2016- 2020

RESEARCH RECOMMENDATION

COMPILER
DR. SURESH Y. PATEL
DR. HEMANT SHARMA

ASPEE COLLEGE OF HORTICULTURE AND FORESTRY
NAVSARI AGRICULTURAL UNIVERSITY
NAVSARI- 396 450

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© An Overview

Research Recommendation

In Horticulture
(2016-2020)

Compiled By

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- Dr. P. K. Shrivastava, Dean & Principal, ACHF, NAU, Navsari for his affirmative approach and provision of necessary support for compilation of this booklet.

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SUMMARY
OF
RESEARCH RECOMMENDATIONS

AGRESCO SUB COMMITTEE

SUMMARY A										
Year	2016-17		2017-18		2018-19		2019-20		2020-21	
AgrescoNo.	13th		14th		15th		16th		17th	
Committee	F	S	F	S	F	S	F	S	F	S
Pl. Br. & Gn.	01	00	03	00	01	00	01	00	01	00
Crop Pro. & NRM	00	00	00	00	03	00	00	00	01	00
Plant Protection	00	00	01	00	00	00	01	00	01	01
Horti. & Forestry	08	03	15	02	08	01	10	02	08	01
Ag. Engg.	03	00	02	00	02	00	01	00	00	00
Basic Sci.	00	04	01	01	00	01	01	03	00	00
Dairy & Food Tech.	-	-	-	-	05	00	02	00	01	00
Total	12	07	22	03	19	02	16	05	12	02

F = Farmer community; S = Scientific community

DEPARTMENTS

Year	Total		Fruit Sci.		Veg. Sci.		FLA		PHT		ACSS		Mo. Bio.		Pl. Prot.	
	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S
2016-17	12	07	00	01	03	02	02	00	07	00	00	00	00	04	00	00
2017-18	22	03	02	03	05	00	08	00	04	00	01	00	01	00	01	00
2018-19	19	02	03	01	01	00	05	00	07	00	03	00	00	01	00	00
2019-20	16	05	04	00	04	02	01	00	03	01	02	00	01	02	01	00
2020-21	12	02	01	01	03	00	05	00	01	00	01	00	00	00	01	01
Total	81	19	10	06	16	04	21	00	22	01	07	00	02	07	03	01

PROCEEDING OF THE THIRTEENTH MEETING OF COMBINED JOINT AGRICULTURAL RESEARCH COUNCIL OF SAUs AND KAMDHENU UNIVERSITY OF GUJARAT - 2016-17 (April 5th & 6th, 2017)

13.1. Plant Breeding and Genetics

A. For Farmer

13.1.1.26: Sweet Potato: Bhu kanti (CIP- 0127) (Endorsement)

Sweet potato variety Bhu Kanti recorded 33.2 t/ha tuber yield, which was 84% higher than national check Gauri. This clone is rich in β-carotene content as compared to national check Gauri. It is recommended for endorsement in South Gujarat.

(Action: Prof. & Head, Dept. of Veg. Sci., ACHF, NAU, Navsari)

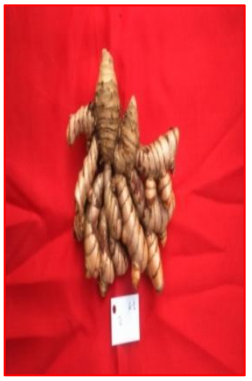
13.4 Horticulture & Forestry

A. For Farmer

13.4.1.17: Effect of rhizome size on growth and yield of turmeric cv. GNT-1

The farmers of south Gujarat heavy rainfall zone are advised to plant mother rhizome pieces (10-15 g) of turmeric cv. GNT-1 in pro tray and transplant it after one month in field with minimum quantity of seed rhizomes.

(Action: Head, Dept. of Vege. Science, ACHF, Navsari)



13.4.1.18: Standardization of fertigation and methods of training in capsicum under naturally ventilated polyhouse

Farmers cultivating capsicum in naturally ventilated polyhouse (1000 m^2 area) are advised to fertigate the crop with 25: 25: 25 kg NPK along with application of 0.5 kg *Trichoderma viride*, Phosphorous Solubilizing Bacteria (*Bacillus megaterium*), Azotobactor, *Pseudomonas fluorescens* each, 0.4 t vermicompost and 5.0 kg micro-nutrients (Grade-5) at the time of planting and train plants to four shoot system for higher net returns.

Crop Duration Growth Period	Distribution pattern/ratio of fertilizers (kg)			Remarks
	N	P	K	
1st Growth Period (Up to 30 days)	7.15	8.32	2.50	❖ Fertigation should be started after 10-15 days of planting. ❖ Fertigation should be carried out once a week. ❖ The source of nitrogen during flowering period should preferably be Calcium Nitrate.
2nd Growth Period (31-60 days)	3.57	5.56	5.00	
3rd Growth Period (61-90 days)	3.57	2.78	7.50	
4th Growth Period (91-120 days)	3.57	2.78	5.00	
5th Growth Period (121-150 days)	3.57	2.78	2.50	
6th Growth Period (151-180 days)	3.57	2.78	2.50	
Total	25.00	25.00	25.00	

(Action: Head, Dept. of Vegetable Science, ACHF, Navsari)

13.4.1.19: Effect of de-leafing and foliar nutrient application for offseason flowering in spider lily (*Hymenocallislittoralis*)

Farmers of south Gujarat heavy rainfall zone I growing spider lily are advised to cut the leaves in 1st week of May and subsequently apply 13-0-45 (NPK) @ 1.5 % (15g/l) through foliar application as first spray when plant attain 30-45 cm height after de-leafing and second spray 15 days after first foliar application along with recommended dose of fertilizers (300:225:200 kg NPK/ha) for getting higher production of flower buds as well net realization.

(Action: Head, Dept. of Flori. & Landscape Architecture, ACHF, Navsari)

13.4.1.21: Standardization of drying technique in Rose var. Top secret, Gold Strike and Rewine

People interested in cottage industry based on dry flowers are advised to dry roses of variety Top Secret and Gold Strike using silica gel (60-120 mesh size) embedding method (850 g silica for 10 flowers) either with Microwave Oven (900 Watts, 30 L capacity, 1 day –drying time) or under room condition (7 daysdrying time) to obtain good quality dry flowers having storage life of about 120 days.

Procedure of Drying (Microwave Oven Silica Gel Embedding Method)

- Embedding in Silica (850 grams/10 flowers)-glass bowl
- Microwave Oven (900 Watt, 30 liter capacity)
- 2 mins on microwave oven/1 hour cooling (Outside)- 3 times repeat
- 18 hours cooling followed by 1 time repeat
- Taking out of dry flowers.

(Action: Head, Dept. of FLA, ACHF, Navsari)

13.4.1.22: Development of technology for dehydration of onions rings for adoption at commercial scale

Processors and entrepreneurs are recommended to dehydrate red onions rings by pre-treating onion rings with combination of 2000 ppm potassium metabisulphite (KMS) and 500 ppm citric acid for 15 minutes followed by dehydration at 75 ºC for 2 hours, 70oC for 2 hours, 65 ºC for 1 hour and 60 ºC for 8 hours till a final moisture content of 4.8%. Dehydrated red onion rings packed in 400 gauge 111 HDPE bags remain microbiologically safe for 6 months with better quality attributes.

