vase life was recorded in flowers of Golden Torch.

Effect of vase solutions was found significant for all parameters on post harvest quality of heliconia during vase life. T_4 (100 mg GA_3) treated flowers shown significantly maximum water uptake, fresh weight retention, TSS, flower opening percentage, number of bracts open, carotene content and useful vase life (15.50 days).

The interaction effect revealed that varieties and vase solution recorded significant influence where variety Golden Torch treated with vase solution contain 100 mg GA_3 (V_2T_4) shown maximum flower opening percentage (54.17), useful vase life (16.28 days) and retained maximum score for appearance of flowers (4.28).

131. Name of the student : Patel Vaishaliben Dipakbhai (2020215047)
Year of completion of degree : 2017
Name of the major advisor : Dr. G. D. Patel
Title of thesis : Integrated nutrient management in African marigold (*Tagetes erecta* L.)

Abstract

The present investigation entitled 'Integrated nutrient management in African marigold (*Tagetes erecta* L.)' was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) and ASPEE Agriculture Research and Development Foundation, Tansa (Maharashtra) during 2015- 16 to study the effect of INM on growth, flowering and properties of soil in African marigold.

The experiment was laid out in Randomized Block Design with three replication and ten treatments *viz.* T_1= 100 % recommended dose of chemical fertilizer (RDF) @ 150:100:100 kg NPK per ha (without FYM), T_2 = FYM @ 5 t/ha + 100 % RDF, T_3 = FYM @ 5 t/ha + 75 % RDF, T_4= FYM @ 10 t/ha + 50 % RDF, T_5= T_1 + Azotobacter + PSB + KMB, T_6= T_2 + Azotobacter + PSB + KMB, T_7= T_3 + Azotobacter + PSB + KMB, T_8= T_4 + Azotobacter + PSB + KMB, T_9= T_1 + 1 % foliar spray of NAUROJI Novel organic liquid fertilizer, T_{10}= T_6 + 1 % foliar spray of NAUROJI Novel organic liquid fertilizer.

The results revealed that application of T_{10} (FYM @ 5 t/ha + 100% RDF + Azotobacter + PSB + KMB + 1 % foliar spray of NAUROJI Novel organic liquid fertilizer) was increasing vegetative, flowering quality and yield parameters as compare to other treatments, with maintained soil properties.

The significant effect of T_{10} (T_6 + 1 % foliar spray of NAUROJI Novel organic liquid fertilizer) was obtained with maximum plant height, plant spread in North-South

as well as East-West direction during 2nd and 4th month after transplanting whereas, No. of primary branches and no. of secondary branches were observed during 2nd month after transplanting and it was also noted higher in T_{10} (T_6 + 1 % foliar spray of NAUROJI Novel organic liquid fertilizer) at Navsari and Tansa conditions, respectively.

Minimum days taken for 50 % flower bud initiation and days to first flowering were recorded in treatment T_{10} whereas, maximum duration of flowering, flower diameter, No. of flowers per plant, higher weight of 20 flowers, flower yield per plant, per net plot and per ha with increase the *in situ* flower longevity and shelf life of flower were observed in application of T_{10} (FYM @ 5 t/ha + 100 % RDF + Azotobacter+ PSB + KMB + 1 % foliar spray of NAUROJI Novel organic liquid fertilizer) at Navsari and Tansa conditions, respectively.

Looking to the economics of present investigation at both the locations, maximum net return (Rs. 2,18,115 and Rs. 2,59,563) was obtained in treatment T_{10} with higher cost benefit ratio (2.65 and 3.20) at both locations of investigation.

On the basis of results obtained in present experiment at both the location it can be concluded that application of FYM @ 5 t/ha (at time of land preparation) + 100 % RDF @ 150:100:100 kg NPK per ha + Azotobacter +PSB + KMB (at time of planting) + 1 % foliar spray of NAUROJI Novel organic liquid fertilizer @ 45 DATP found better for early and quality flower production of African marigold with maintained soil properties for sustainability.

132. Name of the student : Raghuram Pawar (2020215052)

Year of completion of degree : 2017

Name of the major advisor : Dr. Shivam T. Bhatt

Title of thesis : Canopy management in *Jasminum sambac* var. Baramasi

Abstract

The present investigation on "Canopy management in *Jasminum sambac* var. Baramasi" conducted at Floriculture Research Farm, Navsari Agricultural University, Navsari (Gujarat) during the year 2016-17. The experiment was laid out in a Randomized Block Design with Factorial concept (FRBD) along with nine treatment combinations consisting three pruning time *i.e.* Last week of November, Second week of December and last week of December and three different levels of pruning *i.e.* 25 cm, 50 cm and 75 cm from the ground level. The treatments were repeated thrice.

Different pruning time and pruning level influenced significantly on vegetative and flowering characters in *Jasminum sambac*. Among the various pruning time, 2nd week of December (P_2) had most striking influence in enhancing the vegetative attributing characters *viz.* incremental plant height at 60, 120 and 180 days, (87.32, 95.90 and 112.94 cm, respectively), length of primary shoot (52.76 cm), number of leaves on primary shoot (66.72) and plant spread in E-W and N-S (92.45 and 94.88) as compared to the other treatments.

Significant influence was observed for flower characters. Superiority of flowers with respect to flower bud length (3.41 cm), flower bud diameter (1.00 cm), flower yield per plant (1076.14 g), flower yield per plot (4.33 kg) and flower yield per hectare was recorded in (6.91 t) plants pruned in Second week of December Whereas, the traits like, minimum days taken for first bud initiation, commencement of flowering (43.93 and 53.38 days, respectively) and the weight of hundred flower buds (33.42 g), were noticed in plants pruned on last week of December (P_3).

Among the various pruning levels, pruning done at 75 cm from the ground level

(L_3) was most significantly influenced vegetative attributing characters *viz.* incremental plant height at 60,120 and 180 days (106.97, 115.05 and 118.64 cm respectively), and plant spread in E-W and N-S (106.38 and 106.93 cm) directions as compared to the other treatments. However, the length of primary shoot at 60 days (59.02 cm) and maximum number leaves per primary shoot (84.98) were found in bushes pruned at 50 cm from the ground level. Flower bud length (3.46 cm), flower bud diameter (1.04 cm), flower yield (1116.28 g/plant, 4.47 kg/plot 6.69 t/ha) and weight of hundred flower buds (33.42 g) were highest in the plants pruned at 50 cm above the ground level (L_2), whereas early flower bud initiation (42.15 days) and commencement of flowering (51.93 days) were noticed in the plants pruned on last week of December *i.e.* (L_3).

In case of interaction effect of different pruning time and pruning level was found non-significant with respect to all vegetative and flowering characters except for flower yield. Plants pruned in second week of December at 50 cm above ground level (P_2L_2) produced significantly maximum flower yield (1216.20 g/plant, 4.91 kg/plot and 8.12 t/ha).

Based on the results of the present investigation, it can be concluded that pruning of *Jasminum sambac* var. Baramasi at 50 cm above ground level during second week of December is beneficial for better vegetative growth and getting higher yield with good quality of jasmine flowers.

133. Name of the student : Desai Supal Alpesh (2020216006)
Year of completion of degree : 2018
Name of the major advisor : Dr. B. B. Patel
Title of thesis : Effect of plant growth enhancers on growth, flowering and yield of tuberose cv. Prajwal

Abstract

A field experiment on "Effect of plant growth enhancers on growth, flowering and yield of tuberose cv. Prajwal" was conducted at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during March-2017 to March-2018. The experiment comprised of 13 treatments of three concentrations of each plant growth enhancers *i.e.* enriched sap of banana pseudostem (5000 ppm, 10,000 ppm and 15,000 ppm), brassinosteroid (0.25 ppm, 0.50 ppm and 0.75 ppm), GA_3 (50 ppm, 100 ppm and 150 ppm) and BA (50 ppm, 100 ppm and 150 ppm). The treatments were applied as foliar spray at 60, 90 and 120 days after sprouting. The experiment was laid out in randomized block design (RBD) with three replications.

The results indicate that the growth parameters were significantly differed with various treatments. Among different concentrations of plant growth enhancers, T_4 (Enriched sap of banana pseudostem at 15,000 ppm) was found significantly highest plant height (74.8 cm), number of leaves (70.20) and leaf area (65.20 cm^2).

An advanced rachis emergence (37.53 days) and first florets opening (7 days) were also recorded with the application of 15,000 ppm Enriched sap of banana pseudostem. Other floral characters *viz.* spike length (103 cm), rachis length (27.2 cm), spike diameter (13.40 mm), floret diameter (40.10 mm), longevity of spike (12.73 days) and vase life (11.20 days) were also found maximum with T_4 (Enriched sap of banana pseudostem at 15,000 ppm).

Yield attributes *viz.* number of florets per plant (42.93), number of spikes per plant (2.67), per plot (49.86) and per hectare (2.77 lakh), bulbs per plant (2.60), per plot (48.63) and per hectare (2.70 lakh), bulblets per plant (11.33), per plot (211.92) and per hectare (11.77 lakh) were found better with the application of Enriched sap of banana

pseudostem at 15,000 ppm. Similarly, spike weight (170.00 g), weight of bulbs per plant (63.95 g), per plot (1195.92 g) and weight of bulblets per plant (41.53 g), per plot (805.30 g) were obtained maximum in T_4 (Enriched sap of banana pseudostem at 15,000 ppm).

As far as chemical attributes, maximum chlorophyll content (1.09 %) and essential oil (0.23 %) were also recorded in T_4 (Enriched sap of banana pseudostem at 15,000 ppm). T_4 was found superior with higher net realization (Rs. 612805) and higher BCR (2.90).

It can be concluded that the foliar application of banana pseudostem @ 15000 ppm sprayed at 60, 90 and 120 days after sprouting was obtained highest quality flower production with maximum net return.

134. Name of the student : Gamit Dipika Raysingbhai (2020216007)

Year of completion of degree : 2018

Name of the major advisor : Dr. G. D. Patel

Title of thesis : Integrated weed management in African marigold (*Tagetes erecta* L.)

Abstract

The present investigation entitled "Integrated weed management in African marigold (*Tagetes erecta* L.)" was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Summer 2017 to study the effect of IWM on weed flora, growth, quality flower yield, nutrient content and uptake by crop and weed in African marigold.

The experiment was laid out in Randomized Block Design with three replications and twelve treatments *viz.*, T_1= Weedy check (control), T_2= IC at 20 & 40 DATP, T_3= IC at 20 & 40 DATP + HW at 20, 40, 60, & 80 DATP, T_4= IC & HW both at 20 DATP + Organic mulching , T_5= Pendimethalin 1.0 kg/ha as PE, T_6= T_5 + T_4, T_7=T_5 + IC & HW both at 20 DATP + Propaquizafop 0.1 kg/ha as POE, T_8= T_5 + Propaquizafop 0.1 kg/ha at 20 & 40 DATP as POE, T_9= Oxadiargyl 0.90 kg/ha as PE, T_{10}= T_9 + T_4, T_{11}= T_9 + IC & HW both at 20 DATP + Propaquizafop 0.1 kg/ha at 40 DATP as POE, T_{12}= T_9 + Propaquizafop 0.1 kg/ha at 20 & 40 DATP as POE.

The results revealed that impossing of treatment T_6 (Pendimethalin 1.0 kg/ha as PE + IC & HW both at 20 DATP + Organic mulching) was noticed promising to supress the weed population and increasing growth, flower quality and yield parameters as compare to other treatments.

Application of treatment T_6 (Pendimethalin 1.0 kg/ha as PE + IC & HW both at 20 DATP + Organic mulching) was found significantly maximum plant height, plant spread (North- South and East- West direction), number of branches (primary branches and secondary branches) during 60 DATP, 80 DATP and at final harvest. Dry biomass of plant was also found maximum in the same treatment.

Floral parameters *viz.*, earliness to first flowering, total flower duration, flower diameter, number of flowers per plant, average weight of 20 flowers, flower yield (555.60 g/plant, 5.61 kg/net plot and 9.75 t/ha) were recorded higher in treatment T_6, which was noticed statistically at par with T_{10}, T_3 and T_4.

Weed population and dry weight at 40 DATP (7.67) and at final harvest highest (42.00) was observed in treatment T_3. With the reference to weedy check treatment, the highest WCE (97.63 %) at final harvest was observed in treatment T_3 followed by T_6 and T_{10}. With the reference to best yielded treatment T_6, the least weed index was noticed in T_{10} followed by T_3 and T_4.

Regarding the nutrient status of African marigold and weed flora, treatment T_6

was found superior in case of N, P and K content and uptake.

Looking to the economics of present investigation, maximum net return (Rs. 1,93,784) was obtained in treatment T6 with higher cost benefit ratio (1.96).

The overall impact of the present research work, the farmers associated with African marigold cultivation are advised to use Pendimethalin 1.0 kg/ha as Pre emergence + Inter culturing and Hand weeding at 20 DATP + Organic mulch (sugarcane tress) found better for early and quality flower production of African marigold with suppressing the weed population.

135. Name of the student : Kitty Rajan (2020216012)

Year of completion of degree : 2018

Name of the major advisor : Dr. Dipal S. Bhatt

Title of thesis : Effect of nitrogen and phosphorus on growth and flowering of cut chrysanthemum cv. Thai Chen Queen

Abstract

The present investigation entitled "Effect of nitrogen and phosphorus on growth and flowering of cut chrysanthemum cv. Thai Chen Queen" was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Randomized Block Design with factorial concept with twelve treatment combinations, consisting four doses of nitrogen *i.e.* 100 kg N/ha (N_1), 150 kg N/ha (N_2), 200 kg N/ha (N_3), 250 kg N/ha (N_4) and three doses of phosphorus *i.e.* 50 kg P_2O_5/ha (P_1), 75 kg P_2O_5/ha (P_2), 100 kg P_2O_5/ha (P_3). The treatments were replicated four times. Among the various doses of nitrogen, application of 200 kg N/ha (N_3) to cut chrysanthemum was most effective to increase plant height (45.32 cm) whereas, plants receiving 150 kg N/ha (N_2) significantly increased leaf area (16.01 cm^2), plant spread in N-S (27.59 cm) and E-W (26.88 cm) directions, number of branches (8.73), fresh weight (669.7 g) and dry weight (163.20 g) of plant. Moreover, early flower bud initiation (38.70 days) and flower bud opening (57.70 days) with maximum flowering duration (51.97 days) were resulted with an application of 150 kg N/ha (N_2). Application of 150 kg N/ha (N_2) was found promising for maximum flower stem length (38.90 cm), fresh weight of flower (669.71 g), flower diameter (11.11 cm), vase life (8.03 days), highest number of flower stems (7.10 per plant, 146.27 per plot and 507.87 thousand per hectare). Regarding nutrient status, significantly highest organic carbon in soil (0.56 %) as well as maximum nitrogen content (2.89 %), phosphorus content (0.56 %) and potassium content (2.84 %) in leaves were resulted with the application of 250 kg N/ha (N_4). Significantly maximum plant height (44.00 cm), leaf area (14.92 cm^2), plant spread in N-S and E-W directions (26.34 and 25.68 cm, respectively), number of branches per plant (8.10), fresh weight (610.13 g) and dry weight (141.80 g) of plant, flowering attributes like minimum days took for bud initiation (40.09 days) and flower bud opening (60.06 days) with longer flowering duration (49.03 days), quality parameters *viz.*, flower stem length (36.56 cm), fresh weight of flower stem (610.13 g), diameter of flower (10.79 cm), vase life of flower (7.66 days), yield parameters like number of flower stems (6.64 per plant, 136.60 per plot and 474.30 thousand per hectare) were obtained with the plants treated with 75 kg P_2O_5 per ha (P_2). Application of phosphorus gave non significant results with respect to nutrient status of soil and leaf. However, application of 50 kg P_2O_5/ha (P_1) resulted with maximum nitrogen content (238.24 kg/ha) while maximum content of phosphorus (31.48 kg/ha and K_2O content (336.36 kg/ha) was recorded from the soil treated with 100 kg P_2O_5/ha (P_3). In leaf, maximum content of nitrogen (2.77 %), phosphorus (0.50 %) and

potassium (2.75 %) was obtained with the application of 100 kg P_2O_5/ha (P_3). Combined application of 150 kg N/ha along with 75 kg P_2O_5/ha was found most effective for obtaining highest number of branches (9.50), maximum fresh weight (815.40 g) and dry weight (200.58 g) of plant. However, rest of the vegetative characters were found non significant result. Significantly longest stalk length (41.67 cm) and highest number of flower stems (7.80 per plant, 160.70 per plot and 557.99 thousand per ha) were obtained with the application of 150 kg N/ha along with 75 kg P_2O_5/ha. While other flowering attributes were not influenced significantly. Regarding nutrient status, application of 250 kg N/ha along with 50 kg P_2O_5/ha (N_4P_1) significantly obtained maximum phosphorus content (0.57 %) in leaves. The highest BCR of 2.42 and net returns (Rs.394757/ha) were recorded under treatment150 kg N/ha + 75 kg P_2O_5 per ha (N_2P_2) and it was followed by 150 kg N/ha +100 kg P_2O_5 per ha (N_2P_3) and 200 kg N/ha + 75 kg P_2O_5 per ha (N_3P_2).

136. Name of the student : Meghalakshmi Guddad (2020216017)

Year of completion of degree : 2018

Name of the major advisor : Dr. Alka Singh

Title of thesis : Effect of IBA, rooting media and chemicals on rooting of cuttings and plant architecture of potted *Ixora chinensis* var. Mini Double

Abstract

The research endeavor entitled "Effect of IBA, rooting media and chemicals on rooting of cuttings and plant architecture of potted *Ixora chinensis* var. Mini Double" was conducted during 2016-2018 at ATC of Soilless System, Department of Floriculture and Landscape Architecture, ACHF, NAU, Navsari, Gujarat. This investigation was conducted in two experiments *viz.,* Experiment – 1 'Effect of IBA and rooting media on rooting of cuttings in *Ixora chinensis'* and Experiment -2 'Effect of foliar application of chemicals on plant architecture in potted *Ixora chinensis* var. Mini Double'. Further, experiment- 1 was framed out in Completely Randomized Design with Factorial concept (FCRD) and repeated thrice and experiment – 2 was laid out in Completely Randomized Design (CRD) with three repetitions. The data recorded on various aspects were analyzed and the abstract of results is outlined as under.

In Experiment – 1, IBA treatment and rooting media significantly, influenced shoot and root growth of ixora cuttings. Semi-hardwood cuttings treated with IBA (2000 mg/l) as quick dip method and stumped in cocopeat + banana fibre + styrofoam media showed higher sprouting percentage with early sprouting, maximum number of shoots with more number of leaves as well as enhanced on root parameters like higher number of roots (20.47), longest roots per cutting (6.06) and higher survival percentage (100).

In Experiment- 2, plants sprayed with different plant growth enhancing substances significantly influenced various vegetative and flowering parameters as well as on overall appearance of plant in *Ixora chinensis*. Foliar application of salicylic acid at 10 mg/l and silicon at 1.5 % recorded significantly higher vegetative growth *viz.* plant height, plant spread, number of branches, thicker stems, number of leaves, leaf area, leaf area index and higher leaf chlorophyll content, respectively. Further, plants treated with 10 mg/l salicylic acid achieved maximum number of inflorescence per plant with maximum number of buds and flowers per inflorescence with improved flower size. Maximum anthocyanin content in petals (0.28) was observed with application of silicon at 1.5 % which was followed by silicon at 1.0 %. However, improved flowering period (89.60 days), as well as delay in senescence and maximum *in situ* flower longevity (14.87 days) was observed with application of benzyl adenine at 30 mg/l. Thus, among

all foliar application of treatments salicylic acid at 10 mg/l enhanced overall visual appeal of *Ixora chinensis* as potted plant by improving plant architecture in form of vegetative growth as well as flowering parameters.

137. Name of the student : Naik Bhoomi P. (2020216019)
Year of completion of degree : 2018
Name of the major advisor : Dr. Shivam T. Bhatt
Title of thesis : Off season flower induction through various stimulants in *Jasminum sambac* L.

Abstract

The present investigation entitled 'Off season flower induction through various stimulants in *Jasminum sambac* L.' was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2016-17 to study the effect of different stimulants on off season flower production.

The experiment was laid out in Randomized Blocked Design with three replications and twelve treatments *viz*. T_1 = 0.2 % Humic Acid, T_2 = 0.4 % Humic Acid, T_3 = 0.3 % *Panchgavya*, T_4 = 0.5 % *Panchgavya*, T_5 = 0.5 % $FeSO_4$, T_6 = 0.5 % $ZnSO_4$, T_7 = 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$, T_8 = 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ + 20 ppm NAA, T_9 = 20 ppm NAA, T_{10} = 20 ppm NAA + 1 % Urea, T_{11} = 1 % Banana pseudostem enriched liquid fertilizer, T_{12} = Water spray.

The results revealed that foliar application of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ + 20 ppm NAA treatment (T_8) has significantly influenced vegetative, flowering and yield parameters as compared to other treatments.

Foliar application of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ + 20 ppm NAA to jasmine plants after pruning significantly increased maximum plant height at 2nd and 4th month (57.53 cm and 94.13 cm, respectively), longest secondary shoot (19.26 cm), highest number of leaves (14.33) on secondary shoot, plant spread at N-S direction (112.98 cm) and E-W direction (117.07 cm).

Early flower bud initiation (32.58 days), highest flower bud length (11.92 mm) and diameter (8.30 mm), maximum weight of hundred flower bud (25.48 g), maximum shelf life of flower buds (28.26 hours), higher flower yield 181.77 g/plant, 727.08 g/plot and 1262.29 kg/ha) and maximum dry matter yield (1703.51 g) were observed with foliar application of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ +20 ppm NAA (T_8).

Looking to the economics of present investigation, higher cost benefit ratio (1.63) was obtained in treatment T_4 (0.5 % *Panchgavya*).

On the basis of results obtained in present experiment, it can be concluded that foliar application of 0.5 % *Panchgavya* found better for off season flower induction in *Jasminum sambac* L.

138. Name of the student : Patel Ritalben Jayantibhai (2020216025)
Year of completion of degree : 2018
Name of the major advisor : Dr. S. A. Aklade
Title of thesis : Influence of spacing and pinching on growth and flowering of annual chrysanthemum (*Chrysanthemum coronarium* L.) cv. Local White

Abstract

The present investigation entitled "Influence of spacing and pinching on growth and flowering of annual chrysanthemum (*Chrysanthemum coronarium* L.) cv. Local White" was carried out at Floriculture Research Farm, ACHF, NAU, Navsari, Gujarat during the year 2017-2018. The experiment was laid out in a Randomized block design with factorial concept (FRBD) with three replications and four treatment combinations comprising of two factors *viz*., spacing (S) at two levels (S_1= 45 cm x 30 cm and S_2= 60 cm x 30 cm) and pinching at two levels (P_1= 30 DAS in nursery and P_2= 20 DAT in field).

The experimental results revealed that among the spacing treatments, planting of annual chrysanthemum at 45 cm x 30 cm was found significant with respect to maximum plant height, flower yield (t/ha), seed yield (kg/ha), whereas 60 cm x 30 cm spacing recorded significantly maximum number of primary branches, number of leaves and number of flowers as well as flower yield per plant. In case of effect pinching, P_1 was found best for enhancing vegetative growth, flowering and yield parameters as compared to P_2. Further, the treatment combination of S_1P_1 also resulted in higher net income and BCR. So, on the basis of the results obtained under the study and from economical point of view, annual chrysanthemum cv. Local White should be planted at 45 cm x 30 cm spacing and pinching should be done at 20 DAS in nursery.

139. Name of the student : Patel Vipulkumar Hirabhai (2020216026)
Year of completion of degree : 2018
Name of the major advisor : Dr. G. D. Patel
Title of thesis : Integrated weed management in tuberose (*Polianthes tuberosa* L.)

Abstract

The present investigation entitled 'Integrated weed management in tuberose (*Polianthes tuberosa* L.)' was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat) during 2017-18.

The experiment was laid out in Randomized Block Design with three replications and eight treatments *viz.*, T_1= Weedy check, T_2= Weed free check, T_3= Organic mulch after bulb sprouting and remulch at every 4 month interval, T_4= Pendimethalin 1.0 kg/ha as PE + Hand weeding at 25, 50, 75 DAP, T_5= Pendimethalin 1.0 kg/ha as PE + T_3, T_6= Pendimethalin 1.0 kg/ha as PE + Oxyfluorfen 0.25 kg/ha as POE at 25, 50, 75 DAP, T_7= Pendimethalin 1.0 kg/ha as PE + Propaquizafop 0.1 kg/ha as POE at 25, 50, 75 DAP, T_8= Pendimethalin 1.0 kg/ha as PE + (Oxyfluorfen 0.25 Kg/ha + Propaquizafop 0.1 kg/ha) as POE at 25, 50, 75 DAP.

The results revealed that imposing of treatment T_5 (Pendimethalin 1.0 kg/ha as PE + Organic mulch after bulb sprouting and remulch at every 4 month interval) significantly increased vegetative, flower quality and yield parameters as compare to other treatments.

Application of treatment T_5 (Pendimethalin 1.0 kg/ha as PE + Organic mulch after bulb sprouting and remulch at every 4 month interval) recorded significantly higher vegetative parameters like *viz.*, average plant height (at 25, 50, 75, 120, 240 DAP and at end of experiment), number of leaves per plant and tillers per plant (at 120, 240 and at end of experiment). Dry biomass of plant was also found maximum in the same treatment.

Floral parameters *viz.*, earliness for spike emergence, length of spike, vase life

and number of florets per spike were recorded maximum in treatments T_5. In case of spike yield (No. of spike and weight of spike per plant, per plot and per ha) and bulb yield (No. of bulb per plant, per plot and per ha as well as fresh weight of large individual bulb per plant, per plot and per ha) were recorded higher in treatments T_5.

Weed population and dry weight at 180 DAP and at end of experiment was recorded minimum in treatment T_2. Minimum dry weight of weed at end of experiment was recorded lowest in T_2. With the reference to treatment T_5, the highest weed control efficiency and least weed index was noticed in T_2 and least weed index was noticed in T_2.

Regarding nutrient status, treatment T_5 was found superior in case of N, P and K content and uptake by tuberose plant. However, minimum nutrient content and uptake by weed was recorded in treatment T_5.

The highest net returns (8,89,134 ha^{-1}) and B:C ratio (2.05) were obtained in treatment T_5 (Pendimethalin 1.0 kg/ha as PE + Organic mulch after bulb sprouting and remulch at every 4 month interval).

The overall impact of the present research work, the farmers associated with tuberose cultivation, are advised to use Pendimethalin 1.0 kg/ha as PE + Organic mulch (sugarcane tress) after bulb sprouting and remulch at every 4 month interval found better for growth and quality flower production of tuberose with suppressing the weed population.

140. Name of the student : Dudhat Rinkal Himmatbhai (2020217007)

Year of completion of degree : 2019

Name of the major advisor : Dr. Sudha Patil

Title of thesis : Effect of different storage media on corms of gladiolus (*Gladiolus hybridus* L.) var. Psittacinus Hybrid

Abstract

The present investigation entitled "Effect of different storage media on corms of gladiolus (*Gladiolus hybridus* L.) var. Psittacinus Hybrid" was carried out at Laboratory, Department of Floriculture and Landscape Architecture and Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat during 2018-2019.

The whole experiment was arranged over in two parts *viz.*, part A with CRD (Completely Randomized Design) and part B in Randomized Block Design (RBD) including 12 treatments *viz*., cold storage (control), cocopeat (100 %), sawdust (100 %), sand (100 %), rice husk (100 %), cocopeat + sawdust (50:50), cocopeat + sand (50:50), cocopeat + rice husk (50:50), sawdust + sand (50:50), sawdust + rice husk (50:50), sand + rice husk (50:50) and untreated (absolute control). The studies revealed significant variations among different treatments for most of the corms, vegetative, flowering and yield parameters as well as economics.

Amongst all the treatments, corms stored in cocopeat (T_2) exhibited maximum weight of corm (5.60 g), minimum physiological loss of weight (0.65 g), maximum corm diameter (2.70 cm) and minimum reduction in diameter (0.10 cm). Significantly lowest rotting percentage (12.84) was observed in corms stored in cold storage (T_1) however, none of the treatments recorded sprouting.

During crop growth, corms placed in sand during storage (T_4) recorded minimum days to sprout (7.53). Moreover, treatment of T_2 (cocopeat) and T_6 (cocopeat + sawdust) recorded most primitive survival percentage (86.63). Maximum plant height

(61.60 cm) at 90 DAP was recorded in corms placed in cocopeat (T_2) whereas maximum number of leaves per plant (12.93) were produced by corms placed in cocopeat + sawdust (T_6).

Response of gladiolus corms stored in different storage media to various vegetative, flowering and corm parameters were observed to be variable. The plants produced with corms stored in sand (T_4) showed minimum days to spike initiation (68.67) and days to first floret opening (9.40). Among the different treatments, T_6 *i.e.* corms stored in cocopeat + sawdust surpassed all other treatments and recorded longest spike and rachis length with 65.67 cm and 38.22 cm, respectively. Treatments T_2 *i.e.* corms placed in cocopeat alone recorded biggest floret of 4.61 cm and T_6 (cocopeat + sawdust) recorded maximum number of florets per spike (10.78). Maximum longevity of spike with 20.93 day and vase life of 11.67 days were recorded in spikes produced by corms stored in T_6. Same, treatment exhibited maximum number of spikes per plant (2.27), per plot (52.00) and per hector (216.67 thousand) in gladiolus.

Fascinatingly, the treatment T_3 *i.e.* corms stored in sawdust significantly recorded maximum number of corms per plant (2.40), number of corms per ha (291.67 thousand) and weight of corms per plant (64.08 g). Storage media treatments didn't impose any significant effect with regard to weight of cormels per plant and diameter of the corms but treatment T_3 showed maximum weight of cormels per plant (17.05 g) and maximum diameter of corm 5.02 cm. Maximum net return and BCR (Rs. 384691 and 1:0.81, respectively) was observed fpr treatment T_3 *i.e.* sawdust.

On the basis of the experimentation, corms stored in cocopeat + sawdust, cocopeat, sawdust and sand were significantly influenced corm parameters, vegetative parameters, flowering parameters and yield of gladiolus as compared to cold storage.

141. Name of the student : Gohel Ketan P. (2020217010)
Year of completion of degree : 2019
Name of the major advisor : Dr. Shivam T. Bhatt
Title of thesis : Effect of fertigation and bio stimulants on growth and flowering on rose (*Rosa indica* L.)

Abstract

The present investigation entitled "Effect of fertigation and bio stimulants on growth and flowering on rose (*Rosa indica* L.)" was carried out at Horticulture Polytechnic, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Large Plot Experiment (Analysis as per Completely Randomized Design with factorial concept) with twelve treatment combinations, consisting three levels of fertigation of nitrogen *i.e.* 50 % RDN (F_1), 75 % RDN (F_2), 100 % RDN (F_3) and four different types of bio stimulants *i.e.* Humic acid @ 0.5 % (B_1), *Panchgavya* @ 2 % (B_2), Novel liquid organic fertilizer @ 1 % (B_3) and No Spray (B_4). The treatments were repeated four times.

Among the various fertigation levels of nitrogen, application of 75 % RDN (F_2) to rose resulted maximum plant height (98.11 cm, 111.08 cm and 140.43 cm, respectively) at 120 days, 180 days and at the end of experiment, plant spread in N-S direction (61.36 cm, 77.50 cm and 91.74 cm) and E-W direction (66.04cm, 82.86 cm and 96.95 cm) at 4^{th} month, 8^{th} month and at the end of experiment, respectively, maximum number of branches (18.95 and 39.09) at first picking of summer and monsoon season, respectively. The flower diameter (6.92 cm, 5.27 cm and 6.10 cm) and weight of 10 flowers (18.92 g, 20.81 g, and 20.68 g) at first picking of each season. Highest number of flowers per plant (544.48), flower yield per (1242.68 g plant^{-1}, 4.97 kg plot^{-1}, and 15.34 t

ha^{-1}) highest available nitrogen in soil (323.56 kg ha $^{-1}$) were resulted with the application of 75 % RDN (F_2).

Foliar application of *panchgavya* @ 2 % (B_2) in rose plants significantly increased vegetative growth with respect to plant height (93.61 cm, 106.87 cm and 138.68 cm at 120 days, 180 days and at the end of experiment, respectively), plant spread (N-S) (63.06 cm, 79.83 cm and 93.02 cm), plant spread (E-W) (68.30 cm, 84.55 cm and 96.84 cm) at 4th month, 8th month and at the end of experiment, respectively and number of branches (18.90 and 38.54 at first picking of summer and monsoon season, respectively). Flower diameter (7.10 cm, 5.40 cm and 6.08 cm) and weight of 10 flowers (18.21 g, 20.81 g and 20.68 g) during first picking of winter, summer and monsoon season respectively. Highest numbers of flowers per plant (519.85 flowers) and flower yield (1117.56 g plant^{-1}, 4.60 kg plot^{-1} and 14.21 t ha^{-1}) with the foliar application of *panchgavya* @ 2 %.

Combined application of 75 % RDN with foliar application of *panchgavya* @ 2 % (F_2B_2) significantly increased numbers of flowers per plant (614.56 flowers) and flower yield (1349.97 g plant^{-1}, 5.40 kg plot^{-1} and 16.67 t ha^{-1}) in rose.

From the result of the present experiment, it can be concluded that the application of 75 % RDN through fertigation at 15 days interval with the foliar application of *panchgavya* @ 2 % at monthly interval enhanced all vegetative, flowering and yield characters in rose. The same treatment also resulted in the highest net return (Rs. 577261.71 ha^{-1}) and BCR (2.25) and thus economically found best for production of rose flowers.

142. Name of the student : Lad Jesikaben Thakorbhai (2020217014)
Year of completion of degree : 2019
Name of the major advisor : Dr. Alka Singh
Title of thesis : Standardization of drying techniques for preparation of dry ornamentals from different tree species

Abstract

The research endeavor entitled "Standardization of drying techniques for preparation of dry ornamentals from different tree species" was conducted during 2017-18 at Value Addition Laboratory, Department of Floriculture and Landscape Architecture, ASPEE College ofHorticulture and Forestry, Navsari Agricultural University, Navsari. This investigation was conducted in three experiments with Completely Randomized Design (CRD). Experiment- 1 *i.e.* Standardization of drying techniques for flowers of different tree species. It was carried out in flowers of five tree species *viz. Delonix regia, Peltophorum pterocarpum*, *Cordia sebestena, Plumeria alba*, *Plumeria rubra* forma bicolor planned with five treatments with 4 repetitions. Experiment- 2 *i.e.* Standardization of skeletonising techniques for *Ficus* spp. It was conducted in *Ficus religiosa* and *Ficus benjamina* with seven treatments with 3 repetitions. Experiment- 3 *i.e.* Standardization of bleaching techniques in dried ornamental pods and skeletonised leaves. It was carried out in skeletonised leaf of *Ficus religiosa* and pods of *Peltophorum pterocarpum* and *Sterculia foeitida* with nine treatments with 3 repetitions. The data recorded on various aspects were analyzed and the abstract of results is outlined as under. In the first experiment, among various techniques, drying of flowers in microwave oven was found best with regard to better flower colour retention, shape and size with less number of days taken for drying and higher shelf life of dried flowers of all five species *viz., Delonix regia*, *Peltophorum pterocarpum, Cordia sebestena*, *Plumeria alba* and *Plumeria rubra* forma bicolor.

However, embedding in silica under room condition also provides quality dried flowers with extended drying time in *D. regia* (10.00 days), *P. pterocarpum* (9.50 days), *C. sebestena* (8.75 days), *P. alba* (10.25 days) and *P. rubra* forma bicolor (12.00 days). In case of second experiment, maximum skeletonising percentage (98.01 %) with superior grade, minimum retention of green tissue (1.98 %), highest intactness of secondary (92.29 %) and tertiary veins (98.66 %), better colour (4.80) and texture (4.87) with higher loss in fresh weight (92.90 %) was recorded in leaves of *Ficus religiosa* when skeletonised using 20 % sodium carbonate. In case of *Ficus benjamina*, treatment of 20 % potassium hydroxide showed superior results for all the parameters *viz.*, maximum skeletonising percentage (99.35 %) with superior grade, minimum retention of green tissue (0.65 %) and better colour (4.67), and texture (4.93), higher loss in fresh weight (91.79 %) except intactness of secondary veins (97.87 %), that remain intact with 10 % potassium hydroxide. In reference to third experiment, bleaching of skeletonised leaves of *Ficus religiosa* using 30 % sodium chlorite and 30 % sodium hypochlorite by 4 hours of dipping method resulted in maximum bleaching percentage with superior grade, better colour and texture although showed higher loss in fresh weight of leaves. Bleaching of *Peltophorum pterocarpum* and *Sterculia foeitida* pods with 30 % sodium chlorite bydipping in 4 hours and 48 hours, respectively which was followed by 20 % sodium chlorite resulted in maximum bleaching percentage with superior grade, better colour and texture with higher loss in fresh weight of pods. Thus, value addition of plant materials through drying, skeletonization and bleaching using appropriate methods can be novel approach for preservation as well as income generation.

143. Name of the student : Patel Snehakumari Maheshbhai (2020217024)
Year of completion of degree : 2019
Name of the major advisor : Dr. S. A. Aklade
Title of thesis : Effect of different stimulants on growth, flowering and yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda

Abstract

The present investigation entitled “Effect of different stimulants on growth, flowering and yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda” was carried out at Floriculture Research Farm, ACHF, NAU, Navsari during 2017-18. The experiment was laid out in Randomized Blocked Design with three replications and nine treatments consisting of two levels of each of novel organic liquid nutrient @ 0.5 and 1.0 %, humic acid @ 1.0 and 1.5 %, *Panchagavya* @ 1.0 and 2.0 %, GA_3 @ 50 and 100 mg/l along with control (no spray).

The foliar application of novel organic liquid nutrient @ 1.0 % (T_2) at 45 and 60 DAT in African marigold significantly influenced vegetative, flowering and yield parameters as compared to other treatments which registered the maximum plant height, more number of branches per plant, highest stem diameter and maximum plant spread in East-West as well as in North-South directions at 70 and 100 DAT. The flowering parameters like maximum duration of flowering (71.33 days), flower diameter (5.85 cm), fresh weight of single flower (9.70 g), longevity (29.27 days), shelf life of flowers (5.47 days), number of flowers per plant (56.47), flower yield (398.24 g/plant, 8.12 kg/plot and 16.92 t/ha) were also recorded under novel organic liquid nutrient @ 1.0 % (T_2). Further, it also resulted in higher net income and BCR.

So, on the basis of the results obtained under the study and from economical point of view it can be concluded that the foliar application of novel organic liquid

nutrient @ 1.0 % found better regarding production as well as quality of African marigold cv. Pusa Narangi Gainda.

144. Name of the student : Ranjita Kulkarni (2020217029)
Year of completion of degree : 2019
Name of the major advisor : Dr. Sudha Patil
Title of thesis : Assessment of variability and genetic diversity in tuberose (*Polianthes tuberosa* L.)

Abstract

The research endeavor entitled "Assessment of variability and genetic diversity in tuberose (*Polianthes tuberosa* L.)" was conducted during 2018-2019, at the Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat. The experiment was laid out in randomized block design with three replications and fourteen different tuberose varieties *viz*., Arka Nirantara, Suvasini, Calcutta Double, Prajwal, Vaibhav, Phule Rajani, Hyderabad Single, Pune Local Single, Hyderabad Double, Pune Local Double, Mexican Single, Pearl Double, Shringar and Swarna Rekha as treatments.

Significantly early sprouting was observed in var. Phule Rajani (27.20 days) while non-significant but maximum sprouting percentage was recorded in var. Pearl Double *i.e.* 86.23 % (98.95 %). The vigorous growth in terms of plant height at 120 days (47.24 cm) and at 240 DAP (80.84 cm) was noted significantly in var. Pearl Double. Variety Pearl Double recorded significantly maximum leaves per plant at 120 DAP (46.53) whereas, var. Pune Local Single recorded significantly maximum leaves per plant at 240 DAP (108.53). A thorough glance of leaf area was found significantly maximum in var. Prajwal both at 120 and 240 DAP (128.00 cm^2 and 63.49 cm^2, respectively). With respect to flowering parameters, significantly early spike emergence was recorded in var. Hyderabad Single (187.27 days) while, significantly minimum days to 50 % flowering was observed in var. Mexican Single (213.73 days). Similarly, maximum rachis length and spike length were noted in var. Calcutta Double (36.80 cm) and Pune Local Single (111.20 cm), respectively. Variety Vaibhav produced significantly maximum number of florets per spike (55.60) while maximum number of florets open at a time was recorded in var. Mexican Single (7.47). However, the biggest flower was recorded in var. Calcutta Double (4.45 cm). Significantly longest spike longevity as well as vase life were observed in var. Mexican Single (30.00 days) and var. Pune Local Double (18.93 days), respectively. In case of yield parameters, significantly maximum spikes per plant (2.80) and per hector (148148.13) was recorded in var. Prajwal. Maximum number of bulbs and bulblets per plant were noted in var. Mexican Single (9.87) and Pearl Double. Variety Hyderabad Double and Pearl Double recorded significantly maximum weight of bulbs (193.71 g) and bulblets (95.67 g) per plant, respectively.