(Action: Head, Dept. of PHT, ACHF, NAU-Navsari)

13.4.1.23: Development of technology for dehydration of okra slices for adoption at commercial scale

Processors and entrepreneurs are recommended to dehydrate okra slices by pre-treating okra slices with combination of 1500 ppm KMS and citric acid @ 500 ppm for 15 minutes followed by dehydration at 75 for 2 hours and 65 ºC for 10 hours till a final moisture content of 5.2 %. Dehydrated okra slices packed in 400-gauge HDPE bags remain microbiologically safe for 6 months with better quality attributes.

(Action: Head, Dept. of PHT, ACHF, NAU-Navsari)

13.4.1.24: Development of technology for dehydration of cauliflower for adoption at commercial scale

Processors and entrepreneurs are recommended to dehydrate cauliflower cut segments by pre-treating cauliflower cut segments with combination of 1500 ppm KMS and 1000 ppm citric acid for 15 minutes. After pre-treatment, the cauliflower cut segments must be dehydrated at 75 ºC for 2 hours, 70ºC for 2 hours, 65ºC for 1 hour and 60oC for 7 hours till a final moisture content of 4.9%. The dehydrated cauliflower cut segments packed in 400-gauge HDPE bags remain microbiologically safe for 6 months with better quality attributes.

(Action: Head, Dept. of PHT, ACHF, NAU-Navsari)

13.4.1.25: Effect of hot water dip treatment on the eradication of fruit fly, ripening and quality of mango for export purpose (cvs. Kesar and Alphonso)

Exporters are recommended to give hot water treatment at 50 ºC for 20 min to eradicate fruit fly infestation in Kesar and Alphonso mango to maintain the export quality fruits.

(Action: Head, Dept. of PHT, ACHF, NAU Navsari)

B. For Scientific

13.4.2.2: Seasonal influence on nutritional and physiological changes associated with flowering and fruiting behaviour in mango

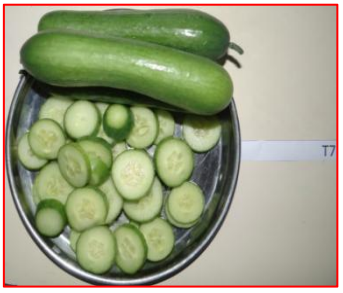
The nutrient contents *viz.* nitrogen, potassium, calcium, magnesium, manganese, iron and zinc in leaves of mango cultivar 'Kesar' and 'Alphonso' were higher during the months of October to January, thereafter the nutrient contents started to decrease and were recorded lower during the months of April to July. Photosynthetic rate and internal CO_2 content of leaves of cultivar 'Kesar' and 'Alphonso' increased significantly during the months of November to March and declined during the months of August–September.

(Action: Head, Dept. of Fruit Science, ACHF, NAU, Navsari)

13.4.2.3: Evaluation of parthenocarpic cultivars of cucumber under protected conditions for yield and other horticultural traits

Greenhouse cucumber cultivars Oscar and Valleystar were identified as the highest yielders recording more than 12 tonnes per 1000 m2under naturally ventilated polyhouse, which were at par in performance with cvs. RS 03602833, Kian and Multistar. Minor differences in yield of these cultivars in general and variation in seed cost of cultivars in particular other than various variables components of cost contributed towards higher net returns in Oscar. Evaluation of cucumber cultivars for various sensory parameters by heterogeneous panel of evaluators revealed highest overall score in cv. Multistar statistically at par with KUK-9 and 52-23.

(Action: Head, Dept. of Vegetable Science, ACHF, NAU, Navsari)



13.4.2.4: Evaluation of tomato cultivars under NVPH for yield and other horticultural traits

Cultivar Bargad was identified as significantly highest yielder producing 14.90 tonnes per 1000 m2 with maximum net realizationin naturally ventilated polyhouse. Higher number of fruits per plant and minimum occurrence of blossom end rot were observed as major contributing traits towards yield. Cv. Rakshita possessed maximum TSS whereas cv. Heemsohna showed higher ascorbic acid, lycopene and pH.

(Action: Head, Dept. of Vege. Sci., ACHF, NAU, Navsari)

13.5 Agricultural Engineering

A. For Farmer

13.5.1.35: Effect of Pretreatments on Quality Attributes of Dehydrated Green Chilli Powder

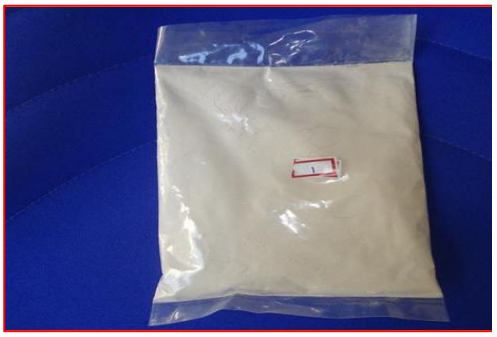
Entrepreneurs/food processors are recommended to prepare green chilli powder by using the process: green chilli pieces (2 cm) blanched in water at standard conditions (90°C for 3 min) followed by pretreatment with 2000 ppm Sodium Metabisulphite solution dipping for 30 min and dried in a tray dryer at temperature of 60°C for 18 h till final moisture content of 5±1%. The green chilli dried pieces to be grinded and packed in 125-micron HDPE pouch for storage up to 6 months at ambient temperature (26-32°C).

(Action: I/c, CE on PHT, Navsari)

13.5.1.36: Standardization of technology for preparation of unripe banana (*Musa paradisiaca* L.) powder for commercial adoption

Food processors and entrepreneurs are recommended to cut 2 mm thick unripe banana (Grand Naine) slices for dehydration by blanching in water at 70°C for 1 min followed by dipping for 30 min in 1000 ppm Potassium Metabisulphite+2000 ppm Citric Acid solution and dried in a tray dryer at a temperature of 60±2 °C till a final moisture content of 3±1%. The dried unripe banana slices should be grinded into powder and packed in glass jar or Aluminium laminate pouches for storage upto six months at ambient temperature.

(Action: I/c, CE on PHT, Navsari)



13.5.1.37: Design of Corrugated Fiber Board (CFB) box for packaging of Kesar mango

Manufactures are recommended to use corrugated fiber board box for 3kg, 5kg and 10 kg to pack Kesar mango fruits packaging having edge crush test value 2.44N/mm, 5.31N/mm and 4.51N/mm respectively prepared from kraft liner paper with B-type flute having less than 12% moisture content with following specifications for safe transport.