Fourteen varieties of tuberose characterized based on DUS guidelines developed by PPV and FRA New Delhi for 29 essential characters among which one character was monomorphic, thirteen dimorphic and fifteen were polymorphic indicating their potential for varietal characterization and distinctiveness.

High magnitude for genotypic and phenotypic coefficient of variation was observed for characters *viz*., percentage disease incidence, number of bulbs per plant and weight of bulbs per plant which indicated wide diversity for these characters. The high estimates of broad sense heritability and genetic advance as percentage of mean were observed for percentage disease incidence, number of bulblets per plant, number of

florets open at a time, weight of bulbs per plant, number of spikes per plant per year, plant height at 120 and 240 DAP, leaf area at 240 DAP and spike longevity.

Association between yield of spikes per plant and other contributing characters revealed that number of spikes per plant was noted highly significant and positive (genotypic and phenotypic) with the characters *viz.,* number of spikes per ha, floret diameter and weight of bulblets per plant.

Path coefficient analysis revealed that the maximum positive direct effects towards spike yield per plant was exerted via floret diameter followed by weight of bulblets per plant and number of leaves per plant at 240 DAP. The magnitude of residual effect was low.

The results of Mahalanobis's D^2 statistics revealed wider genetic diversity among 14 genotypes and grouped them into six clusters. The cluster I contained 7 genotypes followed by cluster II (2 genotypes). On the other hand, the clusters III, IV, V and VI possessed only one genotype in each cluster.

Total 545 reproducible amplicons with 60 loci were generated by 11 RAPD primers, out of which 47 were found polymorphic. The average percentage of polymorphism (76.12 %) was recorded in tuberose genotypes. Wide range of number of amplicons per primer was observed *i.e.* primer OPG-02 and OPG 06 had 4 amplicons whereas, highest 8 amplicons were scored for the primer OPG-08. The average number of amplicons per primer was 5.45. The Jaccard's similarity coefficients for 14 genotypes based on 11 RAPD markers were computed. The similarity coefficients were ranged from 0.458 to 0.967 and clustering based on similarity matrix of 14 tuberose genotypes was assessed. The quantification of RAPD expressed two major clusters. The largest cluster had 11 genotypes which was denoted as cluster II and the smaller with 3 genotypes denoted as cluster I. Further, the cluster II found to be grouped into two sub clusters *viz*., cluster II- B with 2 genotypes and cluster II- C with 7 genotypes.

145. Name of the student : Sangeetha Priya S. (2020217031)
Year of completion of degree : 2019
Name of the major advisor : Dr. Dipal S. Bhatt
Title of thesis : Effect of land configuration and nutrient management on growth and yield of African marigold (*Tagetes erecta* L.) var. Punjab Gainda-1

Abstract

The present experiment entitled "Effect of land configuration and nutrient management on growth and yield of African marigold (*Tagetes erecta* L.) var. Punjab Gainda-1" was conducted at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat during the year 2018. The experiment was laid out in Split Plot Design with nine treatment combinations, consisting of three land configuration methods *i.e.* flat bed (L_1), raised bed (L_2) and ridge and furrow system (L_3) and three doses of fertilizers *i.e.* 10 t FYM/ha + 100 % RDF (150:100:100 kg NPK/ha) (N_1), 8 t FYM/ha + 80 % RDF (120:80:80 kg NPK/ha) (N_2) and 6 t FYM/ha + 60 % RDF (90:60:60 kg NPK/ha) (N_3) replicated five times. Among various methods of land configuration, growing marigold plants on raised bed system (L_2) significantly increased plant height (62.93 cm and 104.41 cm), plant spread in North-South direction (52.27 cm and 70.95 cm), plant spread in East-West direction (51.03 cm and 73.18 cm) at 45 DAT and 90 DAT, respectively, number of branches per plant (11.91), fresh weight of plant (1083.60 g) and dry weight of plant (594.80 g). Moreover, early flower bud initiation (47.06 days), flower bud opening (60.95 days) and

50 % flowering (69.93 days) with longer flowering duration (99.67 days) were achieved in plants grown on raised bed system (L_2). Growing marigold plants on raised bed was found promising for significantly maximum flower diameter (5.36 cm), fresh weight of 10 flowers (65.05 g), number of flowers per plant (139.53) and shelf life of flowers (4.40 days). Significantly highest flower yield per plant (567.11 g), flower yield per plot (12.64 kg) and flower yield per ha (14.621 t) were produced with raised bed configuration (L_2). However, soil health parameters *viz.*, soil pH, EC, organic carbon, nitrogen, phosphorous, potassium, bulk density and water stable aggregates showed non-significant results due to the effect of different land configuration methods. Application of 10 t FYM/ha + 100 % RDF (150:100:100 kg NPK/ha) resulted maximum plant height (56.28 cm and 98.46 cm), plant spread in North-South direction (43.22 cm and 65.75 cm) and plant spread in East-West direction (44.07 cm and 68.53 cm) at 45 DAT and 90 DAT, respectively. Furthermore, maximum number of branches per plant (10.13), fresh weight of plant (966.53 g) and dry weight of plant (473.60 g) were observed in plants treated with 10 t FYM/ha + 100 % RDF (150:100:100 kg NPK/ha) *i.e.* N_1. Flowering characters like minimum days to bud initiation (53.97 days), days to bud opening (66.27 days) and 50 % flowering (72.47 days) with longer flowering duration (96.93 days), maximum flower diameter (4.91 cm), fresh weight of 10 flowers (61.55 g), highest number of flowers per plant (128.16), extended shelf life of flowers (3.73 days), highest flower yield (500.68 g plant^{-1}, 9.77 kg plot^{-1} 11.300 t ha^{-1}) were obtained from plants treated with 10 t FYM/ha + 100 % RDF (150:100:100 kg NPK/ha). However, application of different fertilizer doses exhibited non-significant effect on soil physical and chemical properties. Raised bed system along with the application of 8 t FYM/ha + 80 % RDF (120:80:80 kg NPK/ha) - L_2N_2 was found effective for obtaining maximum plant spread in N-S direction (58.67 cm and 76.74 cm), plant spread in E-W direction (56.74 cm and 79.93 cm) at 45 DAT and 90 DAT, respectively, highest number of branches per plant (13.14), number of flowers per plant (165.68), maximum flower yield (657.37 g plant^{-1}, 6.24 kg plot^{-1} and 16.257 t ha^{-1}). However, rest of the characters was found non-significant. Plants grown on raised bed configuration along with the application of 8 t FYM/ha + 80 % RDF (120:80:80 kg NPK/ha) *i.e.* L_2N_2 resulted maximum net income (Rs. 3,01,665.70/ha) with highest BCR (2.88) followed by raised bed system along with the application of 6 t FYM/ha + 60 % RDF (90:60:60 kg NPK/ha) *i.e.* L_2N_3. Thus, it can be concluded from the present findings that adopting raised bed system along with the application of 8 t FYM/ha + 80 % RDF (120:80:80 kg NPK/ha) for marigold cultivation was found economically feasible for maximum production of quality flowers.

146. Name of the student : Vamaja Shanikumar Mansukhbhai (2020217036)
Year of completion of degree : 2019
Name of the major advisor : Dr. Dipal S. Bhatt
Title of thesis : Effect of mulching on growth and flowering of chrysanthemum (*Dendranthema grandiflora*) cv. Ratlam Selection

Abstract

The present investigation entitled "Effect of mulching on growth and flowering of chrysanthemum (*Dendranthema grandiflora*) cv. Ratlam Selection" was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. The experiment was laid out in Randomized Block Design with nine treatments, consisting various types mulches *viz.*, T_1- no mulching, T_2- black polythene mulch (30 µ), T_3- white polythene mulch (30 µ), T_4- yellow polythene mulch (30 µ), T_5- red polythene mulch (30 µ), T_6- silver polythene mulch (30 µ), T_7-

sugarcane trash mulch @ 5 t ha^{-1}, T_8- paddy straw mulch @ 8 t ha^{-1} and T_9- dry grass mulch @ 6 t ha^{-1}. The treatments were replicated thrice. The results revealed that plants mulched with sugarcane trash @ 5 t ha^{-1} (T_7) was noticed promising to increase the growth, flowering and yield parameters as compare to other mulches used in this study. Significantly maximum plant height (50.13 cm), plant spread in North-South (30.68 cm) and East-West (34.20 cm) directions, leaf area (11.84 cm^2) and highest number of branches $plant^{-1}$ (9.67) were noted with the application of sugarcane trash mulch @ 5 t ha^{-1} (T_7). Among different types of mulches, sugarcane trash @ 5 t ha^{-1} (T_7) significantly increased flower diameter (6.59 cm), flower stalk length (8.73 cm), flower weight (3.20 g) and flowering duration (66.73 days). However, days taken to 50 % flowering was found non-significant. Yield attributes *viz.*, number of flowers $plant^{-1}$ (79.27), flower weight (219.03 g $plant^{-1}$) and flower yield (5.48 kg $plot^{-1}$ and 12.42 t ha^{-1}) were maximum in plants mulched with sugarcane trash @ 5 t ha^{-1} (T_7) which was statistically at par with white polythene mulch (30 µ) (T_3) and paddy straw mulch @ 8 t ha^{-1} (T_8). Significantly minimum fresh weight of weeds (49.33 g and 55.33 g) and dry weight of weed (19.67 g and 27.00 g) at 25 and 50 DAT, respectively were recorded in black polythene mulch (30 µ) (T_2). Whereas, available nitrogen, phosphorusand potash contents in soil was found non-significant. The highest BCR (1.88) and net returns (Rs. 3, 24, 087 ha^{-1}) were recorded in plants mulched with sugarcane trash @ 5 t ha^{-1} (T_7) followed by plants mulched with paddy straw @ 8 t ha^{-1} (T_8). From the result of the present experiment, it can be concluded that the plants mulched with sugarcane trash @ 5 t ha^{-1} enhanced vigorous growth, improved flower quality with higher yield of chrysanthemum cv. Ratlam Selection. The same treatment also resulted in the highest net returns (Rs. 3,24,087 ha^{-1}) and BCR (1.88) thus, economically found best for production of chrysanthemum flowers.

147. Name of the student : Zala Kuvar R. (2020217038)
Year of completion of degree : 2019
Name of the major advisor : Dr. Shivam T. Bhatt
Title of thesis : Year around flowering strategy for *Jasminum sambac* L.

Abstract

The present investigation entitled "Year around flowering strategy for *Jasminum sambac* L." was conducted at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2017-18. The experiment was conducted with ten treatments *viz.,* T_1 - Control, T_2 - $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after pruning, T_3 - *Panchgavya* (1 %) twice after pruning, T_4 - Tip pruning in June, T_5 - $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after pruning + tip pruning in June, T_6 - *Panchgavya* 1 % twice after pruning + tip pruning in June, T_7 – $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after pruning + tip pruning in June + $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after tip pruning, T_8 - *Panchgavya* 1 % twice after pruning + tip pruning in June + *Panchgavya* 1 % twice after tip pruning, T_9 - $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after pruning + $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice in June 1st week, T_{10} - *Panchgavya* 1 % twice after pruning + *Panchgavya* 1 % twice in June 1st week with three replications in Randomized Block Design (RBD).

Different growth stimulants and tip pruning had no significant effect on vegetative growth parameters *viz*., plant height whereas, significantly maximum leaf area (27.50 cm^2) in jasmine was observed in plants treated with T_2 treatmentin April and rest of the months not influenced significantly due to growth stimulants and tip pruning.

The result revealed that floral parameters significantly influenced by various

treatments of stimulants and tip pruning. In the months of March and May largest fully open flower (2.51 cm) was observed in treatment T_3. During April, maximum fully open flower size (2.51 cm) was obtained from plants treated with treatment T_2. The same treatmentrecorded maximum flower bud length (15.50 mm and 16.46 mm) in April and May month. Moreover, maximum flower bud diameter (6.48 mm and 6.96 mm, respectively) was noted from the plants treated treatment with T_2 while, plants treated with treatment T_3 noted maximum bud diameter (7.76 mm) in April.

During June to December months significantly largest fully open flower (2.51, 2.74 cm, 2.60 cm, 3.06 cm, 2.78 cm, 2.87 cm, 2.59 cm and 2.65 cm, respectively) was obtained from the plants treated with treatment T_7. The same treatment also resulted significant increase in length of flower bud (17.80 mm, 17.41 mm, 15.98 mm, 15.28 mm, 16.87 mm, 13.38 mm and 15.98 mm) as well as flower bud diameter (7.07 mm, 6.92 mm, 8.25 mm, 8.43 mm, 7.66 mm, 7.16 mm and 7.63 mm) during June to December months of experimentation.

During February, June, July, September and November month, weight of 100 flower buds significantly influenced due to different treatments of stimulants and tip pruning while, in rest of the months it showed non significant effect. Plants treated with treatment T_7 recorded significantly maximum weight of 100 flower buds (33.94 g, 30.79 g, 33.18 g and 33.80 g) in the months of June, July, September and November, respectively. While, treatment T_2 reported maximum weight of 100 flower buds (23.86 g) in February.

With respect to yield parameters, significantly maximum flower bud yield per plot (27.87 g, 790.77 g and 1569.44 g) was obtained from the plants treated with treatment T_2 during the month of February, March and April, respectively. Significantly highest flower bud yield per plot (646.94 g) was achieved from plants without any stimulant and pruning treatment T_1 in June. In the months of July, August and September, significant increase in flower bud yield per plot (355.46 g, 413.23 g and 256.67 g, respectively) was noted in plants treated with treatment T_7. During October and November, significantly maximum flower bud yield per plot (219.37 g and 76.00 g) was resulted from plants treated with treatment T_5. Whereas, plants treated with treatment T_7 produced highest bud yield per plot (35.86 g) in December. Application of $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after pruning + tip pruning in June + $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after tip pruning (T_7) to jasmine produced significantly maximum total flower bud yield (4.83 kg per plot and 8.39 t per ha). Looking to the economics of present investigation, highest net income (Rs. 4,96,385.8 per ha) with maximum benefit: cost ratio (3.19) was obtained from treatment T_8.

Based on the findings of present investigation, it can be concluded that foliar application of $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after pruning + tip pruning in June + $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) twice after tip pruning found beneficial to induce year round production of marketable flower buds. Moreover, application of *Panchgavya* 1 % twice after pruning + tip pruning in June + *Panchgavya* 1 % twice after tip pruning has been found most economical for inducing year round flowering in *Jasminum sambac* L.

148. Name of the student : Alka (2020218002)
Year of completion of degree : 2020
Name of the major advisor : Dr. Dipal S. Bhatt
Title of thesis : Effect of various stimulants on growth, flower quality and yield of chrysanthemum

Abstract

The present investigation entitled “Effect of various stimulants on growth, flower quality and yield of chrysanthemum” was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2019-20 to study the effect of different stimulants on growth, flower quality and yield of chrysanthemum. The experiment was laid out in Randomized Blocked Design with three replications and twelve treatments *viz*. T_1= $FeSO_4$ (0.5 %), T_2= $ZnSO_4$ (0.5 %), T_3= NAA (20 ppm) + Urea (2 %), T_4= $FeSO_4$ (0.5 %) + $ZnSO_4$ (0.5 %) + NAA (20 ppm), T_5= *Nauroji* Novel Organic liquid nutrient 1 %, T_6= *Nauroji* Novel Organic liquid nutrient 2 %, T_7= *Panchgavya* (0.5 %), T_8= *Panchgavya* (1.0 %), T_9= Humic acid (0.25 %), T_{10}= Humic acid (0.5 %), T_{11}= Water spray and T_{12}= No spray (control). The results revealed that foliar application of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ + 20 ppm NAA treatment (T_4) has significantly influenced vegetative, flowering and yield parameters as compared to other treatments. Foliar application of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ + 20 ppm NAA (T_4) to chrysanthemum plants after transplanting significantly increased plant height (28.83 cm and 34.26 cm), plant spread in N – S direction (27.18 cm and 30.29 cm) and E - W direction (27.46 cm and 29.48 cm) and highest number of branches per plant (6.93 and 8.53) at 60 and 75 days, respectively. Early flower bud initiation (40.80 days), minimum days for flower bud opening (62.80 days), minimum days taken to 50 % flowering (80.67 days), maximum flower diameter (11.03 cm), flower stem length (32.89 cm), vase life (7.87 days) and highest flower stem yield (5.73 per plant, 150.27 per plot and 340654 per ha) were observed with foliar application of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ + 20 ppm NAA (T_4). Looking to the economics of present investigation, higher cost benefit ratio (3.00) and net returns (Rs. 365982 /ha) were obtained in plant sprayed with the application of *Panchgavya* 1.0 % (T_8) at 30, 45 and 60 days after transplanting of chrysanthemum. Thus, it can be concluded from the present findings that the foliar spray of 0.5 % $FeSO_4$ + 0.5 % $ZnSO_4$ + 20 ppm NAA (T_4) at 30, 45 and 60 days after transplanting of chrysanthemum enhanced growth, improved flower quality and yield of chrysanthemum cv. Thai Chen Queen. While, foliar application of *Panchgavya* 1.0 % (T_8) resulted highest net return (Rs. 365982 per ha) with maximum BCR (3.00). Economically foliar application of *Panchgavya* 1.0 % at 30, 45 and 60 days after planting found best for quality flower production of chrysanthemum cv. Thai Chen Queen.

149. Name of the student : Chotaliya Kautik Arjanbhai (2020218010)

Year of completion of degree : 2020

Name of the major advisor : Dr. G. D. Patel

Title of thesis : Response of air layering on rooting of rose (*Rosa centifolia* L.)

Abstract

The experiment on “Response of air layering on rooting of rose (*Rosa centifolia* L.)” was carried out at Horticulture Polytechnic, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the June, 2019.

The objective was to study the impact of different treatments on rooting of rose and to determine the appropriate treatments on survival of air layering. The experiment was laid out in Completely Randomized Design (CRD) with eleven treatments *viz.*, T_1= without treated unfold area of twig, covered with gardensoil moist in water and wrapped in transparent plastic, T_2= without treated unfold area of twig, covered with sphagnum moss moist in water and wrapped in transparent plastic, T_3= without treated unfold area

of twig, covered with sphagnum moss moist in water and wrapped in black plastic, T_4= without treated unfold area of twig, covered with sphagnum moss moist in PGPRs consortia and wrapped in black plastic, T_5= without treated unfold area of twig, covered with sphagnum moss moist in 0.5% solution of 12:61:00 and wrapped in black plastic, T_6= Pasted IBA @ 250 ppm on exposed twig, covered with sphagnum moss moist in water and wrapped in black plastic, T_7= Pasted IBA @ 250 ppm on exposed twig, covered with sphagnum moss moist in PGPRs consortia and wrapped in black plastic, T_8= Pasted IBA @ 250 ppm on exposed twig, covered with sphagnum moss moist in 0.5% solution of 12:61:00 and wrapped in black plastic, T_9= Pasted IBA @ 500 ppm on exposed twig, covered with sphagnum moss moist in water and wrapped in black plastic, T_{10}= Pasted IBA @ 500 ppm on exposed twig, covered with sphagnum moss moist in PGPRs consortia and wrapped in black plastic, T_{11}= Pasted IBA @ 500 ppm on exposed twig, covered with sphagnum moss moist in 0.5% solution of 12:61:00 and wrapped in black plastic with three repetition. There were 25 air layers (20 for nondestructive + 5 for destructive parameters) prepared per treatment per repetition.

The air layer prepared with pasting of IBA @ 500 ppm on exposed twig covered with water moist sphagnum moss covered and wrapped in black plastic (T_9) found significantly effective on root characters, shoot characters, callus formation and survival of air layering in rose. This treatment recorded significantly highest rooting per cent (90.67), number of primary (14.80) and secondary roots (33.87), length of primary (5.22 cm) and secondary roots (2.14 cm), thickness of primary roots (0.64 mm), fresh (0.48 g) and dry weight (0.14 g) of roots, fresh (28.21 g) and dry weight (9.89 g) of shoots and callus formation (1.58 cm). With respect to survival per cent the maximum survival per cent (94.07) were recorded after 1 month of transfer into poly bags.

On the basis of the result obtained from the investigation, it can be concluded that the rose (*Rosa centifolia* L.) prepared with pasting of IBA @ 500 ppm on exposed twig covered with water moist sphagnum moss and wrapped in black plastic (T_9) was found the most effective for diameter of callusing, rooting per cent, number of primary and secondary roots, length of primary and secondary roots, thickness of primary root, fresh and dry weight of roots, fresh and dry weight of shoots as well as final survival of rose air layering. Consequently, IBA @ 500 ppm + water moist sphagnum moss + wrapped in black plastic was found promising for adequate callus formation, effective root and shoot growth as well as adequate survival of rose air layers.

150. Name of the student : Mangroliya Ronak M. (2020218018)
Year of completion of degree : 2020
Name of the major advisor : Dr. Shivam T. Bhatt
Title of thesis : Effect of split application of fertilizers on growth, yield and quality of *Jasminum sambac* L.

Abstract

The present investigation entitled “Effect of split application of fertilizers on growth, yield and quality of *Jasminum sambac* L.” was conducted at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2018-19.

The experiment was conducted with five treatments T_1 - application of 50 % N + 100 % P + 100 % K at last week of December and 50 % N in last week of June, T_2 - application of 50 % N + 75 % P + 75 % K in last week of December + 25 % N + 25 % K in last week of March + 25 % N + 25 % P in last week of June, T_3- application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 25 % P + 25 % K in last

week of March + 25 % N + 25 % P + 25 % K in last week of June, T_4- application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N in last week of March + 25 % N + 50 % K + 50 % P in last week of June, T_5- Application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 50 % P + 50 % K in last week of March + 25 % N in last week of June with five replications in Randomized Block Design (RBD).

Application of 50 % N + 100 % P + 100 % K at last week of December and 50 % N in last week of June (T_1) to jasmine plants resulted maximum length of secondary shoot (29.87 cm), plant spread (83.58 cm) in N-S and (72.43 cm) in E-W directions, weight of hundred flower buds (33.0 g) at 90 days after pruning.

Plants receiving application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 50 % P + 50 % K in last week of March + 25 % N in last week of June(T_5) showed maximum plant height (172.70 cm), length of secondary shoot (67.49 cm), plant spread (114.99 cm) in N-S and (104.33 cm) in E-W directions, flower bud diameter (9.02 mm) and weight of hundred flower buds (36.11 g) at 180 days after pruning.

At 240 days after pruning, maximum flower bud diameter (8.04 mm), weight of hundred flower buds (34.20 g) and at 360 days after pruning maximum plant height (187.84 cm), length of secondary shoot (90.10 cm), plant spread (135.15 cm) in N-S and (132.63 cm) in E-W directions were recorded when plants treated with application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 25 % P + 25 % K in last week of March + 25 % N + 25 % P + 25 % K in last week of June (T_3).

With respect to yield parameters, plants treated with application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 25 % P + 25 % K in last week of March + 25 % N + 25 % P + 25 % K in last week of June (T_3) recorded maximum flower yield (4.33 kg per plot) with the total yield of flower bud per ha (7.51 t).

Plants receiving application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 25 % P + 25 % K in last week of March + 25 % N + 25 % P + 25 % K in last week of June (T_3) resulted maximum available nitrogen in soil (231.53 kg/ha) and highest available phosphorus in soil (69.03 kg/ha) was observed in plant treated with application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 50 % P + 50 % K in last week of March + 25 % N in last week of June(T_5).

The highest net returns (Rs.4,11,729/ha) and BCR (2.71) and were recorded with application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 25 % P + 25 % K in last week of March + 25 % N + 25 % P + 25 % K in last week of June (T_3).

On the basis of results obtained from the present experiment, it can be concluded that the application of RDF (120:240:120 kg/ha) in three splits (application of 50 % N + 50 % P + 50 % K in last week of December + 25 % N + 25 % P + 25 % K in last week of March + 25 % N + 25 % K + 25 % P in last week of June) enhanced vegetative growth, improved quality of flower buds and increased yield with highest net return and BCR (2.71) and therefore, was economically deduced best for production of *Jasminum sambac*.

151. Name of the student : Patel Shivangeeben Ambubhai (2020218036)
Year of completion of degree : 2020
Name of the major advisor : Dr. B. B. Patel
Title of thesis : Effect of different concentrations of IBA and rooting media on growth of rose cutting (Country rose)

Abstract

Research study entitled "Effect of different concentrations of IBA and rooting media on growth of rose cutting (Country rose)" was conducted during rainy season of the year 2019 at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. There were nine treatment combinations comprising three levels of IBA concentration *i.e.* C_1: 1000 ppm, C_2: 1500 ppm, C_3: 2000 ppm and three rooting media *i.e.* M_1: Sand (fine sand), M_2: Red Soil and M_3: Cocopeat + Vermicompost in a Randomized Block Design with Factorial concept with three replications.

The result showed that IBA concentration of 1500 ppm (C_2) recorded maximum highest number of sprouts per cutting (3.00), number of sprouts per treatment (43.67), sprouting percentage (80.37), length of longest shoot (10.04 cm and 16.23 cm), shoot diameter (0.33 cm and 0.40 cm) at 30 and 60 days, respectively, number of roots (9.87), length of longest root (10.53 cm), survival percentage (60.37) and number of leaves per cutting (6.71, 8.60 and 11.96) at 30, 45 and 60 days, respectively.

Among the various rooting media, red soil (M_2) was most effective for obtaining maximum values for number of sprouts per cutting (3.56), number of sprouts per treatment (53.78), sprouting percentage (82.22), length of longest shoot (12.94 cm and 20.33cm at 30 and 60 days, respectively), shoot diameter (0.39 cm and 0.47 cm at 30 and 60 days, respectively), number of leaves per cutting (8.27, 10.56 and 13.84 at 30, 45 and 60 days, respectively), number of roots (12.33), survival percentage (68.89) and minimum days taken to 50 % sprouting (6.67), while maximum length of longest root (10.97 cm) in sand (M_1).

The combined effect of IBA concentrations and rooting media was found significant and observed highest number of sprouts per cutting (4.00), number of sprouts per treatment (66), number of leaves per cutting (10.40, 12.73 and 15.73) at 30, 45 and 60 days, respectively and survival percentage (81.11) under the treatment C_2M_2 (IBA @ 1500 ppm + Red soil).

It can be concluded that in country rose cutting application of IBA @ 1500 ppm using quick dip method and red soil as growing media is most effective for better shoot and root growth as well as survival percentage.

152. Name of the student : Trivedi Saryu Jaldhibhai (2020218048)
Year of completion of degree : 2020
Name of the major advisor : Dr. B. B. Patel
Title of thesis : Effect of biostimulants on growth and yield in gladiolus

Abstract

A field experiment on "Effect of biostimulants on growth and yield in gladiolus" was conducted at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during November- 2019 to May-2020. The experiment comprised of 10 treatments of biostimulants and their combinations *i.e.* Humic acid 0.2 %, *Panchgavya* 3 %, Vermiwash 3 %, *Novel* organic liquid nutrient 1 %, Seaweed extract 1 %. The treatments were applied as foliar spray at 30, 45 and 60 days after planting. The experiment was laid out in randomized block design (RBD) with three replications in gladiolus, 'Psittacinus Hybrid'.

The results indicate that the growth parameters were differed with various treatments. Among different concentrations of biostimulants, T_6 (Humic acid 0.2 % + *Panchgavya* 3 %) was found numerically highest plant height at 60, 90 and 120 DAP

(62.83 cm, 63.23 cm and 63.49 cm respectively) and number of leaves per plant (16.93).

An advanced 50 % spike emergence (60.67 days) and early harvesting (17.50 days) were also recorded with the application of Humic acid 0.2 % + *Panchgavya* 3 %. Other floral characters *viz.* spike length (84.21 cm), rachis length (55.56 cm), Second floret diameter (5.94 cm), Number of florets per spike (10.93) and vase life (9.50 days) were also found maximum with T_6 (Humic acid 0.2 % + *Panchgavya* 3 %).

Yield attributes *viz.* number of spikes per plant (2.60), per plot (42.67) and per hectare (1.58 lakh), corm diameter equatorial and polar (4.45 cm and 3.53 cm), corms per plant (3.36), per plot (61.67) and per hectare (2.28 lakh), cormels per plant (4.38), per plot (97.33) and per hectare (3.60 lakh) and weight of corms per plant and per plot (60.32 g and 1146.02 g) were found better with the application of Humic acid 0.2 % + *Panchgavya* 3 %.

T_6 (Humic acid 0.2 % + *Panchgavya* 3 %) as found superior with higher net realization (Rs. 6,34,279 per hectare) and higher BCR (1.72).

It can be concluded that the foliar application of Humic acid 0.2 % + *Panchgavya* 3 % sprayed at 30, 45 and 60 days after planting obtained highest quality flower production with maximum net return.

153. Name of the student : Vidyashree S (2020218049)

Year of completion of degree : 2020

Name of the major advisor : Dr. Sudha Patil

Title of thesis : Effect of packaging and priming on germination of China aster [*Callistephus chinensis* (L.) Nees.] seeds

Abstract

The present investigation entitled "Effect of packaging and priming on germination of China aster [*Callistephus chinensis* (L.) Nees.] seeds" was carried out at Laboratory, Department of Floriculture and Landscape Architecture and Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during February, 2019 to November, 2019 which was further divided into two experiments.

First experiment "Effect of packaging on germination of seeds of China aster varieties" was carried out in completely randomized design with factorial concept comprising two factors and replicated thrice. Factor 1: Varieties (Arka Archana and Arka Kamini) and Factor 2: Packaging treatments *viz.*, P_1: Plastic bags at refrigerated condition, P_2: Plastic containers at refrigerated condition, P_3: Aluminium sachets at refrigerated condition, P_4: Vacuum packing in plastic bags at refrigerated condition and P_5: Plastic bags at room condition.

Among both varieties of China aster, var. Arka Archana (V_1) significantly achieved higher seed viability (83.07 %), higher speed of germination (21.49), maximum germination percentage at 7^{th} and 14^{th} day (61.21 and 78.68, respectively) with minimum electrical conductivity (123.56 dS/m) and mean germination time (18.40 days) as compared to var. Arka Kamini (V_2). Faster growth in terms of days required to reach 5^{th} leaf stage (34.17) and strong seedling growth due to maximum root length, shoot length and seedling length (2.21 cm, 8.24 cm and 10.45 cm, respectively), seedling fresh and dry weight (547.73 mg and 46.13 mg, respectively) at 45 days after seed sowing was recorded in seedlings grown from seeds of var. Arka Archana (V_1) compared to seedlings produced by var. Arka Kamini (V_2). Moreover, significantly maximum seed vigour index- I and II (859.01 and 4022.07, respectively) was also noted in seeds of var. Arka Archana (V_1) over var. Arka Kamini (V_2).

Different packaging materials shown significant influence on seed quality and growth of seedlings. Seeds vacuum packed in plastic bags and stored at refrigerated condition (P_4) resulted in highest seed viability (87.00 %), lower electrical conductivity (102.75 dS/m), highest speed of germination (23.99) with minimum mean germination time (16.33 days) and days required to reach 5th leaf stage (28.63). Moreover, significantly maximum germination at 7th and 14th day (71.62 % and 85.20 %, respectively), root length (2.94 cm), shoot length (8.84 cm), seedling length (11.79 cm), seedling fresh weight (758.33 mg), seedling dry weight (59.00 mg), seed vigour index-I (1039.00) and seed vigour index-II (5365.01) was observed in vacuum packaging of seeds done in plastic bags and stored at refrigerated condition (P_4).

In case of interaction of varieties and packaging treatments, maximum seed viability percentage (92.67), speed of germination (25.17), germination percentage at 7th and 14th day (72.57 and 86.63, respectively), root length (2.97 cm), shoot length (9.16 cm), seedling length (12.13 cm), fresh weight (833.33 mg) and dry weight (60.00 mg) of seedling, seed vigour index - I and seed vigour index - II (1052.48 and 5544.07, respectively) whereas, minimum electrical conductivity (94.93 dS/m), mean germination time (15.33 days) and days required to reach the 5th leaf stage (27.73) were noticed in seeds of var. Arka Archana after 6 months of storage of seeds in vacuum packed plastic bags and kept at refrigerated condition (V_1P_4) while poor results were obtained in seeds of var. Arka Kamini packed in plastic bags kept at room condition (V_2P_5).

The second consecutive experiment on "Effect of priming on germination of seeds of China aster varieties" was carried out in completely randomized design with factorial concept with three replications comprising two varieties *viz.*, V_1- Arka Archana and V_2- Arka Kamini and seed priming treatments *viz*., T_1: Control, T_2: Hydropriming for 12 hrs, T_3: Hydropriming for 24 hrs, T_4: GA_3 @ 50 ppm for 24 hrs, T_5: GA_3 @ 100 ppm for 24 hrs, T_6: GA_3 @ 150 ppm for 24 hrs, T_7: KNO_3 @ 250 ppm for 24 hrs, T_8: KNO_3 @ 500 ppm for 24 hrs, T_9: KNO_3 @ 750 ppm for 24 hrs, T_{10}: *Trichoderma viride* @ 1x10^7 cfu/ml for 24 hrs, T_{11}: *Nauroji* Novel organic liquid fertilizer @ 1 % for 24 hrs and T_{12}: *Nauroji* Novel organic liquid fertilizer @ 2 % for 24 hrs.

All parameters were significantly affected by both the varieties of China aster in which var. Arka Archana (V_1) recorded maximum speed of germination (14.90), germination percentage at 7th day (53.95) and 14th day (75.41), root length (4.45 cm), shoot length (8.66 cm), seedling length (13.11 cm), seedling fresh weight (942.28 mg) and seedling dry weight (72.28 mg), seed vigour index- I (1041.97) and seed vigour index- II (4401.29) with minimum mean germination time (18.42 days) and time required to reach 5th leaf stage (37.29 days) over var. Arka Kamini (V_2).

Different priming treatments significantly affected germination and growth of seedling of China aster. Among all treatments, seeds primed with GA_3 @ 100 ppm for 24 hrs (T_5) showed highest speed of germination (23.38), germination on 7th and 14th day (63.50 % and 89.17 %, respectively), root length, shoot length and seedling length (6.09 cm, 10.73 cm and 16.82 cm, respectively), seedling fresh and dry weight (1571.67 mg and 127.00 mg, respectively) as well as seed vigour index – I and II (1533.69 and 8328.00, respectively) with minimum mean germination time (14.50 days) and time to reach 5th leaf stage (31.17 days) as compared to control and other priming treatments.

With respect to interaction of varieties and priming treatments, significantly maximum speed of germination (24.45), germination percentage at 7th and 14th day (71.50 and 90.00, respectively), root length (6.63 cm), seedling length (17.70 cm), seedling fresh weight (1618.00 mg), seedling dry weight (141.33 mg), seed vigour index-I (1627.62) and seed vigour index-II (10082.00) was recorded with seeds of var. Arka Archana primed with GA_3 @ 100 ppm for 24 hrs (V_1T_5). Whereas, rest of all the characters were found non significant but maximum shoot length (11.07 cm), minimum

mean germination time (13.67 days) and days required to reach the 5th leaf stage (29.60) were obtained in same treatment (V_1T_5). Moreover, poor performance was recorded in seeds of var. Arka Kamini treated with *Nauroji* Novel organic liquid fertilizer @ 2 % for 24 hrs (V_2T_{12}).

According to the statistical analysis, it can be concluded from results that seeds of China aster var. Arka Archana packed in vacuum packaging in plastic bags at refrigerated condition (V_1P_4) and seed of same variety treated with GA_3 @ 100 ppm for 24 hrs (V_1T_5) improved seed germination, seed vigour and seedling growth under Navsari condition.

POST HARVEST TECHNOLOGY

154. Name of the student : Desai Riddhi Prakashkumar (2020214011)
Year of completion of degree : 2016
Name of the major advisor : Dr. Shakti S. Arbat
Title of thesis : Standardization of ginger flavoured aonla-carrot blended beverage

Abstract

The present investigation entitled "Standardization of ginger flavoured aonla-carrot blended beverage" was aimed to standardize formulation for the preparation of nutritional as well as medicinal drink by blending aonla, carrot and ginger. The blended beverage with varying levels of juice of aonla and carrot with 15^o Brix TSS, 0.3 per cent acidity was preferred and evaluated by complete randomized design and three repetitions for changes in chemical and sensory qualities during storage period of 0, 2, 4 and 6 months at room temperature. In the ginger flavoured aonla-carrot blended beverage, the highest bio-chemical characters like TSS, acidity, total sugars, reducing sugars and ascorbic acid were recorded in proportion of T_{11} (aonla:carrot:ginger, 18:0:2). However, T_1 (aonla: carrot: ginger, 0:18:2) was found good in higher level of sugar: acid ratio and β-carotene. The chemical constituents like TSS, acidity, total sugars, reducing sugars were found increasing trend during storage while, sugar: acid ratio, ascorbic acid and β-carotene were found decreased during six months of storage. In sensory evaluation, T_6 (aonla: carrot: ginger, 9:9:2) was rated best treatment on the basis of higher sensory scores in colour, taste, flavour and overall acceptability which exhibited minimum changes in sensory attributes. All sensory parameters decreased during six months of storage. The cost of production of ginger flavoured aonla-carrot blended beverage was maximum in T_1 *i.e.* (aonla: carrot: ginger, 0:18:2) with low benefit: cost ratio, while low cost of production in T_{11} *i.e.* (aonla: carrot: ginger, 18:0:2) with high benefit: cost ratio. According to results obtained, it may be suggested that for preparation of ginger flavoured aonla-carrot blended beverage, 9 per cent aonla, 9 per cent carrot and 2 per cent ginger (aonla:carrot:ginger, 9:9:2) juice blend should be used for optimum quality beverage.

155. Name of the student : Lavanya Tahasildar (2020214019)
Year of completion of degree : 2016
Name of the major advisor : Dr. Dev Raj
Title of thesis : Optimization of blend for the preparation of nectar using aloe vera (*Aloe barbadensis* Miller.), guava (*Psidium guajava* L.) and jamun (*Syzigium cuminii* L.)

Abstract

The present investigation entitled "Optimization of blend for the preparation of nectar using Aloe vera (*Aloe barbadensis* Miller.), guava (*Psidium guajava* L.) and jamun (*Syzigium cuminii* L.)" was aimed to standardize formulation for the preparation of blended nectar by blending *Aloe vera*, guava and jamun; and to evaluate nutritional, sensory and microbial quality of blended nectar during storage. During investigation, experiment was laid out using completely randomized design with factorial concept. Experiment was conducted for preparation of blended nectar using different levels of blends [B_1- 2:2:16, B_2- 2:4:14, B_3- 2:6:12, B_4- 4:2:14, B_5- 4:4:12, B_6- 4:6:10, B_7- 6:2:12, B_8- 6:4:10 and B_9-6:6:8 (*Aloe vera*: Guava: Jamun)] and TSS (T_1- 15 °B and T_2- 17 °B). The results of the present investigation indicate that selected produce can be recommended for processing into blended nectar. Blended nectar prepared from 4 per cent *Aloe vera*, 2 per cent guava and 14 per cent jamun having TSS of 15.00 °Brix and 0.30 per cent acidity was rated as the best treatment (T_1B_4) on the basis of higher sensory score as well as nutritional composition. Six month storage of blended nectar prepared by using 4 % *Aloe vera*, 2 % guava and 14 % jamun having TSS of 15 °Brix and 0.30 per cent acidity (T_1B_4) exhibited minimum changes in nutritional as well as sensory attributes. During storage period of six months, no microbial counts were observed in blended nectar. Overall findings of investigation revealed that blended nectar can successfully be stored for 6 months in glass bottles (after 30 min heat processing at 96 ± 1 °C) with minimum changes in chemical, sensory and microbial quality. The benefit cost ratio (BCR) of blended nectar was 1.20 at 20 per cent profit margin and 1.70 at minimum market sale price of Rs. 15.00 per bottle (200 ml). Thus, prepared formulation can commercially be explored by food processing industry for the production of quality blended nectar to ensure better returns to growers, processors and consumers as well.