Particulars	3 kg Box	5 kg Box	10 kg Box
Type of Box	One piece Interlocking box (OSC)	One-piece tuckin cover/ telescopic box (OSC)	One piece box (RSC)
Compressive Strength of Box, Kgf	105.49	217.30	228.92
Internal Dimension, mm L x W x H	398x 256x 66	332x 256x 130	332x 256x 256

(Action: I/c, CE on PHT, Navsari)

13.7 Basic Science

B. For Scientific

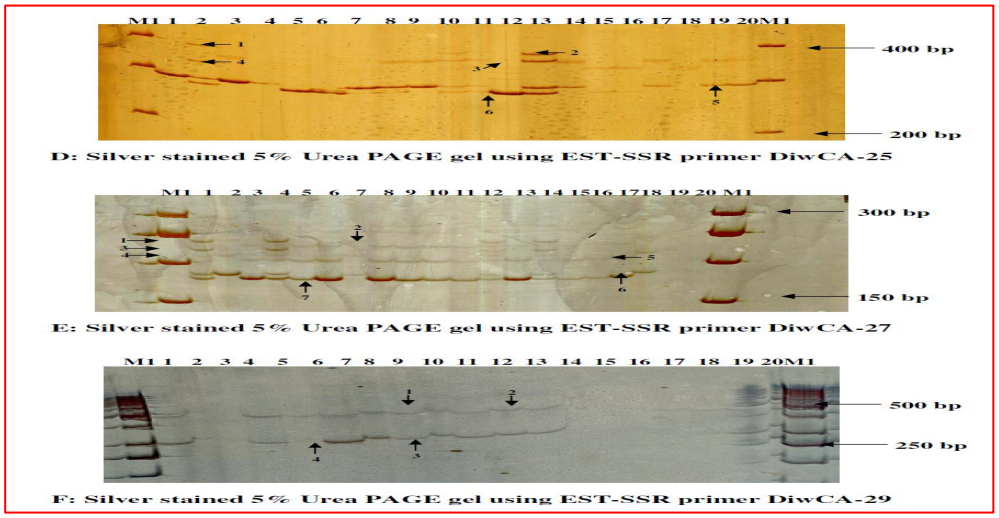
13.7.1.5: Development of EST - SSR marker in chilli

It is informed to scientific community that 25 out of 86 polymorphic markers arepresent in EST-SSR based primers (3893 EST-SSR) in chilli genotypes.

SN	Primer ID	Expected fragment size (bp)	Observed fragment size range (bp)	Monomorphic/ Polymorphic
1	DiwCA03	280	421-474	Polymorphic
2	DiwCA05	370	378-507	Polymorphic
3	DiwCA08	398	350-540	Polymorphic
4	DiwCA09	398	671-748	Polymorphic
5	DiwCA12	307	310-465	Polymorphic
6	DiwCA17	168	155-325	Polymorphic

7	DiwCA22	166	175-305	Polymorphic
8	DiwCA25	370	284-436	Polymorphic
9	DiwCA27	184	180-260	Polymorphic
10	DiwCA29	254	265-396	Polymorphic
11	DiwCA30	122	110-156	Polymorphic
12	DiwCA32	169	215-232	Polymorphic
13	DiwCA33	297	316-326	Polymorphic
14	DiwCA36	233	228-242	Polymorphic
15	DiwCA41	320	254-495	Polymorphic
16	DiwCA49	394	300-565	Polymorphic
17	DiwCA50	226	200-395	Polymorphic
18	DiwCA62	355	350-601	Polymorphic
19	DiwCA67	226	205-359	Polymorphic
20	DiwCA68	174	166-346	Polymorphic
21	DiwCA73	337	302-487	Polymorphic
22	DiwCA75	174	185-325	Polymorphic
23	DiwCA79	227	200-350	Polymorphic
24	DiwCA81	246	250-463	Polymorphic
25	DiwCA83	140	140-265	Polymorphic

(Action: Prof. & Head, Dept. of Plant Molecular Biology and Biotech, ACHF, NAU)



13.7.1.6: Refinement of sucker tip decontamination technique for mass multiplication of banana through tissue culture

It is informed to scientific community that trimming of banana sucker tip up to 3-4 leaf bases and then treating with lactic acid (0.15 %) + Tween-20 (0.1 %) + commercial bleach (0.8 %) for 30 minutes. Further, trim the sucker tip up to 1-2 leaf bases and then retreat with Sodium chlorite (0.3 %) for 30 minutes. Inoculate these explants aseptically on the culture medium to reduce bacterial and fungal contamination with culture establishment up to 66 per cent.

(Action: Prof. & Head, Dept. of Plant Molecular Biology and Biotech, ACHF, NAU)

13.7.1.7: Development of low-cost technology for in vitro mass multiplication of banana

It is informed to scientific community that replacement of laboratory grade sucrose with commercial sugar (30g/l) produced highest no. of shoots. Further, agar (4 g/l) with isabgul (10 g/l) reduces the cost of media and gives better multiplication.

(Action: Prof. & Head, Dept. of Pl. Molecular Biology and Biotechnology, ACHF-NAU)

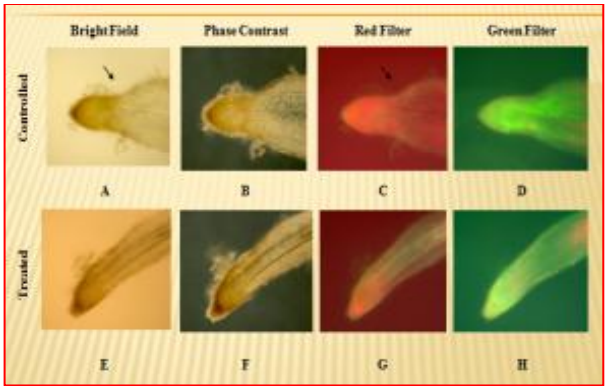
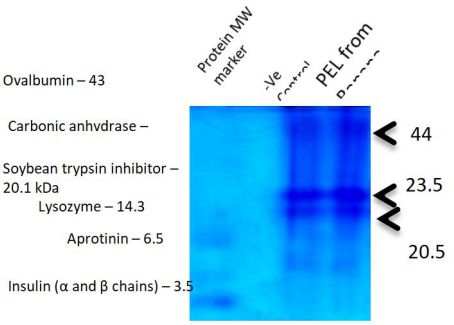


Fig: Molecular weight analysis of partially purified PEL enzyme from banana pulp



13.7.1.8: In vitro regeneration protocol for spine gourd (*Momordica dioca* Roxb.)

It is informed to scientific community to use MS medium supplemented with BAP (1.0 mg/l) + NAA (1.0 mg/l) for highest shoot multiplication and ½ MS medium supplemented with IBA (2.0 mg/l) for rooting in spine gourd (Momordica dioca Roxb.). The rooted plantlets of 6 cm shoot length be transferred from culture bottles into plastic cups containing mixture of cocopit and sand (1:1). After 21 days of hardening in the green house, these plants are ready for transfer in the soil.

(Action: Prof. & Head, Dept. of Pl. Molecular Biology & Biotech, ACHF, NAU, Navsari)

14.1. Plant Breeding and Genetics

A. For Farmer

14.1.1.22: Tomato: NTL-12-01 (GT-7)

Tomato genotype NTL-12-01 (301.0 q/ha) performed well under South, Middle and North Gujarat regions where, it exhibited overall 28.47, 26.54 and 25.82 % higher fruit yield over standard checks JT-3, AT-3 and DVRT-2, respectively. The genotype showed less damage by fruit borer, whitefly as well as leaf miner as compared to checks. This variety GT-7 is recommended for cultivation of farmers of South, North and Middle Gujarat regions.

(Action: Professor, Dept. of Vege. Science, ACHF, Navsari)


14.1.1.23: Adenium: Gujarat Adenium-1 (GAd. - 1)

Adenium variety GAd. -1 is unique ornamental plant bearing attractive multi petalous red coloured flowers with 15 petals per flower with good flower longevity. It can be propagated by grafting on local pink root stock. This variety of adenium is recommended to grow as ornamental crop for higher commercial value in Gujarat.

(Action: Asso Prof, Dept. of Floriculture, ACHF, NAU, Navsari)


14.1.1.24: Adenium: Gujarat Adenium-2 (GAd. -2)

Adenium variety GAd. -2 is unique ornamental plant bearing reddish purple coloured flowers having dual whorls each of 5 petals *i.e.* 10 petals in each flower along with good flower longevity. It can be propagated by grafting on local pink root stock. The nurserymen dealing with ornamental plants are advised to grow adenium GAd. -2 under polyhouse for higher commercial value.

(Action: Asso Prof, Dept. of Floriculture, ACHF, NAU, Navsari)

14.3 Plant Protection

A. For Farmer

14.3.1.21: Population dynamics of *Helicoverpa armigera* (Hubner) through pheromone trap in tomato

Farmers of South Gujarat Heavy Rainfall Agro-climatic Zone III growing tomato are recommended to monitor the infestation of *Helicoverpa armigera* from 3rd to 18th week after transplanting tomato crop for timely management of pest.

(Action: Prof and Head, Deptt. of Ento, ACHF, NAU; Navsari)

14.4 Horticulture & Forestry

A. For Farmer

14.4.1.10: Effect of time of inarch grafting on success and survival in mango cv. Kesar

Farmers and nurserymen of South Gujarat Heavy Rainfall Agro-climatic Zone I (AES-III) preparing inarch graft of mango are advised to prepare grafts throughout the year with uniform success rate and survival of inarch grafts

(Action: Res. Sci, RHRS., ACHF, NAU, Navsari)

14.4.1.11: Effect of time and dose of fertilizer application on yield and quality of sapota cv. Kallipati

The Farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I (AES–III) having a sapota orchard with adult trees of cv. Kalipatti are recommended to apply 100 per cent recommended dose of fertilizers @ 1000-500-500g NPK/tree/year in three splits *i.e.* 250-125-125g NPK/tree in June along with FYM @ 100kg/tree/year. Remaining 250-125-125g NPK/tree in October and 500-250-250g NPK/tree in February instead of two equal splits *i.e.* in June and October. This treatment gives higher fruit yield of sapota with higher net realization in winter season in comparison to summer season.

(Action: Res. Scientist, RHRS., ACHF, NAU, Navsari)

14.4.1.13: Effect of liquid manures on quality and productivity of banana and papaya grown under alternate row system

The farmers of south Gujarat heavy rainfall agro climatic zone- I (AES III) growing banana (variety, Grand Naine) and papaya (variety, red lady 786) under alternate row system are advised to apply 7.2 kg NADEP manure along with 2 l/plant Jeevamrut and 2 l/plant Amreetpani to each of banana and papaya crop for achieving higher yield and net return.

Detail management for banana and papaya alternate row system as follows:

i. Planting: Prepare the pits at 2.4 m x 1.5 m distance. Sow plant by applying 2.4 kg of NADEP manure per plant along with PSB and *Azotobactor* biofertilizer and *Trichoderma* and *Pseudomonas* bio-pescicide 2 ml or g each/plant.
ii. 2.5 & 5 MAP: Apply 2.4 kg of NADEP manure per plant each time.
iii. Apply liquid manures Jeevamrut and Amreetpani @ 400ml/plant at one month interval starting from planting in 5 equal splits.
iv. In banana, drench 500 ml 0.5% each of *Trichoderma* and *Pseudomonas* after one month of planting.
v. In papaya, drench 400 ml 0.5% each of *Trichoderma* and *Pseudomonas* at 30 and 60 days of planting.
vi. For plant protection measure, use the 40 fruit fly traps/ ha for control of

fruit fly in papaya and alternate spray of cow urine 2 %, neem oil 0.02%, neem extract 0.5% for control of sucking pest and disease in the both crops as per need basis.

(Action: Assoc Res Sci, ACSS, ACHF, NAU, Navsari)

14.4.1.14: Integrated Nutrient Management in cauliflower (*Brassica oleracea* var. b*otrytis*)

The farmers of South Gujarat Agro-climatic Zone-I growing cauliflower are advised to apply 20 kg N+ 40 kg P2O5 along with 20 t/ha FYM and 5.70 t/ha bio compost as basal dose. The 20 kg nitrogen should be applied 30 DAT as top dressing to get higher yield and return.

(Action: Res. Sci., Dept. of Veg Sci., ACHF, NAU, Navsari)

14.4.1.15: Response of okra to foliar application of Silicon

The farmers of South Gujarat growing summer okra are advised to spray silicon based liquid fertilizer@ 2 ml/l (silicon:0.79% w/v + boron:0.18% w/v - OSAB-Si+) at 30, 45 and 60 DAS to obtain higher yield and net income.

(Action: Dept. of Vege. Sci., ACHF, NAU, Navsari)

14.4.1.16: Performance of grafted V/S non-grafted brinjal during rainy season under South Gujarat conditions

The farmers of South Gujarat Heavy Rainfall Zone-I (AES-III) are advice to adopt grafting technique using wild species (*Solanum torvum)* as rootstock and pink and purple *Surati Ravaiya* brinjal as scion for better plant survival during rainy season, better fruit set, comparatively less shoot and fruit borer infestation, extended life span, higher yield and net returns.

(Action: Res. Scientist, Dept. of Veg Sci., ACHF, NAU, Navsari)

14.4.1.17: Comparative performance of different parthenocarpic cultivars of cucumber through vegetative propagation under poly house conditions

Farmers cultivating parthenocarpic cucumber varieties in greenhouse are advised to use newly pruned side shoots of current crop as propagating material for raising of successive crop without paying high price for seed which performs equally well to the crop raised from seeds and concurrently, excessive plants generated from pruned side shoots can be sold for additional income.

(Action: Res Sci, Dept. of Vege Sci, ACHF, NAU, Navsari)

14.4.1.18: Effect of plant growth regulators on growth, quality and yield of Dendrobium orchid under NVPH

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I growing Dendrobium orchid under naturally ventilated polyhouse are advised to spray GA_3 @50 ppm (1 g/20 lit.) at every two months interval throughout the year for getting higher spike yield and net return.

(Action: Prof. & Head, Dept. of Flori., ACHF, NAU, Navsari)

14.4.1.19: Response of gladiolus cv. Sancerre to different levels of fertilizers (N & P) in respect to growth and yield parameters

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-1 (AES-III) cultivating gladiolus are advised to apply 125: 150: 200 kg NPK/ha along with FYM @ 8 t/ha during bed preparation and remaining dose of nitrogen *i.e.* 125 kg should be applied at 40 days after planting to produce higher yield and net return.