156. Name of the student : Patel Santosh Vijaybhai (2020214036)
Year of completion of degree : 2016
Name of the major advisor : Dr. C. S. Desai
Title of thesis : Standardization of blended nectar using banana pseudo-stem sap and mango pulp

Abstract

The present investigation entitled "Standardization of blended nectar using banana pseudostem sap and mango pulp" was undertaken at Department of Post-harvest Technology and Banana Pseudostem Processing Unit, Navsari Agricultural University, Navsari during the year 2015-2016. In this experiment different combinations of banana pseudostem sap and mango pulp were taken as treatments to prepare blended nectar and packed glass bottles were stored at room temperature. The physico-chemical properties *viz.* Acidity (%), Total sugar (%), Reducing sugar (%), Non-reducing sugar (%), Lipid (%), Potassium (%), Carbohydrate (%), Protein (%), Calorific value (Kcal), Iron (mg/100 g), microbial characteristics and sensory qualities were evaluated periodically up to six months. The result data were statistically analyzed by using simple CRD with 3 repetitions. It can be elucidated that Acidity, Total sugars, Reducing sugars, Carbohydrate, Protein and Calorific value was best gain in treatment T_1 *viz.* 0 % banana pseudostem sap and 100 % mango pulp, whereas T_{11} *viz.* 100 % banana pseudostem sap and 0 % mango pulp gain highest Lipid, Potassium and Iron content. Acidity and Lipid content of nectar showed increasing trend while most of the other parameter value showed very slight decreasing trend during 6 month of storage period. Looking to the sensory scores of blended nectar, treatment T_1 *viz.* 0 % banana pseudostem sap and 100 % mango pulp gained maximum score at initial, 2, 4, and 6 month of storage, which

might be due to higher proportion of mango pulp which was preferred more by panelists. During storage period of six months no microbial counts were observed in blended nectar. Overall findings of investigation revealed that blended nectar can successfully be stored for 6 months in glass bottles (after 30 min heat processing at 96 ± 1 °C) with minimum changes in chemical, sensory and microbial quality. Moreover, blending up to 50 % banana pseudostem sap with 50 % mango pulp was found with acceptable sensory qualities which were not only preferred by panelist but also provide higher nutritive qualities than onward treatments.It also revealed from the experiment that as the proportion of banana pseudostem sap increased in the blended nectar, the net profit and B:C ratio also increasing due to cheap raw material cost of banana pseudostem sap than mango pulp. Thus, prepared formulation can commercially be explored by food processing industry for the production of quality blended nectar to ensure better returns to growers, processors and consumers as well.

157. Name of the student : Zinzala Paresh Bhikhabhai (2020214042)
Year of completion of degree : 2016
Name of the major advisor : Dr. Dev Raj
Title of thesis : Evaluation of UV light effect for preservation of aloe vera, bitter gourd, aonla and guava blended nectar

Abstract

The present investigation entitled "Evaluation of UV light effect for preservation of Aloe vera, bitter gourd, aonla and guava blended nectar" was aimed to study the effect of UV light for preservation of blended nectar for quality retention, to study the physico-chemical and sensory quality of blended nectar during storage, to evaluate economics of the blended nectar. During investigation, experiment was laid out using completely randomized design. Experiment was conducted for preservation of blended nectar (12 % *Aloe vera* juice, 2 % Bitter gourd juice, 2 % Aonla juice and 4 % Guava pulp having 15.00 °Brix TSS and 0.30 per cent acidity) using different preservation methods *i.e.* standard heat processing, chemical preservation and UV light treatments. The results of the present investigation indicate that blended nectar can be preserved for long time by adding 75ppm KMS (50 % recommended chemical preservative) followed by 30 minutes UV light treatment (T_{10}- $P_{75}U_{30}$) on the basis of higher sensory score as well as nutritional composition. Six month storage of blended nectar preserved by adding 75 ppm KMS followed by 30 minutes UV light treatment (T_{10}- $P_{75}U_{30}$) exhibited minimum changes in nutritional as well as sensory attributes. Overall findings of investigation revealed that blended nectar can successfully be stored for 6 months in glass bottles with minimum changes in chemical, sensory and microbial quality. The Benefit cost ratio (BCR) of blended nectar was observed 1.20 at 20 per cent profit margin and 1.74 at minimum market sale price of Rs. 10.00 per bottle (200 ml). Thus, UV light treatment of blended nectar for 30 minutes containing 75 ppm KMS can be utilized more beneficially for its preservation by food processing industry for a period of six months to ensure minimum changes in nutritional as well as sensory quality.

158. Name of the student : Ashuqullah (2020215004)
Year of completion of degree : 2017
Name of the major advisor : Dr. Dev Raj

Title of thesis : Evaluation of sweet potato {*Ipomoea Batatas* (L) Lam} varieties and pre-treatments for dehydration into flour

Abstract

The present investigation entitled "Evaluation of sweet potato {*Ipomoea batatas* (L) Lam} varieties and pre-treatments for dehydration into flour" was aimed to evaluate suitable sweet potato variety/varieties for dehydration into flour, to standardize suitable pre-treatment (s) for dehydration of sweet potatoes into flour and to evaluate the nutritional as well as sensory quality of developed products during storage. During investigation, experiment was laid out using completely randomized design with factorial concept. Experiment was conducted for dehydration of sweet potatoes into flour using different sweet potato varieties ["Gauri" (V_1), "ST-14" (V_2), "CIP-440038" (V_3) and "Kamala Sundari" (V_4)], blanching pre-treatments [without blanching (B_1) and with blanching at 85 ^oC for 3 min (B_2)] and sulphitation pre-treatments [Control (K_1), KMS @ 1000 ppm (K_2), KMS @ 2000 ppm (K_3)]. The prepared flour was packed in polypropylene bags of 200 gauge thickness and stored at ambient temperature to evaluate the nutritional as well as sensory quality of developed products during six months storage. The results of the present investigation indicate that flour obtained from sweet potato variety "ST-14" when prepared without blanching and given pre-treatment with KMS @ 1000 ppm ($V_2B_1K_2$) possess higher yield, ascorbic acid, β-carotene, rehydration ratio and sensory score while lowest reducing sugars and non-enzymatic browning (NEB). The dehydrated sweet potato flour prepared from sweet potato variety "ST-14" without blanching and given pre-treatment with KMS @ 1000 ppm ($V_2B_1K_2$) exhibited minimum changes in nutritional as well as sensory attributes during six months storage when packed in polypropylene bags of 200 gauge thickness. Overall findings of investigation revealed that sweet potato flour prepared from sweet potato variety "ST-14" without blanching and given pre-treatment with KMS @ 1000 ppm ($V_2B_1K_2$) can successfully be stored for 6 months in polypropylene bags of 200 gauge thickness with minimum changes in chemical, sensory and microbial quality. The benefit cost ratio (BCR) of flour for best treatment ($V_2B_1K_2$) at minimum market sale price of Rs. 20.00 per 100g was 1.56. Sweet potato flour of variety "ST-14" prepared without blanching and given sulphitation pre-treatment (KMS @ 1000 ppm) remained microbiologically safe during storage period of six months. Thus, treatment combination $V_2B_1K_2$ is rated as best treatment for the preparation of better quality sweet potato flour. The developed technologies can commercially be explored by food processing industry for the production of sweet potato flour. Therefore, profitable utilization of sweet potato tubers grown in India by processing can ensure better returns to the growers, processors and consumers.

159. Name of the student : Bharai Rambhai B. (2020215007)

Year of completion of degree : 2017

Name of the major advisor : Dr. Shakti S. Arbat

Title of thesis : Standardization of process for juice clarification from banana (*Musa paradisiaca* L.)

Abstract

The present investigation entitled "Standardization of process for juice clarification from banana (*Musa paradisiaca* L.)" was aimed to standardize formulation for the preparation of nutritional as well as medicinal drink by juice clarification of banana. Clarified of banana juice with different concentration of enzyme evaluated by

complete randomized design with factorial concept and three repetitions for changes in bio-chemical and sensory qualities during storage period at Initial, 3, 6 months at room temperature.

In the clarified banana juice, the bio-chemical constituents like TSS, acidity, total sugars and reducing sugars were found increasing trend during storage while, sugar : acid ratio and ascorbic acid were found decreasing trend during six months of storage. The highest bio-chemical character like TSS, acidity, total sugars, reducing sugars and ascorbic acid were recorded in proportion of C_0P_2 *i.e.* (pectinase: cellulase, 0:1). However, C_0P_0 *i.e.* (pectinase: cellulase, 0:0) was found good in higher level of sugar: acid ratio. In sensory evaluation, all sensory parameters were found decreasing trend during six months of storage. C_0P_2 *i.e.* (pectinase: cellulase, 0:1) was rated best treatment on the basis of higher sensory scores in colour, taste, flavour and overall acceptability. The cost of production of clarified banana juice were found maximum in C_2P_2 *i.e.* (pectinase: cellulase, 1:1) with high benefit: cost ratio, while low cost of production in C_0P_0 *i.e.* (pectinase: cellulase, 1:0) with low benefit: cost ratio.

According to above, it may be suggested that for preparation of clarified banana juice use of the proportion of 1 per cent pectinase should be adopted.

160. Name of the student : Dholiya Dhavalkumar (2020215018)

Year of completion of degree : 2017

Name of the major advisor : Dr. C. S. Desai

Title of thesis : Reduction of postharvest loss and prolong the shelf-life of banana through hot water treatment cv. Grand Naine

Abstract

The present investigation entitled "Reduction of postharvest loss and prolong the shelf-life of banana through hot water treatment cv. Grand Naine" was carried out at the Department of Post-Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari and Banana Pseudo stem Processing Unit, SWMRU, NAU, Navsari during the year 2016- 2017. The experiment comprised of twenty six treatment combinations of different hot water temperature (45, 50, 55 and 60 ^{0}C), dipping time (5, 10 and 15 min.) and sleeeving (with sleeving and without sleeving) with two control treatments (room temperature with sleeving and without sleeving) laid out in completely randomized design under factorial concept with three repetitions. The physico-chemical parameters like acidity (%), total sugars (%), reducing sugars (%), total soluble solids (^{0}Brix) and vitamin-C (mg/100g), physical parameters like, firmness (kg/cm^2), shelf life (Days), decay (%), day to ripening (%), physiological loss in weight (%) and microbial infection as well as sensory parameters like colour of pulp, flavour, skin colour, taste and overall acceptability were evaluated periodically up to spoilage.

Hot water treatment of banana fruits at 50 ^{0}C for 5 min. gave significantly results for maintaining phsico-chemical parameters; acidity (%), total sugars (%), reducing sugars (%), total soluble solids (^{0}Brix) and vitamin-C (mg/100g). All the physical parameters like firmness (kg/cm^2), decay (%) and physiological loss in weight (%) were also found with significant better results for hot water treatment at 50 ^{0}C for 5 min. and maintain best physical properties of banana fruits during entire storage period compared to other treatment combinations as well as control (A) and control (B).

All the sensory parameters like colour of pulp, flavour, skin colour, taste and overall acceptability were superior compared to other treatment combination in the $H_2T_1B_1$ *i.e.* 50 ^{0}C temperature for 5 min. with sleeved. However, it is observed that at 60

^{0}C temperature, banana fruits showed burring effect on peel after hot water treatment lead to poor appearance. Based on the above observations, the treatment combination $H_2T_1B_1$ resulted with maximum shelf-life and retains their marketing up to 15 days without any microbial load on fruits.

This treatment also had economically value and gave good BCR. Thus, the hot water treatment of sleeved banana fruits at 50 ^{0}C for 5 min. can adopted by the commercial units if it is required.

161. Name of the student : Kothariya Bhavesh H. (2020215027)
Year of completion of degree : 2017
Name of the major advisor : Dr. Shakti S. Arbat
Title of thesis : Standardization of process for juice clarification from aonla (*Embilica officinalis* Gaertn) fruits

Abstract

The present investigation entitled "Standardization of process for juice clarification from aonla (*Embilica officinalis* Gaertn) fruits" was aimed to standardize formulation for the preparation of nutritional as well as medicinal drink by juice clarification of juice. Clarified of aonla juice with different concentration of enzyme evaluated by complete randomized design with factorial concept and three repetitions for changes in chemical and sensory qualities during storage period at Initial, 3, 6 months at room temperature. In the clarified aonla juice, the bio-chemical constituents like TSS, acidity, total sugars and reducing sugars were found increasing trend during storage while, sugar : acid ratio, phenol contents and ascorbic acid were found decreasing trend during six months of storage. The highest bio-chemical character like TSS, acidity, total sugars, reducing sugars, phenol contents and ascorbic acid were recorded in proportion of C_0P_2*i.e.* (pectinase: cellulase, 0:1). However, C_0P_0 *i.e.* (pectinase: cellulase, 0:0) was found good in higher level of sugar: acid ratio. In sensory evaluation, all sensory parameters were found decreasing trend during six months of storage. C_0P_2 *i.e.* (pectinase: cellulase, 0:1) was rated best treatment on the basis of higher sensory scores in colour, taste, flavour, aroma and overall acceptability. The cost of production of clarified aonla juice were found maximum in C_2P_2 *i.e.* (pectinase: cellulase, 1:1) with high benefit: cost ratio, while low cost of production in C_0P_0 *i.e.* (pectinase: cellulase, 0:0) with low benefit: cost ratio. The findings summarized above indicate that aonla fruits available in the market can be utilized for extraction of juices. The best quality clarified aonla juices can be obtained from crushed aonla fruits given enzyme treatment with 1.0 per cent pectinase for 2 hours followed by pressing to get higher juice recovery with better quality.

162. Name of the student : Madhusudan R. (2020216014)
Year of completion of degree : 2018
Name of the major advisor : Dr. C. S. Desai
Title of thesis : Effect of pre-cooling on quality and shelf-life of banana cv. Grand Naine

Abstract

The present investigation entitled "Effect of pre-cooling on quality and shelf-life of banana cv. Grand Naine" was conducted at Department of Post-Harvest Technology and Banana Pseudo stem Processing Unit, Navsari Agricultural University, Navsari- 396-450, Gujarat during May 2017 to July 2017. The experiment consist of five

different pre-cooling methods *viz*., P_0- Control, P_1- Forced air cooling (13 ^{0}C), P_2- Hydro-cooling (Spray @ 13^{0}C), P_3- Slush-cooling and P_4- Hydro-cooling (Water dip) and three different storage conditions *viz*., S_1- Ambient Temperature, S_2- Recommended Cold Storage Temperature (13-14 ^{0}C) and S_3- Zero Energy Cool Chamber. The experiment was laid out in a Completely Randomized Design with Factorial Concept (FCRD) with three repetitions and 15 treatment combinations. During storage, different physico-chemical parameters *viz*., Physiological loss in weight (PLW), Ripening (%), Spoilage (%), Shelf life (days), Acidity (%), TSS (^{0}Brix), Total sugar (%), Reducing sugar (%) and Total Carbohydrates (%) along with sensory parameters such as Appearance**,** Flavour**,** Taste and Overall acceptability of banana fruits were estimated at three days interval up to fruit spoilage. The experiment results indicated that fruits pre-cooled with Hydro-cooling (Spray @ 13 ^{0}C) (P_2) and stored in cold storage @ 13 ^{0}C (S_2) attained the maximum shelf life in banana fruits. The lower Physiological loss in weight, ripening and spoilage were recorded for extended period in these treatments. Although, the slower rate of increasing and decreasing TSS, reducing and total sugar content, higher acidity, higher total carbohydrate content and higher organoleptic ratings with regard to appearance, flavour, taste and overall acceptability and with higher net income and maximum cost benefit ratio (CBR) also found in above mentioned investigation.

163. Name of the student : Naik Poojaben Rajeshbhai (2020216020)
Year of completion of degree : 2018
Name of the major advisor : Dr. N. V. Patel
Title of thesis : Standardization of technology for preparation of carrot (*Daucus carota* L.) candy

Abstract

Present investigation entitled "Standardization of technology for preparation of carrot (*Daucus carota* L.) candy" was aimed to evaluate the sensory as well as nutritive quality of developed product during storage. The study conducted at Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during year 2017.

For preparation of carrot candy using different levels of sugar/syrup treatments (S_1- Mixing of 500 g sugar / kg pieces, S_2 - Mixing of 750 g sugar / kg pieces , S_3 - Mixing of 1000 g sugar / kg pieces , S_4- Mixing of 1 kg 50° Brix syrup / kg pieces and S_5- Mixing of 1 kg 60° Brix syrup / kg pieces, S_6- Mixing of 1 kg 70° Brix syrup / kg pieces) and KMS (K_1- 0 ppm, K_2- 1000 ppm and K_3- 2000 ppm). The experiment was laid out using completely randomized design with factorial concepts.

The yield of carrot was found maximum in candy prepared by using 1 kg syrup (50 ^{0}B) having 1000 ppm KMS per kg pieces (K_2S_4). Whereas, mass transfer-in and out for carrot candy were found minimum in candy prepared with same treatment. The acidity (%) of candy was decreasing with the advancement of storage period. However, the trend of decreasing was minimum in treatments K_3S_5, K_2S_6 and K_3S_3. Whereas, the maximum decreasing trends for acidity was observed in treatments K_2S_1, K_1S_3, K_2S_3 and K_3S_4. The TSS of carrot candy was found maximum in candy prepared by using 1 kg syrup (50^{0}B) with 1000 ppm KMS per kg pieces (K_2S_4) and minimum TSS was found in candy prepared by using 1000 g sugar per kg pieces along with 2000 ppm KMS (K_3S_3). The maximum carotene, ascorbic acid and moisture content were found in candy prepared by using 1kg syrup (50 ^{0}B) per kg pieces containing 1000 ppm KMS (K_2S_4). The maximum total and reducing sugars were found in candy prepared with same treatment while, they were minimum in candy prepared by using 1000 g sugar per kg

pieces along with 2000 ppm KMS (K_3S_3). Furthermore, the scores for various organoleptic characters *viz.*, colour, texture, flavor and taste were found maximum in candy prepared by using 1 kg syrup (50 ^{0}B) per kg pieces with 1000 ppm KMS (K_2S_4) during storage.

Overall findings of investigation revealed that carrot candy can be prepared by mixing of 1 kg syrup (50 ^{0}B) per kg pieces along with 1000 ppm KMS followed by gradual rise (10 ^{0}B) in the syrup strength up to 70 ^{0}B was found better. The carrot candy can be successfully stored for a period of 6 months in polypropylene bags without much changes in physico-chemical, sensory and microbial quality.

Thus, the developed technologies can commercially be adopted by food processing industry for the production of quality carrot candy. Therefore, profitable utilization of carrots grown in India for processing can ensures better returns to the growers and processors as well.

164. Name of the student : Bhatt Zalakben Kartikkumar (2020217004)
Year of completion of degree : 2019
Name of the major advisor : Dr. N. V. Patel
Title of thesis : Development of technology for preparation of instant tomato (*Solanum lycopersicum* L.) soup mix powder

Abstract

The present investigation entitled "Development of technology for preparation of instant tomato (*Solanum lycopersicum* L.) soup mix powder" was aimed to evaluate effect of thickening agents on physico – chemical parameters of instant tomato soup mix powder and effect of storage on quality of instant tomato soup mix powder. An experiment was laid out in completely randomized design with 17 treatments along with 3 repetitions. The experiment was conducted for preparation of instant tomato soup mix powder by combinations of different concentrations of thickening agents [Four concentrations of xanthan gum – (0.5 %, 1.0 %, 1.5 %, 2.0 %), Four concentrations of potato starch – (1.0 %, 2.0 %, 3.0 %, 4.0 %), Pectin – 0.5 % (control)]. The results of present investigation indicate that instant tomato soup mix powder can be prepared by blending tomato powder (50 g), onion powder (5 g), garlic powder (2 g), coriander leaf powder (2 g), salt (10 g), sugar (23 g), red chilli powder (3 g), black pepper (2 g), citric acid (1 g), edible oil (2 ml) along with 1.5 % xanthan gum and 2.0 % potato starch (T_{11}). Instant soup mix powder blended with 1.5 % xanthan gum + 2.0 % potato starch (T_{11}) rated best treatment on the basis of higher textural (consistency) as well as other sensory and nutritional qualities. However, the increasing trend was found in TSS, moisture, acidity, total sugar and reducing sugar whereas, decreasing trend was observed in ascorbic acid, lycopene and viscosity of tomato soup mix powder during storage. Moreover, it was found safe without any microbial contamination up to six months storage. Overall findings of investigation revealed that instant tomato soup mix powder can be successfully stored for six months in poly propylene bags (200 gauge) with minimum changes in chemical, sensory and microbial quality. Thus, prepared formulation can commercially explored by food processing industry for the production of ready to use instant tomato soup mix powder to ensure better returns to growers, processors and consumers as well.