(Action: Prof. & Head, Dept. of Flori. ACHF, NAU, Navsari)

14.4.1.20: Standardization of nitrogen and phosphorus levels in Chrysanthemum var. Ratlam Selection

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I (AES-III), growing Chrysanthemum variety, Ratlam Selection are advised to apply 150-100-100 kg NPK / ha along with FYM @ 10 t/ha. Full dose of phosphorus, potassium and half dose of nitrogen should be applied as basal dose whereas, remaining half dose of nitrogen should be applied after 30 days of transplanting for obtaining higher yield and net return.

(Action: Prof. & Head, Dept. of Flori. ACHF, NAU, Navsari)

Ratlam Selection

Red Gold (red)

CS-16

14.4.1.21: Effect of different growing conditions on growth and flowering of heliconia varieties

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-1 (AES-III) are advised to grow heliconia under 25 % green agro-shadenet house for getting higher yield and net return.

(Action: Prof. & Head, Dept. of Flori. ACHF, NAU, Navsari)

14.4.1.22: Effect of foliar spray of polyamines and banana enriched sap on Rose (Rosa hybrida L.) under polyhouse conditions

Farmers cultivating rose in polyhouse are advised to give foliar application of enriched banana psuedostem sap (Novel O.L.F. @ 200 ml/10 lit. of water) 2 times at 15 days interval from second week of November to obtain higher yield and net returns.

(Action: Prof. & Head, Dept. of Flori. ACHF, NAU, Navsari)

14.4.1.23: Standardization of suitable formulation for preparation of instant mango milk shake powder

It is recommended that instant mango milk shake powder can be prepared using 45 % of mango powder, 35 % of milk powder, 20 % sugar and in addition to 0.5 % citric acid. The product packed in 200 gauge PP pouches (50 microns) found stable upto 6 months at room temperature on the basis of physico-chemical and sensory qualities.

(Action: Prof. & Head, PHT, ACHF, NAU, Navsari)

14.4.1.24: Standardization of protocol for the extension of shelf life of fresh sapota fruit

Farmers and entrepreneurs are recommended to extend the shelf life of sapota fruits by packing in CFB box (10 kg capacity) and pre-cooling at 10 oC for 8 hours. The shelf life of pre-cooled sapota fruits can be extended up to 12 days (including 3 days transportation at ambient condition) at 11 °C.

Harvesting

↓

Packaging in CFB 10kg box

↓

Pre-cooling at 10°C for 8 hours

↓

Transportation (3 days at ambient temperature)

↓

Storage at 11°C

(Action: Prof. & Head, Dept. of PHT, ACHF, NAU, Navsari)

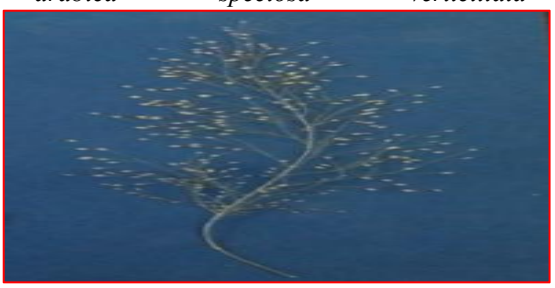
14.4.1.25: Exploration and evaluation of local weed flora for value addition through drying

People interested in cottage industry and entrepreneurs are advised to use weeds for making dry flower products. Leaves of Argyreia speciosa can be dried in 7 days, inflorescence of Celosia argentea and Setaria verticillata in 5 days, Cyperus rotundus and Dinebra arabica in 4 days and Eragrostis pilosa in 3 days through press drying method at room temperature for use in dry flower products up to 6 months.

(Action: Prof. & Head, Dept. of Flori., ACHF, NAU, Navsari)

Dinebra arabica *Argyreia speciosa* *Setaria verticillata*

Cyperus rotundus *Celosia argentea*



Eragrostis pilosa

Dry weeds used in a frame

B. For Scientific

14.4.2.2: Screening of salt tolerant rootstock for mango from South Gujarat region

Genotype 73-2 was found better in terms of germination, seedling growth and survival at EC 4 to 5 dSm-1 salinity level. Scientists, those who are interested to work on salt tolerant rootstock of mango may take advantage in hybridization programme.

(Action: Professor & Head, Dept. of Horti., ACHF, NAU, Navsari)

14.4.2.4: Determination of nutritional composition of minor fruits

Minor fruits (mentioned below) of South Gujarat are found rich in following parameters as compared to banana and sapota.

Fruits	Composition better than banana and sapota
Palmyra palm	K (3902 ppm), Ca (739 ppm), P (268 ppm) and Zn (2.79 ppm)
Jamun	Total phenol (241.6 mg/100g), Antioxidant activity (126.5 mg/100g), Ca (324 ppm) and Mg (241 ppm)

White wax apple	Antioxidant activity (16.4 mg/100 g)
Carambola	Vitamin-C (16.1 mg/100 g), Total phenol (20.8 mg/100 g), Antioxidant activity (28.4 mg/100 g), K (4099 ppm), Ca (657 ppm), Mn (3.01 ppm) and Cu (2.75 ppm)
Tamarind	Carbohydrates (62.8 %), Protein (2.81 %), Vitamin-C (18.9 mg/100 g), Total phenol (25.6 mg/100 g), Antioxidant activity (30.4 mg/100 g), K (12433 ppm), Ca (2759 ppm), Mg (1286 ppm), P (1099 ppm), Fe (154.3 ppm), Mn (6.47 ppm), Zn (7.11 ppm) and Cu (6.13 ppm)
Jackfruit	Total phenol (31.8 mg/100 g), Antioxidant activity (62.9 mg/100 g), K (5135 ppm), Ca (405 ppm), Mg (533 ppm) and Mn (5.12 ppm)
Star gooseberry	Protein (4.31 %), β carotene (100.7 µg/100 g), Vitamin-C (17.1), Total phenol (105.0 mg/100 g), Antioxidant activity (83.7 mg/100 g), K (4411 ppm), Ca (4933 ppm), Mg (1518 ppm), P (545 ppm), Fe (17.2 ppm) and Zn (3.94 ppm) 107
Lasoda	β carotene (62.7 µg/100 g), Total phenol (41.8 mg/100 g), Antioxidant activity (55.7 mg/100 g), K (4644 ppm), Ca (656 ppm), P (431 ppm), Mn (3.51 ppm) and Zn (2.06 ppm)
Kair	Protein (2.24 %), Total phenol (61.5 mg/100 g), Antioxidant activity (77.7 mg/100 g), K (7313 ppm), Ca (1011 ppm), Mg (723 ppm), P (999 ppm) and Zn (4.71 ppm)
Rayan	β carotene (87.63 µg/100 g), total phenol (157.4 mg/100 g), Antioxidant activity (92.6 mg/100 g), Ca (284 ppm) and P (321 ppm)

(Action: Professor & Head, Dept. of Horti., ACHF, NAU, Navsari)

14.5 Agricultural Engineering

A. For Farmer

14.5.1.46: Packaging and storage studies of drumstick '*Moringa oleifera*' and its pulp

1. Farmers, processors and entrepreneurs are recommended to preserve the drumstick pod pieces by packing in glass bottle and 'A-1 tall tin can' with 2 % brinesolution and steam retorting at 115 °C temperature for 15 min and cooling. Thus, bottled and canned drumstick pod pieces can be stored safely and utilized up to 8 and 12 months, respectively.
2. Farmers, processors and entrepreneurs are recommended to preserve the drumstick pulp in glass bottle and 'A-1 tall tin can' after sterilization and steam retorting at 121 °C temperature for 10 min and cooling. Thus, bottled and canned drumstick pulp can be stored safely and utilized up to 8 and 12 months, respectively.

(Action: Incharge, CE on PHTC, NAU, Navsari)

14.5.1.47: Technology for utilization of Orange Peel and Seed

Sub-title: Standarization of drying parameters for orange peel and seed

Processors and entrepreneurs are recommended to dry the sweet orange peel and seed below 7 % final moisture content using tray dryer operated at 50°C drying air with tray load of 4.6 kg/m2 and 2.7 kg/m2 for 32 h and 21 h, respectively to extract highest orange oil with optimum d- limonene cotent.

(Action: Incharge, CE on PHTC, NAU, Navsari)

14.7 Basic Science

A. For Farmer

14.7.1.4: Effect of pre-harvest water stress on yield and post-harvest quality of cabbage (*Brassica oleraceae* var. capitata L.)

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone AES III growing cabbage are advised to withheld two irrigations, first at head development (35- 40 DAS) and second at leaf overlapping stages (65-70 DAS) for sustaining post-harvest quality, increasing yield, saving water and to get higher net return.

(Action: Prof. & Head, Dept. of Plant Mol. Bio. & Biotech, ACHF, NAU, Navsari)

B. For Scientific

14.7.2.21: Assessment of genetic diversity through molecular markers in mango (*Mangifera indica* L.)

Scientific community is informed to use markers OPA-04, OPG-17, OPA-18 and OPB-19 for genetic diversity analysis in mango. Amarapali and Dashehari varieties were found to be genetically most similar, followed by Sonpari and Baneshan; Neelphanso and Sonpari; Dashehari and Mallika; Ratna and Sindhu and Sonpari and Alphanso. Whereas, Banglora and Neelphanso were found to be genetically most diverse varieties followed by Lal Malgoa and Amrutang; and Lal Malgoa and Vanraj.

(Action: Res. Sci, RHRS, ACHF, NAU, Navsari)

15.1. Plant Breeding and Genetics

A. For Farmer

15.1.1.21: GREATER YAM VARIETY: NGy-7 (GGY-1)

Greater yam variety NGy-7 had recorded 18.48 t/ha average tuber yield which was 28.24 per cent higher than national check Da-199 (Sree Karthika). The purple flesh tuber of this clone is rich in total soluble sugar, crude fibre, anthocyanin, phosphorus, potassium, ferrous, zinc and copper content and low in anti-nutritional factor Diosgenin compared to national check Da-199 (Sree Karthika). The proposed genotype showed moderately resistant to Anthracnose disease. The variety NGy-7 is recommended for cultivation in Gujarat as "GGY1 (Gujarat Greater Yam-1)".

(Action: Professor, Dept. of Vegetable Sci, ACHF, Navsari)

15.2 Crop Production and NRM

A. For Farmer

15.2.1.22: Effect of different organic source on yield and quality of sorghum varieties

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing *rabi* sorghum (GJ 42) organically are recommended to apply 50% RDN (40 kg N/ha) through NADEP compost and spray 1% Novel organic liquid nutrient three times (20, 40 and 60 days after sowing) for attaining the higher yield and net profit.

Detail management as follows:

- Sow the sorghum crop at 60 x 15 cm and apply 4.2 t/ha of NADEP compost.
- Apply 2 kg or l/ha each of *Azospirillum*, PSB, *Trichoderma* and *Pseudomonas* in soil at the time of sowing.
- Apply 900 l/ha of *Jeevamrut* with irrigation water in three equal splits at 15 days interval starting from sowing.
- Need based alternative spray of 0.20 % neem oil, 4 % neem extract and 2 % cow urine should be done to control sucking pests.

(Action: Assoc. Prof., Dept. of SSAC, ACHF, NAU, Navsari)

15.2.1.23: Agronomical evaluation of different pigeon pea varieties under organic farming

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing pigeon pea (*Vaishali*) organically are recommended to apply 100% RDN (25 kg N/ha) through vermicompost or NADEP compost or FYM for achieving higher yield and net profit.

Detail management as follows:

- Sow the pigeon pea crop at 60 cm x 20 cm x 120 cm (Row x Plant x Pair). Apply 1.6 t/ha vermicompost in two equal splits at the time of sowing and one month after sowing.
- Soil application of *Trichoderma* and *Pseudomonas* @ 2.0 kg/ha each at the time of sowing.
- Inoculate seeds wijth *Rhizobium* @ 10 ml/kg seed before sowing.
- Grow marigold plant as a trap crop in the surrounding of the field.
- Keep 12 pheromone trap/ha to control *Helicoverpa armigera*.
- Spray 4% neem extract, 0.2 % neem oil and 2 % cow urine alternatively at 15 days interval from the flowering. Keep 50 bird perch/ha to control the insects.

(Action: Assoc. Prof., Dept. of SSAC, ACHF, NAU, Navsari)

15.2.1.24: Evaluation of sugarcane varieties under organic farming

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing sugarcane organically are recommended to prefer CoN 05072 or CoN 05071 (for Jaggery) or Co 62175 (for Jaggery) variety for attaining higher yield and net profit.

Details of management for sugarcane under organic farming

- Planting at 120 cm spacing and treat two eye budded setts with biofertilizer *i.e. 0.5 % each of Acetobacter,* PSB, *Trichoderma* and *Pseudomonas* for 20 minutes.
- At planting: Apply 3.4 t NADEP compost and 2.4 t vermicompost per hectare.
- At 45 DAP: Apply 3.3 t NADEP compost and 2.4 t vermicompost per hectare.
- At 90 DAP: Apply 3.3 t NADEP compost and 2.3 t vermicompost per hectare.
- Spraying of 0.5 % *Acetobacter* should be done at 30 and 45 days after planting.
- Apply 900 l/ha of jeevamrut with irrigation water in three equal splits at 45, 90 and 120 days after planting.
- Apply 5 kg or l per hector each of *Trichoderma* and *Pseudomonas* at the time of earthing up.

(Action : Assoc. Prof., Dept. of SSAC, ACHF, NAU, Navsari)

15.4 Horticulture & Forestry

A. For Farmer

15.4.1.8: Effect of foliar spray of KNO3 and plant growth regulators on flowering and fruiting behaviour of mango cv. Alphonso

The farmers of South Gujarat having adult mango orchard of Alphonso variety are advised to apply paclobutrazol at 5.0 g a.i./ tree at 1st fortnight of August in soil and two foliar spray of 2% KNO3 (20 g/litre) during starting of third week of October and November to increase the yield and improve quality of fruits along with higher net realization.