165. Name of the student : Patel Gauravkumar Dalpatbhai (2020217020)
Year of completion of degree : 2019

Name of the major advisor : Dr. N. V. Patel

Title of thesis : Development of technology for preparation of fortified tomato (*Solanum lycopersicum* L.) beverage

Abstract

Present investigation entitled "Development of technology for preparation of fortified tomato (*Solanum lycopersicum* L.) beverage" was aimed to evaluate the sensory as well as nutritive quality of developed product during storage. The study conducted at Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during year 2018.

For preparation of tomato beverage using different levels of calcium chloride (C_1- control, C_2 - 0.5 %, C_3 - 1.0 % and C_4- 1.5 %) and xanthan gum (X_1- control, X_2- 0.25 %, X_3- 0.50 %, X_4- 0.75 % and X_3- 1.00 %). The experiment was laid out using completely randomized design with factorial concepts.

The TSS of tomato beverage was increasing with the advancement of storage period. However, the trend of increasing was minimum in treatments C_2X_2, C_3X_2 and C_3X_4. Whereas, the maximum increasing trend was observed in treatments C_2X_1 and C_1X_2. The acidity (%) of beverage was increasing with the advancement of storage period. However, the trend of increasing was minimum in treatments C_3X_2, C_4X_2, C_3X_3 and C_3X_5. Whereas, the maximum increasing trend was observed in treatment C_1X_1. The ascorbic acid content (mg/100 ml) of beverage was decreasing with the advancement of storage period. The maximum ascorbic acid was found in treatments C_2X_4 and C_2X_5. While, minimum was found in treatments C_1X_2 and C_2X_1 after six months storage. The total sugar of tomato beverage was increasing with the advancement of storage period. However, the trend of increasing was minimum in treatment C_1X_2. Whereas, the maximum increasing was observed in treatment C_2X_3. The reducing sugar of tomato beverage was increasing with the advancement of storage period. However, the trend of increasing was minimum in treatment C_3X_5. Whereas, the maximum increasing trend was observed in treatment C_2X_3. The lycopene content (mg/100 ml) of beverage was decreasing with the advancement of storage period. However, the trend of decreasing was minimum in treatment C_3X_5 which was followed by treatment C_3X_3. Whereas, the maximum decreasing trends for lycopene content was observed in treatment C_1X_3. The calcium content (mg/100 ml) of beverage was decreasing with the advancement of storage period. However, the trend of decreasing was minimum in treatments C_4X_3, C_4X_4, C_2X_3 and C_2X_4. Furthermore, calcium content in beverage was found stable in treatment C_3X_3 up to 4 months storage. Whereas, the maximum decreasing trends for calcium content was observed in treatment C_3X_1.

Overall findings of investigation revealed that tomato beverage can be prepared using 1.0 per cent calcium chloride with 0.5 per cent xanthan gum (C_3X_3) was found better. The tomato beverage can be successfully stored for a period of 6 months in glass bottle without much changes in physico-chemical, sensory and microbial quality. Thus, the developed technologies can commercially be adopted by food processing industry for the production of tomato beverage.

166. Name of the student : Raghavendra H. R. (2020217028)

Year of completion of degree : 2019

Name of the major advisor : Dr. C. S. Desai

Title of thesis : Standardization of banana fruit (*Musa paradisiaca* L.) and pseudostem central core blended jam

Abstract

The present investigation entitled "Standardization of banana fruit (*Musa paradisiaca* L.) and pseudostem central core blended jam" was conducted at Department of Post Harvest Technology and Banana Pseudostem Processing Unit, Navsari Agricultural University, Navsari- 396450, Gujarat during February 2018 to July 2018. In this experiment different combination banana fruit and pseudostem central core pulp were taken as treatments to prepare blended jam and packed in glass bottles were stored at room temperature. Initially physico-chemical parameters of fresh fruits and pseudostem central core were taken *viz.* Pulp recovery (%), TSS (^{0}Brix) and acidity (per cent). Later, during storage bio-chemical parameters *viz*. TSS (^{0}Brix), Acidity (per cent), Ascorbic acid (mg/100g), Total sugars (per cent), Reducing sugars (per cent), Non-reducing sugars (per cent), Carbohydrate (per cent), Protein (per cent), Fibre content (per cent), Lipid (per cent), Iron (mg/100g), Potassium (mg/100g), Calorific value (Kcal), microbial parameters and sensory qualities were evaluated periodically up to 6 months. The result were statistically analysed using simple CRD with 3 repetitions. It can be elucidated that, TSS, acidity, ascorbic acid, total sugars, reducing sugars, carbohydrate, protein and calorific value was best gained in treatment T_{11} (banana fruit: pseudostem central core 100:00) whereas fiber, lipid, iron and potassium showed highest in T_1 (banana fruit: pseudostem central core 00:100). TSS, acidity, total sugars, reducing sugar and lipids shows increasing trend while other parameters shows very slightly decreasing trend during 6 months of storage period. Looking to the sensory evaluation of blended jam, treatment T_{11} (banana: pseudostem central core) gained maximum acceptance score at initial, 3 and 6 months of storage which might be due to higher proportion of banana pulp which preferred more by sensory panellists. During storage period of blended jam no microbial counts were observed. Overall findings of investigation revealed that blended jam bottles can be successfully stored for 6 months with slightly minimum changes in chemical and sensory qualities. Moreover, blending up to 50 % banana pseudostem central core pulp with 50 % banana pulp were found with acceptable sensory qualities which were not only gives good sensory characters but provide higher nutritive qualities *i.e.* fiber, iron and potassium. From the experimentation, it is also revealed that due to cheap raw materials cost of banana pseudostem central core than banana the net profit and B: C ratio also increased by blending central core with banana fruits. Thus, prepared proportion can commercially utilized by food processing industry for the production of nutritive and qualitative blended jam to ensure better returns to growers, processors and consumers as well.

167. Name of the student : Gohil Mehulbhai Maganbhai (2020218014)
Year of completion of degree : 2020
Name of the major advisor : Dr. Dev Raj
Title of thesis : Utilization of banana (*Musa paradisiaca* L.) peel for value addition into 'sev'

Abstract

Present investigation entitled utilization of banana (*Musa paradisiaca* L.) peel for value addition into 'sev' was aimed to evaluate the sensory as well as nutritive quality of banana peel based 'sev' during storage. For preparation of banana peel based 'sev', an experiment was laid out with ten treatment combinations comprised of five different levels of TBHQ (C_1- control, C_2- 50 ppm, C_3- 100 ppm, C_4- 150 ppm and C_5- 200 ppm) and two levels of packaging material (P_1- polypropylene bag and P_2- Aluminium laminated bag) using completely randomized design with factorial concepts. The

prepared ‘sev’ was stored for a period of 5 month to analyse the quality attributes at monthly intervals. The results of the investigation revealed that banana peel based ‘sev’ fried in oil using 150 ppm TBHQ and packed in aluminium laminated bags (C_4P_2) observed to have minimum increase of peroxide value while maximum increase in ‘sev’ fried in oil without TBHQ and packed in polypropylene bags (C_1P_1) during five month storage. The taste and overall acceptability score was found maximum in ‘sev’ fried in oil using 150 ppm TBHQ and packed in aluminium laminated bags (C_4P_2) and minimum in ‘sev’ fried in oil containing no TBHQ and packed in polypropylene bags (C_1P_1) during storage of five months. Overall findings of investigation revealed that banana peel based ‘sev’ with better nutritional and sensory attributes can be prepared by frying ‘sev’ in sunflower oil containing 150 ppm TBHQ followed by packing in aluminium laminated bag (C_4P_2). The banana peel based ‘sev’ can be successfully stored for a period of 5 months with minimum changes in physico-chemical and sensory quality. Thus, the developed technologies can commercially be adopted by food processing industry for the production of banana peel based ‘sev’.

168. Name of the student : Muhammad Rokai Muhammadi (2020218021)
Year of completion of degree : 2020
Name of the major advisor : Dr. C. S. Desai
Title of thesis : Evaluation of banana pseudostem based nectar blended using banana pseudostem sap with apple, pomegranate and *Aloe vera*

Abstract

The present investigation entitled "Evaluation of banana pseudostem based nectar blended using banana pseudostem sap with apple, pomegranate and *Aloe vera*" was carried out with objectives to find out best suitable combination for preparation of nectar as well as to evaluate storage stability of blended nectar at the Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry and Banana Pseudostem Processing Unit, Soil and Water management Research Unit, Navsari Agricultural University, Navsari- 396450, Gujarat during April 2019 to October 2019. The prepared blended nectar was filled in PET bottles and stored at room temperature. Initially juice recovery (%) of fresh fruits and banana pseudostem were taken. Later on periodically at initial, 2, 4 and 6 months of storage physico-chemical parameters like total soluble solids (°Brix), titrable acidity (%), ascorbic acid (mg/100 ml), total sugars (%), reducing sugars (%), non reducing sugars (%), carbohydrates (%), proteins (%), iron (mg/100 ml), potassium (mg/100ml), total phenols (mg/100 ml), calorific value (Kcal/100 ml), microbial and sensory parameters (9 point Hedonic scale) were recorded. The results were statistically analysed using completely randomised design with 3 repetitions. The Results revealed that acceptable physico chemical and sensory parameters of banana pseudostem blended nectar can be possible with apple, pomegranate and *Aloe vera*. However treatment T_6 *i.e.*, 10 % banana pseudostem and 10 % pomegranate can give best physico chemical and sensory quality blended necter with no microbial growth up to 6 month of storage period with high economical returns. Looking to the sensory evaluation of blended nectar, treatment T_6 (banana pseudostem sap: apple: pomegranate: *Aloe vera* 10:0:10:0) gained maximum overall acceptance score at initial, 2, 4 and 6 months of storage which might be due to higher proportion of pomegranate juice which was preferred more by sensory panellists. From the experimentation results, it was revealed that best quality blended nectar with higher sensory acceptability, stable nutritional quality and good net return with B: C ratio can be prepared using 10 per cent pseudostem sap and 10 per cent pomegranate juice. Thus,

prepared combination can be commercially utilized by food processing industry for the production of nutritive and qualitative blended nectar to ensure better returns to growers, processors and consumers as well.

169. Name of the student : Ram Bhavinkumar B. (2020218041)
Year of completion of degree : 2020
Name of the major advisor : Dr. N. V. Patel
Title of thesis : Effect of sweetening agents and pulp proportion on quality of cashew apple (*Anacardium occidentale* L.)-pineapple (*Annanas comosus* L.) blended nectar

Abstract

Present investigation entitled "Effect of sweetening agents and pulp proportion on quality of cashew apple (*Anacardium occidentale* L.)- pineapple (*Annanas comosus* L.) blended nectar" was aimed to evaluate the best blending proportion and sensory as well as nutritional quality of developed product during storage. An experiment was laid out using completely randomized design with factorial concepts using 20 treatment combination with 3 repetitions. For preparation of cashew apple - pineapple blended nectar, different sweeteners (S_1- sugar, S_2- unbleached jaggery, S_3- bleached jaggery and S_4- honey) and cashew apple: pineapple pulp proportions (P_1- 20:00, P_2- 15:05, P_3- 10:10, P_4- 05:15 and P_5- 00:20) were incorporated.

The results of present investigation indicate that cashew apple and pineapple fruits can be utilized for processing of blended nectar. The TSS and acidity of blended nectar were increased with advancement of storage period. However, the trend of increasing was found minimum in treatment S_4P_4. Further increasing trend was observed in reducing sugars with minimum change in S_4P_2. Whereas, decreasing trend was observed in total sugars with minimum change in S_4P_4 and S_4P_5. In case of ascorbic acid, iron and sulphur content of blended nectar were gradually decreased with storage period up to six months. The maximum ascorbic acid was found in treatment S_4P_1 whereas, iron content of blended nectar was noted highest in S_2P_1 with minimum change in treatment S_1P_1 and S_4P_4. The minimum sulphur content was noted in S_4P_5 as well as S_4P_4. Moreover, the score for overall acceptability with respect to colour, texture, flavour and taste was found maximum in treatments S_4P_5 and S_4P_4 equally up to six months storage. Overall findings of investigation revealed that blended nectar can be prepared by using honey as a sweetener along with 05:15 blending ratio of cashew apple: pineapple pulp (S_4P_4) was found better. The blended nectar can be successfully stored at ambient temperature for a period of 6 months in PET bottle without much changes in physicochemical, sensory and microbial quality. Thus, the developed technology can commercially be adopted by food processing industry for the production of quality blended nectar to ensure better returns to processor and consumers as well.

170. Name of the student : Sushmitha M B (2020218046)
Year of completion of degree : 2020
Name of the major advisor : Dr. C. S. Desai
Title of thesis : Standardization of blended juice using banana pseudostem sap with noni, *Aloe vera* and guava

Abstract

The present investigation entitled "Standardization of blended juice using banana pseudostem sap with noni, *Aloe vera* and guava" was carried out with the

objectives to study the effect of blending proportion on nutritional quality of the blended juice as well as to study the storage stability of blended juice with 16 treatments along with different blending combinations of banana pseudostem sap:noni: *Aloe vera*: guava (T_1- 100:0:0:0, T_2- 80:0:0:20, T_3- 80:0:5:15, T_4- 80:0:10:10, T_5- 80:0:15:5, T_6- 80:0:20:0, T_7- 80:5:5:10, T_8- 80:5:10:5, T_9- 80:5:15:0, T_{10}- 80:5:0:15, T_{11}- 80:10:0:10, T_{12}- 80:10:10:0, T_{13}- 80:10:5:5, T_{14}- 80:15:5:0, T_{15}- 80:15:0:5 and T_{16}- 80:20:0:0) at the Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry and Banana Pseudostem Processing Unit, Soil and Water Management Research Unit, Navsari Agricultural University, Navsari, Gujarat during April 2019 to October 2019.

The prepared blended juice was filled in PET bottles and stored at room temperature up to 6 months. Chemical parameters namely, total soluble solids (°Brix), titrable acidity (%), ascorbic acid (mg/100 ml), total sugars (%), reducing sugars (%), non-reducing sugars (%), carbohydrates (%), proteins (%), iron (mg/100 ml), potassium (mg/100 ml), total phenols (mg/100 ml), calorific value (Kcal/100 ml), microbial and sensory parameters (9 point Hedonic scale) were recorded at initial, 2, 4 and 6 months of storage. The results were statistically analysed using completely randomized design with 3 repetitions.

From the experimentation it was revealed that, the TSS, titrable acidity, reducing sugars showed increasing trend and ascorbic acid, total sugars, non reducing sugars, carbohydrates, proteins, iron, potassium, total phenols, calorific value and organoleptic parameters showed decreasing trend up to 6 months storage of blended juice and no microbial growth was observed during 6 months storage period. Results revealed that, as per the objective of blending of noni, *Aloe vera* and guava with banana pseudostem juice, it was found that best quality blended juice with higher sensory acceptability, stable nutritional quality and good benefit cost ratio (1.91) can be prepared using 80 per cent banana pseudostem sap, 5 per cent noni juice, 5 per cent *Aloe vera* juice and 10 per cent guava pulp. Thus, the developed technology can be commercially explored by the food processors for production of quality blended juice. Therefore, it will be helpful for profitable utilization of banana pseudostem and also helps in development of different value added products.

HORTICULTURAL ENTOMOLOGY

171. Name of the student : Ashokkumar Tarabhai Chaudhary (2020214006)

Year of completion of degree : 2016

Name of the major advisor : Dr. H. V. Pandya

Title of thesis : Evaluation of botanical extracts against jassid [*Amrasca biguttula biguttula* (Ishida)] and whitefly [*Bemisia tabaci* (Gennadius)] on okra [*Abelmoschus esculentus* (L.) Moench]

Abstract

Investigations were carried out on “Evaluation of botanical extracts against jassid [*Amrasca biguttula biguttula* (Ishida)] and whitefly [*Bemisia tabaci* (Gennadius)] on okra [*Abelmoschus esculentus* (L.) Moench]”at Organic Farm, NAU, Navsari during 2015.

Out of 13 treatments of botanicals tested at different intervals, data indicated that of Datura leaves extract 10 per cent was the best in reducing almost two major insect pests, recording (7.18 jassid/leaf) and (2.51 whitefly/leaf). Among all the treatments, maximum pod yield (115.24 q/ha) was recorded in the treatment Datura leaves extract 10 per cent. With respect to BCR, highest BCR (1:18.05) was registered in the treatment

Datura leaves extract 10 per cent followed by Ipomoea leaves extract 10 per cent (1:16.25).

Results revealed that the population of jassid was initiated from 3rd WAS *i.e.* 4th week of January (0.16 jassid/leaf) and continued till crop maturity *i.e.* 5th week of April and reached to a peak level (21.68 jassid/leaf) during 11th WAS *i.e.* 4th week of March. The population of whitefly was started from 5th WAS *i.e.* the 2nd week of February (0.11 whitefly/leaf) and reached to a peak level (8.34 whitefly/leaf) during 12th WAS *i.e.* first week of April. Thereafter, the whitefly population was gradually declined and lower level (4.01 whitefly/leaf) at the time of harvest.

The non-significant positive correlation was found between jassid population and maximum temperature (r= 0.350), significant positive correlation was found minimum temperature (r= 0.565) and average temperature (r= 0.527), sunshine hours (r= -0.066) had non-significant negative correlation with jassid population. The non-significant positive correlation was found between whitefly population and maximum temperature (r= 0.471), highly significant positive correlation was found between whitefly population and minimum temperature (r= 0.801) and average temperature (r= 0.737), sunshine hours (r= -0.200) had non-significant negative correlation with whitefly population.

The green lace wing population was observed from the 4th WAS *i.e.* the first week of February (0.15 per plant) and then it increased and reached to the peak level (1.05 per plant) 13th WAS *i.e.* the fourth week of March. Population of green lace wing slowly declined and reached to the lower level by the 16th WAS. The population of lady bird beetle appeared from the 4th WAS *i.e.* first week of February (0.15 per plant) and increased rapidly and reached to the peak level (1.10 per plant) during 10th WAS *i.e.* third week of March. Then it declined slowly and reached to the lower level by the 16th WAS. The population of spider was started from 5th WAS *i.e.* the second week of February (0.45 per plant) than it increased and touched the peak level (4.10 per plant) during the 10th WAS *i.e.*, the third week of March, then it is declined slowly reaching the lower level by the last week of April.

Green lace wing, lady bird beetle and spider population was shown highly significant positive correlation with jassid and whitefly population.

172. Name of the student : Pandya Samarth Mukeshkumar (2020214024)

Year of completion of degree : 2016

Name of the major advisor : Dr. Snehal M. Patel

Title of thesis : Evaluation of botanical extracts against pod borer [*Helicoverpa armigera* (Hubner)] and pod fly [*Melanagromyza obtusa* (Malloch)] infesting vegetable pigeon pea

Abstract

Investigations were carried out on "Evaluation of botanical extracts against Pod borer [*Helicoverpa armigera* Hubner] and pod fly [*Melanagromyza obtusa* Malloch] infesting vegetable pigeon pea" at Regional Horticultural Research Station Farm, NAU, Navsari during 2015-16.

Out of 13 treatments of botanicals tested, neem leaves extract 10 per cent was the best in reducing almost two major insect pests, recording lower infestation of pod borer (4.95 larvae/20 plants) and pod fly (7.42 per cent damage). Maximum healthy pod yield (12.02 q/ha) was harvested from the plots treated with neem leaves extract 10 per cent. The highest (9.21) Cost Benefit Ratio was registered in the treatment neem leaves

extract 10 per cent followed by Dhatura leaves extract 10 per cent (7.50).

The infestation of the *H. armigera* started from the 6th week after sowing *i.e*. second week of August (0.40 larvae per 20 plants) and reached on peak during the 18th week after sowing *i.e*. the first week of November (15.45 larvae per 20 plants). Pod fly damage was noticed for the first time (7.60 per cent damaged pod) during the 14th week after sowing *i.e*. the first week of October and increased gradually showing peak activity (46.40 per cent damaged pods) during the 22nd week after sowing *i.e*. end of the November (13.35 per cent damaged pods).

The infestation of *H. armigera* showed highly significant positive correlation with maximum temperature (r= 0.819) significant positive correlation with average temperature (r= 0.446), while significantly negative correlation wind velocity (r= -0.459). The Pod fly infestation was highly significant positive correlation with sun shine hour (r= 0.548), while highly significant negative correlation with minimum temperature (r= -0.815), average temperature (r= -0.699), morning relative humidity (r= -0.762), evening relative humidity (r= -0.842), average relative humidity (r= -0.863) and wind velocity (r= -0.579).

The lacewing (*Chrysopa* spp.) population was observed from the 12th week after sowing *i.e.* the third week of September (1.85 per plant), increased rapidly and reached the peak level (7.50 per plant) during the 14th week after sowing *i.e.*, the first week of October. The population of Coccinellid beetles was started (1.10 per plant) in the early crop growth stage up to 5th week after sowing; thereafter it increased gradually reaching the peak level of 13.25 beetles per plant during the third week of November. The spiders population was started from 8th week after sowing *i.e.* fourth of August (1.25 per plant), increased rapidly and reached on peak (3.40 per plant) during the 13th week after sowing *i.e.,* the end of September.

Green lacewing bug population had highly significant positive correlation with maximum temperature (r= 0.418) and average temperature (r= 0.392). The remaining weather parameters did not show significant effect.

Population of Coccinellid beetles beetle showed highly significant positive correlation with maximum temperature (r= 0.655) and significant positive average temperature (r= 0.397).

Spider population showed highly significant positive correlation with morning relative humidity (r= 0.556), while significant positive correlation with minimum temperature (r= 0.437), average temperature (r= 0.430), evening relative humidity (r= 0.412) and average relative humidity (r=0.481).While remaining weather parameters did not show significant effect.

173. Name of the student : Jigarkumar N. Shah (2020214037)

Year of completion of degree : 2016

Name of the major advisor : Dr. H. V. Pandya

Title of thesis : Evaluation of botanical extracts against thrips (*Thrips tabaci* Lindeman) infesting garlic

Abstract

Investigations were carried out on evaluation of botanical extracts against thrips (*Thrips tabaci* Lindeman) infesting garlic and seasonal abundance of thrips infesting garlic in relation to major abiotic factors at Organic Farm, NAU, Navsari during 2015.

Amongst 13 treatments of botanicals tested at different intervals, results indicated that of *Datura metel* (L.) leaves extract 10 per cent was the best in reducing thrips population, recorded 14.79 thrips/plant. Also maximum bulb yield (75.24 q/ha)

was obtained from treatment *D. metel* leaves extract 10 per cent. With respect to CBR, highest CBR (1:13.47) was registered in the treatment *D. metel* leaves extract 10 per cent followed by *Calotropis gigantean* (L.) leaves extract 10 per cent (1:12.89). Results revealed that the population of thrips was initiated from 3rd WAS *i.e.* 4th week of January (2.45 thrips/plant) and continued till crop maturity *i.e.* 4th week of April and reached to a peak level 41.10 thrips/plant during 12th WAS *i.e.* 13 week of April. Thereafter, the thrips population gradually was declined till (7.30 thrips/plant) the time of harvest.

The non- significant positive correlation was found between thrips population on garlic and maximum temperature (r= 0.350), minimum temperature (r= 0.370), average temperature (r= 0.399), morning relative humidity (r= 0.379), evening relative humidity (r= 0.277), average relative humidity (r= 0.374), sun shine hours (r= 0.163), wind velocity (r= 0.072) and rainfall (r= 169). However, significant positive correlation as found between thrips population and evaporation (r= 0.692).

174. Name of the student : Patel Prashant Parshottambhai (2020215044)
Year of completion of degree : 2017
Name of the major advisor : Dr. S. M. Patel
Title of thesis : Biology and host preference of lemon butterfly (*Papilio demoleus* Esper) under south Gujarat condition

Abstract

An experiment was conducted to study the biology and host preference of lemon butterfly under South Gujarat condition during the year 2016-17 at P. G. laboratory, Department of Entomology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

Studies on biology of citrus butterfly, *Papilio demoleus* Esper indicated that the female laid eggs singly or in batches of 8 to 10 on tender leaf of citrus plant. Eggs were spherical with flat and smooth. The egg diameter of freshly laid eggs measured from 1.5 to 2.5 mm (1.92 ± 0.30 mm), respectively. The egg period varied from 2 to 4 days with an average of 2.8 ± 0.65 days. The hatching percentage was 72.64 ± 1.96. There were five larval instars and average larval duration of first, second, third, fourth and fifth instar larvae were recorded as 2.80 ± 0.50, 2.72 ± 0.61, 2.92 ± 0.40, 3.80 ± 0.49 and 5.04 ± 0.35 days, respectively. The total larval period was completed in 16.56 ± 1.08 days. The average length of first, second, third, fourth and fifth instar larvae were 3.17 ± 0.22, 8.13 ± 0.80, 15.61 ± 0.76, 24.32 ± 0.49, and 47.50 ± 0.49 mm, while that the average breadth were 1.50 ± 0.19, 3.48 ± 0.39, 3.63 ± 0.40, 3.82 ± 0.54, and 4.20 ± 0.62 mm, when reared on citrus. Initially the pupa is greenish-brown in colour and it changed to dark brown later. The pupa was naked and typical of butterfly and there was no silken cocoon round the pupa. A search for external morphological characters that would facilitate the sexing of *P. demoleus* in the pupal stages showed that female pupae have a small narrow vertical furrow extending over two sternites. Male pupae can be distinguished only by the absence of these characters. The average length and breadth of pupa measured as 30.04 ± 1.07 and 9.22 ± 0.24 mm, respectively. The average pupal period was 7.16 ± 0.99 days.

The adult is a large-sized butterfly, the average length of male and female measured from 26.75 ± 1.46 and 28.40 ± 1.51 mm, while breadth with expanded wingspan measured as 90.75 ± 2.04 and 90.78 ± 2.65 mm, respectively. The fecundity of adult female butterfly was 61.76 ± 4.83. The average pre-oviposition period of adult was 1.04 ± 0.20, oviposition period 4.12 ± 0.33 and post oviposition period 2.24 ± 0.44 was

recorded. The average longevity of male recorded as 3.92 ± 0.28 days while that of female was 7.04 ± 0.68 days. The sex ratio (Male: female) was 1:2.14. The total life cycle of male was completed in 30.96 ± 3.32 days, while female was completed in 34.24 ± 2.73 days during the present investigation. Studies on host preference indicated significant differences in egg laying among different hosts by lemon butterfly. Maximum number of eggs were laid on Lemon: *Citrus limon* L. (11.03 eggs), followed by Mandarin: *Citrus grandis* Merr. (10.18), Lime: *Citrus aurantifolia* swingle. (9.34), Curry leaf: *Murraya koenigii* Sprengle. (8.49), Beal: *Aegel marmelos* L. Correa. (7.64) and minimum number of eggs was recorded on Ber: *Zizyphus mauritiana* Lam. (6.49). This showed that Lemon: *C. limon* (11.03) was the most preferred host of lemon butterfly.

The results of host plant survey revealed that plants such as lemon, lime, mandarin, beal, curry leaf, ber and babchi supported the larvae of lemon butterfly from 46th to 7th SMW while maximum larvae were recorded at 49th and 50th SMW. These plants can be considered as the host plants of lemon butterfly.

175. Name of the student : Thakor Dilipkumar Chhotabhai (2020215058)

Year of completion of degree : 2017

Name of the major advisor : Dr. S. M. Patel

Title of thesis : Seasonal abundance and evaluation of botanical extracts against aphid (*Brevicoryne brassicae* Linnaeus) on cabbage (*Brassica oleraceae* var. *capitata* Linn.) relation to major abiotic factors

Abstract

Investigations were carried out on seasonal abundance and evaluation of botanical extracts against aphid [*Brevicoryne brassicae* Linnaeus] on cabbage [*Brassica oleraceae* var. *capitata* Linn.] relation to major abiotic factors and natural enemies at Organic Farm, NAU, Navsari during October-2016 to March-2017.

Population of aphids was initiated from the fifth week after transplanting (WAT) *i.e.* 4th week of November and continued till to crop maturity *i.e.* 2nd week of February and reached to a peak level 22.39 aphids/leaf during 11th WAT *i.e.* 2nd week of January. Thereafter, the population of aphids was gradually declined till (4.25 aphids/leaf) the time of harvest.

Correlation indicated that their existed significant negative correlation of aphid population with minimum temperature (r= -0.879) and average temperature (r= -693). The correlation of aphid population with evening relative humidity was significant and positive (e= 0.580).

The Syrphid fly population was observed from the 5th WAT *i.e.,* the fourth week of November (0. 50 per plant) and then it increased and reached to the peak level (1.92 per plant) during the 11th WAT *i.e.,* the second week of January. Population of Syrphid fly slowly declined and reached to the lower level by the 15th WAT. The population of lady bird beetle appeared from the fourth week of November (0.70 per plant) and increased rapidly and reached to the peak level (2.16 per plant) during 11th WAT *i.e.* third week of January. Then it declined slowly and reached to the lower level by the 15th WAT. Their existed significant negative correlation of Syrphid fly population with minimum temperature (r= -0.751), average temperature (r= -624). Correlation coefficient of lady bird beetle population with maximum temperature was significant and negative (r= -0.795) similar trend was observed for average temperature (r= -0.617). However correlation of lady bird beetle population with evening relative humidity significant and positive. Out of 9 treatments of botanicals tested at different

intervals, data indicated that of tobacco leaves extract 10 per cent was the best in reducing almost two major insect pests, recording (1.37 aphid/leaf). Among all the treatments, maximum cabbage yield (295.05 q/ha) was recorded in the treatment tobacco leaves extract 10 per cent. With respect to CBR, highest CBR (1:18.53) was registered in the treatment tobacco leaves extract 10 per cent followed by neem leaves extract 10 per cent (1:16.96).

176. Name of the student : Vipul A. Surela (2020216029)
Year of completion of degree : 2018
Name of the major advisor : Dr. H. V. Pandya
Title of thesis : Evaluation of botanical extracts against fruit borer (*Helicoverpa armigera* Hubner) on tomato

Abstract

Investigation was carried out on "Evaluation of botanical extracts against fruit borer (*Helicoverpa armigera* Hubner) on tomato" at Instructional Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2017-18.

The results revealed that out of 13 treatments of botanicals tested at different intervals, data indicated that bakaneneem leaves extract 10 per cent was the best in reducing fruit borer infestation, recording lowest infestation of fruit borer (1.14 larvae per plant). The lowest fruit damage per cent was recorded from the plots treated with bakaneneem leaves extract 10 per cent (20.18 per cent) and maximum healthy fruit yield was also recorded from the plots treated with bakaneneem leaves extract 10 per cent (28.81 t/ha) followed by neem leaves extract 10 per cent (27.95 t/ha).

Results revealed that population of *H. armigera* started from the 7th week after transplanting *i.e.* fourth week of November (0.24 larvae per plant) and reached on peak level during the 13th week after transplanting *i.e*., first week of January (2.56 larvae per plant). The infestation of *H. armigera* showed highly significant negative correlation with maximum temperature (r= -0.754), minimum temperature (r= -0.535), average temperature (r= -0.772) and evaporation (r= -0.691).

The spider population differed at different periods. The spider population was started from 8th week after transplanting *i.e.*first week of December (0.04 spider per plant), increased rapidly and reached the peak level (4.24 spider per plant) during the 17th week after transplanting *i.e.*, first week of February.Spider population showed highly significant negative correlation with minimum temperature (r= -0.657) and average temperature (r= -0.598): remaining weather parameters did not show significant effect.

Lady bird beetle population was observed from the 7th week after transplanting *i.e.* the first week of December (0.2 per plant), increased rapidly and reached the peak level (1.86 per plant) during the 13th week after sowing *i.e.*, the second week of January. It then declined slowly reaching the lowest level by the 23th week after transplanting. Population of lady bird beetle population was observed from the 8th week after transplanting *i.e.* the first week of December (0.2 lady bird beetle per plant), increased rapidly and reached the peak level (1.86 lady bird beetle per plant) during the 14th week after sowing *i.e.*, the second week of January.

177. Name of the student : Tandel Roma Ramniklal (2020216030)
Year of completion of degree : 2019

Name of the major advisor : Dr. Snehal Patel

Title of thesis : Biology, host preference and population dynamics of citrus psylla (*Diaphorina citri* Kuwayama)

Abstract

The experiment on biology, host preference and population dynamics of Citrus psylla (*Diaphorina citri* Kuwayama) under South Gujarat condition was conducted during the year 2017-18 at Department of Entomology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari.

The citrus psylla, *D. citri* laid eggs singly or in clusters or groups on leaf folds, petioles, axillary buds, upper and lower surfaces of young leaves and tender shoots (unopened leaf bud) with the help of strong pointed ovipositor and anchored there by means of a short stalk embedded in the plant tissue. Freshly laid egg was elongated, almond shaped and yellow coloured and measured 0.25 ± 0.01 mm in length and 0.09 ± 0.01 mm in width. The egg period was 3.64 ± 0.70 days. Hatching of eggs was 66 ± 4.65 per cent.

The nymph passed through five distinct instars wherein duration of first, second, third, fourth and fifth instar nymphs were 2.28 ± 0.46, 1.76 ± 0.44, 2.68 ± 0.90, 2.52 ± 0.51 and 4.56 ± 0.51 days, respectively. The total nymphal development period of *D.citri* was 13.80 ± 1.08 days. The length of first, second, third, fourth and fifth instars nymphs were 0.28 ± 0.03, 0.40 ± 0.03, 0.81 ± 0.09, 1.06 ± 0.06 and 1.60 ± 0.13 mm, while their width were 0.17 ± 0.01, 0.23 ± 0.04, 0.40 ± 0.04, 0.66 ± 0.07 and 0.99 ± 0.04 mm, respectively when reared on citrus.

Adults were small, brownish coloured sap-sucking insects. Males had a smaller pronotum and shorter wings than females. The length of male adult psyllid was smaller than the female. Females had a pointed tip and males had blunt tip on posterior end of the abdomen. The average length of male and female were 2.02 ± 0.07 and 2.92 ± 0.09 mm, respectively while their width was 0.66 ± 0.09 and 0.78 ± 0.04 mm, respectively. The average pre-oviposition, oviposition and post-oviposition periods were 2.93 ± 0.59, 20.8 ± 5.03 and 3.47 ± 0.99 days, respectively. The fecundity of the female psyllid was 561.44 ± 34.91 eggs. The average longevity of male and female insects was 22.27 ± 2.19 and 28.13 ± 2.77 days, respectively. The total life period from egg laying to the death of adult male was 38.27 ± 2.19 days and female was 43.87 ± 2.97 days.

Studies based on host preference indicated significant differences in egg laying among different hosts by citrus psylla wherein maximum eggs were laid on curry leaf (*Murrya koenigii* L.) (191.25/plant) indicating maximum preference and lowest eggs were laid on mandarin (*Citrus grandis* L.) (29.55/plant) indicating lowest preference.

In population dynamics of *D. citri* and effect of weather parameters study, highest population (10.23 adults and nymphs/twig/plant) was observed during 3rd week of August, 2017 (34th std. week) while, it remained lowest (0.20/twig/plant) on 52nd STW of 2017. Extremes of high and low temperatures were both observed injurious to the pest.

Population of *D. citri* was highly significant and positively correlated with minimum (‘r’= 0.728**) and average temperature (‘r’= 0.675**), morning (‘r’= 0.509**), evening (‘r’= 0.620**) and average relative humidity (‘r’= 0.639**), rainfall (‘r’=0.362**) and wind velocity (‘r’= 0.449**).

178. Name of the student : Anjali G. P. (2020217003)

Year of completion of degree : 2019

Name of the major advisor : Dr. H. V. Pandya

Title of thesis : Population dynamics and evaluation of botanical extracts against diamondback moth (*Plutella xylostella* Linn.) on cabbage (*Brassica oleracea* var. *capitata* Linn.)

Abstract

The present investigation on population dynamics and evaluation of botanical extracts against diamondback moth (*Plutella xylostella* Linn.) on cabbage (*Brassica oleracea* var. *capitata* Linn.) were carried out at Regional Horticultural Research Station, Navsari Agricultural University, Navsari during rabi season of 2018-19.

The study on population dynamics of diamondback moth larvae on cabbage variety, Golden Acre revealed the commencement of pest during second week of December (50th SMW) with initial record of 3.60 larvae/plant and maximum larval population (5.75 larvae/plant) on first week of January (1st SMW). The larval population showed highly significant negative correlation with maximum temperature (r= –0.693), minimum temperature (r= –0.825) and average temperature (r= –0.817). However, morning (r= –0.287), evening (r= –0.224) and average relative humidity (r= –0.312) and evaporation (r= –0.330) showed negative non-significant effect, while sunshine hours (r= 0.245) showed positive non-significant effect on the incidence of the diamondback moth. Further, wind speed (r= 0.646) had significant positive correlation with the larval population. Regression studies revealed 76.90 per cent association of the *P. xylostella* larval population with significant weather parameters.

Coccinellid predators were recorded in the field with initial population of 0.5 adults/plant during second week of December. The maximum temperature (r= –0.524), morning (r= –0.035) and average relative humidity (r= –0.240) had non-significant negative effect, while, minimum temperature (r= –0.626), average temperature (r= –0.619) and evening relative humidity (r= –0.549) had significant negative effect with the population of coccinellid predators. However, wind speed (r= 0.747) had highly significant positive influence, while, sunshine hours (r= 0.448) and evaporation (r= 0.184) had positive non-significant influence on population trend of coccinellids. The regression analysis revealed that 80.70 per cent of the variation in abundance of coccinellids was contributed by significant abiotic factors.

The monitoring of adults using pheromone trap recorded the initial presence of male moths (9 adults/trap) after three weeks of transplanting during first week of December (49th SMW). The peak catch (40 adults/trap) was recorded during last week of December (52nd SMW) and decreased gradually at the end of crop growth period. The results on correlation studies revealed that the weather parameters like maximum (r= –0.736), minimum (r= –0.801) and average (r= –0.830) temperature showed highly significant negative influence, while morning (r= –0.448), evening (r= –0.325) and average (r= –0.478) relative humidity had non-significant negative effect on adult moth catch. Meanwhile, wind speed (r= 0.565) had positive significant effect on adult male catch in pheromone trap. Furthermore, the correlation with evaporation (r= –0.409) and sunshine hours (r= 0.068) on trap catches indicated a negative non-significant and positive non-significant relationship, respectively. The regression analysis revealed that the 70.50 per cent of the variation in population of adult diamondback moth in pheromone trap was contributed by significant weather parameters.

A field trial to study the efficacy of aqueous extracts from fresh leaves of some selected plants was conducted in Randomized Block Design with three replications. The results revealed that aqueous extract of *Azadirachta indica* (A. Juss.) leaves at 10 per cent concentration was most effective as it significantly reduced the larval population

(0.51 larvae/plant) after spraying and also gave significantly higher yield of marketable heads (20.91 t/ha) when compared to other treatments. The per cent increase in yield over control (70%) was also very high in*A. indica* treated plots.

179. Name of the student : Patel Niyati Pradipbhai (2020217023)
Year of completion of degree : 2019
Name of the major advisor : Dr. Snehal Patel
Title of thesis : Biology, seasonal abundance and evaluation of botanical extracts against lily caterpillar (*Polytela gloriosae* Fabricius)

Abstract

Investigations were carried out to study the biology, seasonal abundance and evaluation of botanical extracts against lily caterpillar (*Polytela gloriosae* Fabricius) at P. G. Laboratory, Department of Entomology, ASPEE College of Horticulture and Forestry, NAU, Navsari and Floriculture Farm, NAU, Navsari during the year 2018.

Studies on biology of lily caterpillar specified that the female laid eggs in masses on the lower and upper surface of tender leaves as well as inflorescences of spider lily. The freshly laid eggs were small, round and dorsoventrally flattened with light yellowish in colour. The egg period varied from 3 to 4 days (3.32 ± 0.48 days). The diameter of freshly laid eggs ranged from 0.66 to 0.74 mm (0.70 ± 0.02 mm). The hatching percentage was 78.94 to 90.95 per cent (86.12 ± 3.65 per cent).

The larva passed through five distinct instars. The average larval duration of first, second, third, fourth and fifth instar larvae were reported as 2.24 ± 0.44, 2.36 ± 0.49, 2.52 ± 0.51, 2.96 ± 0.61 and 3.24 ± 0.44 days, respectively. The total larval development period varied from 12 to 16 days (13.32 ± 0.99 days). The average length of first, second, third, fourth and fifth instar were 4.52 ± 0.31, 9.68 ± 0.34, 20.14 ± 0.60, 34.15 ± 0.58 and 40.12 ± 0.59 mm, while the average breadth were 0.50 ± 0.06, 1.19 ± 0.16, 4.24 ± 0.13, 4.98 ± 0.21 and 5.56 ± 0.13 mm, respectively.