(Action: Res. Sci. RHRS, NAU, Navsari)

15.4.1.9: Evaluation of nutrient management under coconut based cropping systems for different agro climatic regions

The farmers of South Gujarat growing coconut cv. D x T at 7.5 m x 7.5 m are advised to grow banana, elephant foot yam, tannia and turmeric as a component crop under coconut garden and apply the nutrients as per following schedule to increase the yield of coconut and component crops along with higher remuneration.

SN	Crop and variety	In-organic and Organic nutrients					Time of application	
		50% RDF (NPK)	Vermicompost from dry coconut leaves (kg/pl)	Biofertilizer *Azotoactor* (ml/pl)	*In situ* green manuring with sunhemp (kg/pl)	Vermiwash (lit/ha)	Organics (Two splits)	In-organics
1	Coconut (DxT)	750-375-750 (g/pl)	40 (20 + 20)	100 (50+50)	20 (10+10)	100 (50+50)	one month after application of In-organics	As per the recommendation
2	Banana (G-9)	150-45-100 (g/pl)	6 (3+ 3)	20 (10+10)	5 (2.5+2.5)	10 (5+5)	First at basal and second 3 MAP	
3	Elephant Foot Yam (Gajendra)	40-30-50 (Kg/ha)	3 (1.5 + 1.5)	10 (5+5)	3 (1.5+1.5)	5 (2.5+ 2.5)		
4	Tannia (Local)	40-30-50 (Kg/ha)	1 (0.5 + 0.5)	5 (2.5+2.5)	2 (1.0+1.0)	5 (2.5+ 2.5)		
5	Turmeric-Sugandham	30-30-30 (Kg/ha)	5 t/ha (at time of planting)	20 lit/ha (10+10)	100 kg/ha (at time of planting)	10 (5+5)		

(Action: Research Scientist. RHRS, NAU, Navsari)

15.4.1.15: Performance of cocoa varieties/hybrids for their performance as intercrop in coconut gardens

Farmers of south Gujarat growing coconut cv. WCT at 7.5 x 7.5 m are advised to grow VTLCH-4 cocoa clone as intercrop at intra spacing of 3.75 m under coconut garden for getting higher yield of coconut and cocoa.

(Action: Res Sci. RHRS, NAU, Navsari)

15.4.1.17: Standardization of grafting technique in adenium

Nurserymen raising adenium as pot culture are advised to propagate by flat method of grafting using 2 cm length of mature scion on local root stock of one year old adenium under naturally ventilated polyhouse to obtain attractive plants.

(Action: Asso Proff, FLA, ACHF, NAU, Navsari)

15.4.1.18: Standardization of soilless based growing media for different varieties of potted *Euphorbia milii*

Nurserymen raising Euphorbia milii as pot culture under naturally ventilated polyhouse condition are advised to grow in soilless growing media containing cocopeat + coco chips + styrofoam (4:2:1) for better plant growth and good quality flowering.

(Action: Asso Prof, FLA, ACHF, NAU, Navsari)

15.4.1.19: Testing of new genotypes of China aster

Farmers of South Gujarat cultivating China aster are advised to grow variety Arka Archana (white colour) for loose flowers and Phule Ganesh Pink (pink colour) and Phule Ganesh White (white colour) for cut flowers to get higher yield and net realization.

(Action: Asso Prof., FLA, ACHF, NAU, Navsari)

15.4.1.20: Standardization of postharvest treatment using boric acid and sodium benzoate for improving postharvest life of loose flowers of tuberose

Farmers growing tuberose for loose flower production are advised to dip florets for five seconds (quick dip) in 4 per cent boric acid (40 g boric acid dissolved in one litre warm water and cool it at ambient temperature) for improving postharvest life up to 24 hrs.

(Action: Asso Prof, FLA, ACHF, NAU, Navsari)

15.4.1.21: Studies on use of food dyes for tinting in tuberose stems

Farmers and florists are advised to use 4 % (40 g/L) lemon yellow food dye with 1 hour immersion time for obtaining yellow colour in tuberose spikes to get additional income by tinting. Moreover, different food dyes viz. kesar yellow, kalakhatta, orange red, rose pink, raspberry red at 4 % concentration with 1 hour immersion time to be used for obtaining desired colour shades by tinting.

(Action: Asso Professor, FLA, ACHF, NAU, Navsari)

Lemon yellow 4 % | Kesar yellow 4 % | Kalakhatta 4 %

B. For Scientific

15.4.2.3: Effect of environment on behaviors and structures of flowering, pollen and fruit set characters in mango

- Pollen viability was higher in Kesar and Alphonso mango however, the flowers with germinated pollen in-vivo were very less (20-23%) in field conditions. Pollen germination at 35° C decreased by 3.87 and 5.00 % in Kesar and Alphonso, respectively; when compared with 20° C.
- Correlation of weather data with different flowering and fruit-set parameters of Kesar mango indicated that, the number of male flowers per panicle was positively correlated with minimum relative humidity, however, negatively correlated with sunshine hours. Ovule dimension was negatively correlated with minimum temperature and minimum relative humidity whereas positively correlated with sunshine hours. Fruit set at marble stage was negatively correlated with maximum temperature in Kesar variety.
- Correlation of weather data with different flowering and fruit-set parameters of Alphonso mango indicated that the length of panicle was negatively correlated with minimum temperature while width of panicle was negatively correlated with sunshine hours. Style dimension was negatively correlated with maximum temperature. Pollen viability was negatively correlated with minimum relative humidity.

(Action: Research Scientist. RHRS, NAU, Navsari)

15.5 Dairy and Food technology

A. For Farmer

15.5.1.3: Standardization of technology for removal of the bitter compound 'aloin' from the Aloe vera juice

Recommendation for industry and entrepreneurs The food processors interested in preparing Aloe vera juice with reduced aloin content are recommended to use the protocol standardized at Navsari Agricultural University, Navsari. The Aloe vera juice can be prepared by giving pre-treatment to Aloe vera gel obtained by peeling the skin with water soaked soybean @ 1.5 per cent for 6 hrs followed by juice extraction and heat processing of the bottled juice at 96±1°C for 30 min. Such treated Aloe vera juice led to significant reduction (69.7 per cent) in aloin content; the juice recovery being 52.94 per cent.

(Action: PI & HOD, PHT, ACHF, NAU, Navsari)

15.5.1.4: Standardization of technology for preparation of Aloe vera juice

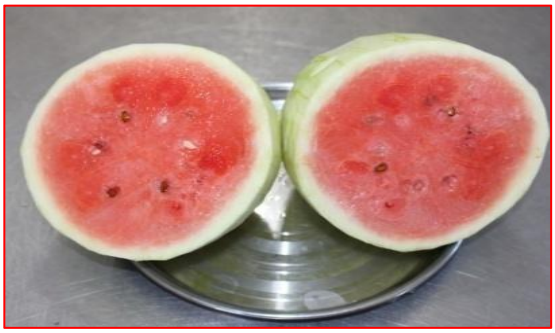
Recommendation for industry and entrepreneurs The fruit juice processors interested in preparing sweetened Aloe vera juice are recommended to use the protocol standardized at Navsari Agricultural University, Navsari. The protocol involves adjusting the TSS of unsweetened Aloe vera juice to 12°Brix and 0.25 per cent acidity by use of sugar and citric acid respectively, followed by in-bottle heat treatment (96±1°C for 30 min) and cooling to ambient temperature. Such sweetened Aloe vera juice had shelf life of 6 months at ambient (37°C) temperature.