The pupa was reddish brown in colour initially, later changed to dark red colour and attained dark brown colour before emergence. Pupation took place in soil in earthen cocoon. The average pupal period was recorded as 12.48 ± 1.12 days. The average length and breadth of pupa were recorded as 16.07 ± 0.57 mm and 5.52 ± 0.25 mm, respectively.

The adults were small sized moths with beautiful mosaic pattern of yellow, black and red dots on fore wings. The average length of male and female adults measured from 14.01 ± 0.58 mm and 15.93 ± 0.72 mm, while that of breadth ranged from 32.39 ± 0.84 mm and 36.25 ± 0.40 mm, respectively. The fecundity of the female moth was 138.68 ± 47.21 eggs. The average pre-oviposition, oviposition and post-oviposition periods were recorded as 1.52 ± 0.51, 3 .72 ± 0.65 and 2.48 ± 0.51 days, respectively. The average longevity of male was reported as 5.60 ± 0.65 days, whereas female was 7.72 ± 0.94 days. The total life cycle of male was 34.72 ± 1.49 days, where in case of female it was 36.80 ± 1.94 days.

The results on seasonal abundance showed that the higher population of *P. gloriosae* was started from the fourth week of June (2.40 larvae per plant) and reached on its peak level during the last week of July (5.00 larvae per plant). The peak population was noticed from the fourth week of June (2.40 larvae per plant) to the fourth week of August (4.20 larvae per plant). Population of *P. gloriosae* showed highly significant negative correlation with maximum temperature (r= -0.916), average temperature (r= -0.668), sun shine hours (r= -0.956) and evaporation (r= -0.830).

The observations indicated that out of 8 treatments of botanical extracts, neem leaves extract 10 per cent was the best treatment recorded lowest larval population of lily caterpillar (1.44 larvae per plant). The lowest per cent flower bud damage was also recorded from the treatment of neem leaves extract 10 per cent (24.95 per cent flower bud damage per plant). The highest flower bud yield (29.63 lakhs flower buds/ha/year) was obtained from the plots treated with Neem leaves extract 10 per cent. Mean loss in flower bud yield by lily caterpillar was recorded 48.90 % in spider lily.

HORTICULTURSL PLANT PATHOLOGY

180. Name of the student : Anjana Mohitkumar D. (2020214001)

Year of completion of degree : 2016

Name of the major advisor : Dr. P. R. Patel

Title of thesis : Investigation of post-harvest diseases of sapota (*Manilkara achras*) and its management

Abstract

Sapota (*Manilkara achras* L.) is the important fruit crop of India. It suffers from several post-harvest diseases among them black mould rot, green mould rot and soft rot take heavy toll of these fruit crops. The present investigation was directed towards developing the effective control methods for managing the post-harvest rots of sapota. Investigation were carried out at Department of Plant Pathology, ACHF, NAU, Navsari on the symptomatology of sapota post-harvest rots, their causal organisms, evaluation of different bioagents, fungicides and their combinations against disease development.The survey showed that the highest incidence (13.75 %) of the black mould disease was found during 30 September, 2015 whereas lowest incidence (3.25 %) was found during 15 April, 2016 and average incidence of post-harvest sapota black mould was found 8.00 per cent. The maximum disease incidence was observed in the market of Amalsad (10.63 %). The highest growth encounted incidence (10 %) was found during 15 September, 2015 while lowest incidence (3 %) was found during 15 April, 2016 and average incidence of post-harvest sapota green mould was found 6.56 per cent. The maximum disease incidence was observed in the market of Amalsad (8.88 %).The highest soft rot incidence (10 %) was found during 15 September, 2015 whereas lowest incidence (2.25 %) was found during 15 April, 2016 and average incidence of post-harvest sapota soft rot was found 5.91 per cent. The maximum disease incidence was observed in the market of Amalsad (8.5 %).The morphological characters of *Aspergillus niger* showed that heads of conidial are radiate initially, which splits into columns at maturity. Conidiophores are long (7.85- 13.87 micron), conidia are brown to black (14.48- 20.89 micron). The morphological characters of *Penicillium digitatum* showed that conidiophores borne from surface or aerial hyphae, stipes 63–165 mm long, with thin, smooth walls, bearing terminal penicillin. *Rhizopus stolonifer* appeared as white cottony colonies becoming heavily speckled by the presence of sporangia and then brownish black in age. The sporangiophores measure up to 38 µm in diameter and 1150-3700 µm in length. The sporangia are 120-380 µm in diameter, globose or sub-globose with somewhat flattened base.The symptoms observed in the infected fruit of sapota by *Aspergillus niger* during the survey were development of dark brown discoloration with black colonies which is having white edges sunken spots, fruits become dark brown, becoming radiate spongy with gas production.Symptoms were developed by *Penicillium digitatum* include a soft water-soaked area on the peel. Green asexual spores (conidia) form at the centre of the colony, surrounded by a broad band of white mycelium. The lesion spreads more rapidly. The fruit rapidly spoils and collapses, or in lower humidity shrinks and mummifies.The

symptoms observed in the infected fruit of sapota by Rhizopus soft rot caused by *Rhizopus stolonifer* were like as large water soaked areas which become soft and sunken. Gray whiskery mould with dusty black spores are grown on the fruit surface.In the management study, five known antagonists were evaluated in vitro for their antagonistic effect against *A. niger* by dual culture method. The results revealed that all the antagonists screened against *A. niger* were significantly superior in their efficacy over the control. The least growth of the pathogen was recorded in the Petriplate which are treated with *T. viride* (7.75 mm) followed by *T. harzianum* (16.75 mm) and *T. fasciculatum* (36.75 mm). Per cent growth inhibition over control indicated that significantly higher growth inhibition (91.39 %) was recorded in Petriplate treated with *T. viride* followed by *T. harzianum* (81.39 %) and *T. fasciculatum* (59.17 %). The results of all the antagonists against *Penicillium digitatum* and *Rhizopus stolonifer* revealed that out of five antagonists tested, the lowest mycelial growth was noticed in Petriplate treated with *T. harzianum* (7.75 and 7.00 mm) followed by *T. viride* (16.50 and 16.00 mm) and *T. fasciculatum* (37.50 and 37.75 mm). The per cent growth inhibition over control indicated that significantly higher per cent growth inhibition (91.39 and 92.22 %) was recorded in Petriplate treated with *T. harzianum* followed by *T. viride* (81.67 and 82.22 %) and *T. fasciculatum* (58.33 and 58.06 %).In the management studies seven fungicides were evaluated by poisoned food technique to know their inhibitory effect on the growth of *Asperillus niger* and *Penicillium digitatum*. The lowest mycelial growth (0.00 mm) of *A. niger* and *P. digitatum* was recorded in benomyl 50 % WP (0.05 and 0.1 per cent concentration), propiconazole 25 % EC (0.05 and 0.1 per cent concentration) and carbendazim 50 % WP (0.1 per cent concentration). The results in terms of per cent growth inhibition revealed that significantly cent per cent inhibition (100.00 %) was recorded with benomyl 50 % WP (0.05 and 0.1 per cent concentration), propiconazole 25 % EC (0.05 and 0.1 per cent concentration) and carbendazim 50 % WP (0.1 per cent concentration). The results showed that all seven fungicides proved significantly superior on the mycelial growth of the *Rhizopus stolonifer* over control. Among the all tested fungicides, benomyl 50 % WP (0.05 and 0.1 per cent concentration), carbendazim 50 % WP (0.05 and 0.1 per cent concentration) and propiconazole 25 % EC (0.1 per cent concentration) proved significantly more effective (0.00 mm) in checking the disease intensity over the rest. The results in terms of fungul growth reduction index revealed that significantly cent per cent inhibition (100.00 %) was recorded with benomyl 50 % WP (0.05 and 0.1 per cent concentration), carbendazim 50 % WP (0.05 and 0.1 per cent concentration) and propiconazole 25 % EC (0.1 per cent concentration). Among combined applications carbendazim with 0.1 % concentration proved significantly more effective (0.00 PDI) in checking the disease intensity over the rest followed by *Trichoderma harzianum* + *Pseudomonas flueroscence* both having 5 per cent concentration (6.67, 6.00 and 6.67 PDI), Sodium chloride + hot water both having 5 per cent concentration (8.00, 7.33 and 7.33 PDI), *Trichoderma harzianum* with 5 per cent concentration (10.00, 10.67 and 10.67 PDI), hot water for 10 minutes at 49 ^{o}C (11.33, 11.33 and 10.00 PDI), *Pseudomonas flueroscence* with 5 % concentration (12.00, 11.33 and 12.67 PDI) were found significantly superior in controlling the *Asperillus niger*, *Penicillium digitatum* and *Rhizopus stolonifer*. The results in terms of fungus growth reduction index revealed that significantly cent per cent disease control (100.00 %) was recorded during post-harvest fruit dipping in carbendazim 50 % WP (0.1 per cent concentration), Next best in order of effectiveness *Trichoderma harzianum* + *Pseudomonas flueroscence* both having 5 per cent concentration (89.79, 90.91 and 89.89 %), Sodium chloride + hot water both having 5 per cent concentration (87.75, 88.89 and 88.89 %).

181. Name of the student : Chauhan Rinkal Tulsidas (2020215016)

Year of completion of degree : 2017

Name of the major advisor : Dr. P. R. Patel

Title of thesis : Evaluation of seed bio-priming against chilli diseases

Abstract

Chilli (*Capsicum frutescence* L.) is mainly cultivated for its vegetable green fruits and for dry chilli as the spice of commerce. It is a rich source of Vitamin C, A and B. In India, it is an important cash crop, which is grown for the both domestic and export market. It is an important food flavoring ingredient for many vegetarian and non-vegetarian food products. Chilli plant is affected by number of seed borne diseases *viz.*, damping off (*Pythium aphanidermatum*), anthracnose or fruit rot (*Colletotrichum capsici*) and fusarium wilt (*Fusarium solani*) which cause Sudden Death Syndrome (SDS) is the most important and serious that eventually leads to quick and rapid death of plants. Keeping in mind considering the severeness of damping off, anthracnose and fusarium wilt the present investigations were carried out. Field survey was conducted in Navsari district during *Kharif* 2016-17 for damping-off, anthracnose and fusarium wilt. Among them anthracnose was found with maximum mean per cent disease incidence (26.57 %) and damping off was found minimum mean per cent disease incidence (2.21 %). Chilli plant showing typical symptoms of damping-off, anthracnose and fusarium wilt diseases were collected and brought to the laboratory for isolation. The cultural and morphological characters revealed the, damping off, anthracnose and fusarium wilt caused by *Pythium aphanidermatum*, *Colletotrichum capsici* and *Fusarium solani*, respectively. The pathogenicity test was proved by artificial inoculation methods *viz.*, soil inoculation (for damping off) spore spray (for anthracnose) and seedling root dip (for fusarium wilt). The pathogenicity revealed the symptoms similar to those observed under field condition. Further, the samples were subjected to isolation and cultures obtained were purified. Occurrence of seed borne pathogen was carried out by two different methods *viz.,* Standard blotter paper method and Potato Dextrose Agar (PDA) method. In standard blotter paper method *A. niger* was found dominant fungus in sterilized and unsterilized seeds and in PDA method per cent disease incidence was not recorded in sterilized seeds by *A. niger*, *A. flavus*, *Fusarium* sp., *Rhizopus* sp., *Colletotrichum capsici* and *Penicillium* sp. while maximum per cent disease incidence *A. niger* was found in unsterilized seeds. Seed bio-priming of chilli seeds *in vitro* revealed seed biopriming with *P. fluorescens* @ 10 gm/kg seed recorded maximum seed germination 86.70 % and minimum per cent infected seeds with *P. fluorescens* applied at imbibition 21.3 %. Seed bio-priming of chilli seeds *in vivo* revealed maximum per cent seed germination 59.4 % in *P. fluorescens* applied as imbibition @ 10 gm/kg and these treatment was also found significantly superior over the rest and also reduce per cent disease incidence damping off, anthracnose and fusarium wilt of chilli by 21.6 %, 9.0 % and 18.9 %, respectively. Seed bio-priming with *P. fluorescens* applied as imbibition @ 10 gm/kg was also found promoting plant growth activity significantly higher after 10, 20 and 30 days of seed sowing in seedling height, shoot length and root length.

182. Name of the student : Chaudhari Pooja Mukeshbhai (2020216003)

Year of completion of degree : 2018

Name of the major advisor : Dr. P. R. Patel

Title of thesis : Symptomatology, morphology and management of leaf blight disease of turfgrass [*Axonopus compresus* (Sw.)] caused by *Curvularia* sp.

Abstract

Investigation was carried out on "Symptomatology, morphology and management of leaf blight disease of turfgrass [*Axonopus compresus* (Sw.)] caused by *Curvularia* sp." at Department of Plant Pathology, P. G. Laboratory, ACHF, Navsari Agricultural University, Navsari. The survey was conducted in NAU campus, Navsari during *summer* 2017-2018, maximum per cent disease incidence of leaf blight was observed at ASPEE college garden. First symptoms appeared on older leaves, as minute reddish brown spot of 3 mm to 4 mm in diameter. Later, the spot enlarged with oval and yellowish to lights brown, adjuvant spots coalesced to form large, irregular spots leading to drying and necrotic. The chief symptoms of disease involved were small reddish-brown colored leaf spot which were later increasing in size and tissues shriveled. The repeated isolation from infected leaves and the pathogenicity test revealed the association of *Curvularia* sp. in leaf blight of turfgrass. Morphological characters were also studied and the pathogen was suspected as *Curvularia* sp. The pathogen was further identified by Indian Type Culture Collection, IARI, New Delhi as *Curvularia lunata* (Wakker) Boedijn (I. T. C. C. No- 10.513.17). The pathogenicity test was proved by three artificial inoculation methods on turfgrass *viz*., leaf injury by pin pricking, tooth brush and spraying of spore suspension. Among the three methods of inoculation tried, injury by pin pricking and tooth brush was found more efficient. The morphological characteristics of the pathogen were studied. The fungus produced profuse, septate, dark black mycelial growth on PDA. Conidia were ellipsoidal, straight, mostly median portion thick with three transverse septa and very dark brown central cells. The conidiophores were erect, grouped, unbranched, septate and brown to dark in colour. Study on effect of antagonist by dual culture method revealed that *Trichoderma viride*, *T. harzianum* and *T. fasiculatum* were strong antagonist against *Curvularia lunata*. *In vitro* screening of five non systemic fungicides carried out by poisoned food technique at different concentrations. Mancozeb 2000 ppm (Dithane M-45) was found best against *Curvularia lunata* followed by 2000 ppm (Indofil Z-78). *In vitro* screening of six systemic fungicides carried out by poisoned food technique at different concentrations. Carbendazim 1000 ppm (Bavistin) was effective for *Curvularia lunata* followed by Tebuconazole 1000 ppm (Folicur). *In vitro* screening five combi fungicides carried out by poisoned food technique at different concentrations. Hexaconazole 4 % + Zineb 68% 1500 ppm (Avtar) was the effective fungicides for managing the leaf blight of *Axonopus compresus* caused by *Curvularia lunata*. The phytoextracts (conc. 10 %) of eleven plant species were evaluated *in vitro* by poison food technique against *Curvularia lunata*. It was revealed that extract of Turmeric (*Curcuma longa* L.), Nafattia (*Ipomea* sp.), Gando-baval (*Prosopsis juliflora* L.), Ginger (*Zingiber officinalis*), Garlic (*Allium sativum* L.) and Tulsi (*Ocimum sanctum* L.) had an inhibitory action. This is a new record from South Gujarat that the pathogen, *Curvularia lunata* (Wakker) Boedijn isolated from turfgrass [*Axonopus compressus* (Sw.)] which caused leaf blight disease.

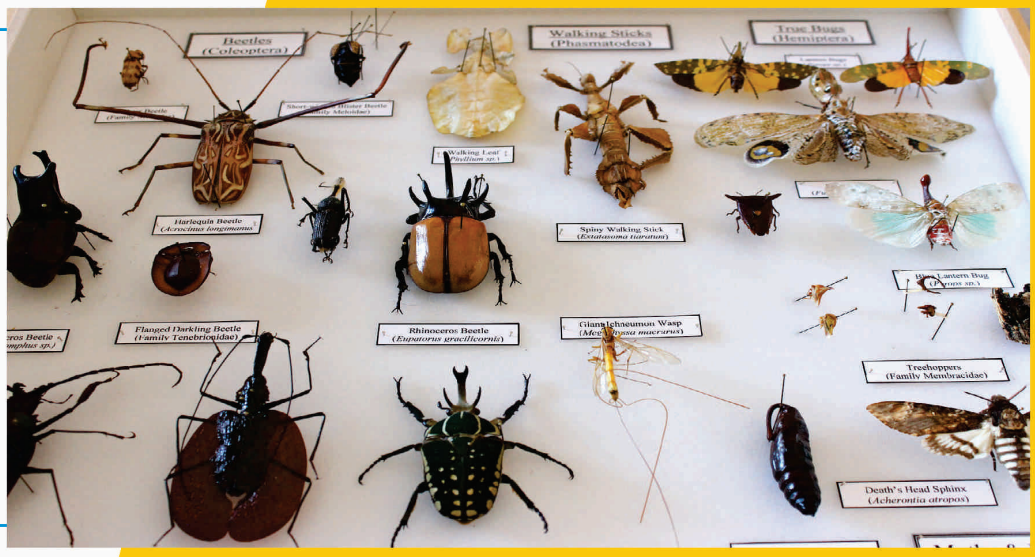
183. Name of the student : Desai Disha Devang (2020217006)
Year of completion of degree : 2019
Name of the major advisor : Dr. P. R. Patel
Title of thesis : Investigation on leaf spot of Areca palm (*Chrysalidocarpus lutescens* H. Wendl.)

Abstract

Areca palm (*Chrysalidocarpus lutescens* H. Wendl.) is one of the most important ornamental flowering palm sufferring from the new leaf spot caused by *Colletotrichum gloeosporioides*. The plants were severly affected by this disease in south Gujarat. Considering this the present research, "Investigation on leaf spot of Areca palm

(*Chrysalidocarpus lutescens* H. Wendl.)", was carried out by undertaking various aspects such as collection, isolation, symptomatology, cross inoculation and host range studies and management of the disease by using different bioagents and fungicides. The repeated isolation from the infected leaves confirmed the association of *Colletotrichum* sp. causing leaf spot. The cultural and morphological studies revealed the pathogen as *Colletotrichum gloeosporioides*, which was also confirmed by Indian Type Culture Collection (ITCC), Division of Plant Pathology, IARI, New Delhi- 110 012 as *Colletotrichum gloeosporioides* (ITCC No- 10,907.18). The pathogenicity of the fungus was proved by using three standard methods. Pin prick injury method proved highly efficient as it produced maximum symptoms. Cross inoculation studies revealed that areca palm was susceptible to all the *Colletotrichum* sp. isolates obtained from five different hosts *viz*., deacaena, anthurium, fishtail palm, royal palm and chamaedorea palm. The host range study was also performed which revealed that *Colletotrichum gloeosporioides* could infect three hosts (anthurium, fishtail palm and royal palm) out of the five hosts inoculated. Interaction studies on the effect of five antagonists was carried out *in vitro* using dual culture method, the results showed that *Bacillus subtilis* and *Trichoderma viride* showed strong antagonistic effect against *Colletotrichum gloeosporioides*. Fifteen different fungicides were screened *in vitro* by using poisoned food technique at three different concentrations. Amongst them, mancozeb at two concentrations *viz*., 1500 ppm and 2000 ppm, propiconazole at all the three concentrations *viz*., 250 ppm, 500 ppm and 1000 ppm and pyraclostrobin 13.3 % WP + epoxyconazole 5 % WP at all the three concentrations *viz*., 500 ppm, 1000 ppm and 1500 ppm were highly fungitoxic against *Colletotrichum gloeosporioides*.


T - 1
Watermelon Juice
T - 2
Watermelon Juice
T - 3
Watermelon Juice
T - 4
Watermelon Juice
T - 5
Watermelon
Juice
T - 6
Watermelon Juice
T - 7
T - 8
Watermelon Juice


Beetles
(Coleoptera)
Walking Sticks
(Phasmatodea)
True Bugs
(Hemiptera)
Harlequin Beetle
(Acrocinus longimanus
Spiny Walking Stick
(Extatosoma tiaratum)
Flanged Darkling Beetle
(Family Tenebrionidae)
Rhinoceros Beetle
(Eupatorus gracilicornis)
Treehoppers
(Family Membracidae)
Death's Head Sphinx
(Acherontia atropos)

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