(Action: PI & HOD, PHT, ACHF, NAU, Navsari)

15.5.1.5: Standardization of formulation for processing of Watermelon (*Citrullus lanatus*) juice

Recommendation for industry and entrepreneurs The fruit juice processors interested in preparing watermelon juice are recommended to use the protocol standardized at Navsari Agricultural University, Navsari. The standardized protocol involves adjusting the TSS and acidity of extracted watermelon juice to 10°Brix and 0.30 per cent acidity through use of sugar and citric acid, respectively. Further, it requires use of 1.0 per cent pectin and 100 ppm of sodium benzoate as food additives before packing the juice in glass bottle and subjecting it to thermal treatment (96±1°C for 5 min.) followed by cooling to ambient temperature. The packaged and heat treated watermelon juice had shelf life of 6 months at ambient temperature (37°C).

(Action: PI & HOD, PHT, ACHF, NAU, Navsari)



15.5.1.6: Standardization of formulation for processing of Watermelon (*Citrullus lanatus*) nectar

Recommendation for industry and entrepreneurs The fruit juice processors interested in preparing watermelon nectar are recommended to use the protocol standardized at Navsari Agricultural University, Navsari. The standardized protocol involves use of 25.0 per cent of watermelon juice and adjusting its TSS and acidity to 16°Brix and 0.30 per cent acidity by use of sugar and citric acid, respectively. Further, it require to use of 1.0 per cent pectin and 100 ppm of sodium benzoate before packaging in glass bottle and subjecting it to thermal treatment (96±1°C for 5 min) followed by cooling to ambient temperature. The packaged and heat-treated watermelon nectar had shelf life of 6 months at ambient temperature (37°C).

(Action: PI & HOD, PHT, ACHF, NAU, Navsari)

15.5.1.7: Standardization of process for the preparation of Watermelon (*Citrullus lanatus*) albedo candy

Recommendation for industry and entrepreneurs The food processors interested in preparing fruit by-product candies are recommended to use the protocol standardized at Navsari Agricultural University, Navsari. The standardized protocol involves mixing of equal parts of sugar and watermelon albedo cubes, to which 0.2 per cent of citric acid and 1500 ppm of potassium metabisulphite is added. Subsequent steps involve raising the TSS of sugar syrup containing watermelon albedo cubes to 70°Brix gradually in 72 hrs followed by washing away adhering sugar syrup and then drying in cabinet dryer (60°C, final moisture ~17.0 *per cent*). The watermelon albedo candy packed in polypropylene bags (400 gauge) and stored under ambient (37°C) conditions had shelf life of 6 months.

(Action: PI & HOD, PHT, ACHF, NAU, Navsari)

15.6 Agricultural Engineering

A. For Farmer

15.6.1.5 : Standardization of solvent for extraction of oil and colour matter from orange peel and seed

Food processors are recommended to grind the dried orange peel and seed in pulveriser with 0.10 mm diameter sieve followed by extraction of maximum oil recovery and d-limonene content in solvent extraction method using n-hexane as solvent with 1:4 dry matters to solvent ratio for period of 98 mins.

Powder of Dried orange seed and peel

↓

Extraction of oil using n-Hexan (Solute – Solvent Ratio at 1:4)

↓

Packing in glass bottles

↓

Storage

(Action: Asst. Prof., PHTC, NAU, Navsari)

15.6.1.6: Development and quality evaluation of jackfruit seed flour and soy flour fortified pasta

The food processors are recommended to prepare pasta by dry mixing of refined wheat flour, jack fruit seed flour and soy flour at 70, 20 and 10%, respectively with addition of 30% water to prepare dough and then passed through pasta machine. The raw pasta is dried in a tray dryer at a temperature of 60±2° C till final moisture content of 3±1 % and packed in 500 gauge air tight polyethylene pouch for storage upto 60 days at ambient temperature without deterioration in quality.

Take refined wheat flour, soya flour and jack fruit seed flour

↓

Mixing of refined wheat flour, jack fruit seed flour and soy flour at 70, 20 and 10% respectively

↓

Addition of 30% water to prepare dough

↓

Prepare raw pasta by cutting the extruded dough from machine

↓

Dry raw pasta in tray dryer at 60±2°C till final moisture content of 3±1 %

↓

Packed pasta in 500 gauge polyethylene pouches

↓

Stored upto 60 days at ambient condition

(Action: Asst. Prof., PHTC, NAU, Navsari)

15.8 Basic Science

B. For Scientific

15.8.2.9: Genetic diversity analysis among promising Nagli (*Eleusine coracana* L.) genotypes

House approved the recommendation after recasting as follows: It is informed to scientific community that ISSR markers are more reliable than RAPD for genetic diversity analysis. The ISSR markers UBC 841, UBC 857 and UBC 863 are most diverse for polymorphism and genetic diversity analysis in Nagli genotypes. Among 25 genotypes, GN-4 and GPU-48 & GPU-28 are genetically diverse genotypes and observed in different clusters in PCA analysis that can be used in future breeding program.

(Action: HoD, Dept. of Plant Molecular Biology & Biotech, ACHF, NAU, Navsari)

16.2 Crop Production and NRM

A. For Farmer

16.2.1.36 : Effect of natural organic liquid on growth, yield and quality of green gram (*Vigna radiate* L.) under organic farming

The farmers of south Gujarat heavy rainfall agro-climatic zone growing organic summer green gram are recommended to spray 1% of Enriched banana pseudostem sap three times (30, 45 and 60 DAS) for attaining the higher yield and net profit

Detail management

- Sow green gram at 45cm x 10cm spacing and to supply 20 kg N/ha, apply 2.2 t/ha NADEP compost (contain 1.1% N) at the time of sowing.
- Inoculate seeds with *Rhizobium*, PSB and KMB bio-fertilizer each @ 10 ml/kg seed before sowing.
- As a preventive measures and need based alternative spray of 0.20% neem oil, 4% neemastra and 5% agniastra should be done to control sucking pests.

(Action: Assoc. Prof., Dept. of SSAC, ACHF, NAU Navsari)

16.3 Plant Protection

A. For Farmer

16.3.1.25 : Effect of bio pesticides on shoot borer in organic mango

Farmers of south Gujarat growing organic mango are advised to spray azadirachtin 1500 ppm @33 ml / 10 litres at the initiation of flowering and second at fifteen days after the first spray for the management of mango shoot borer.

(Action: Prof. & Head, Pl Prot, ACHF, NAU, Navsari)


16.4 Horticulture & Forestry

A. For Farmer

16.4.1.18 : Integrated nutrient management in Sapota cv. Kalipatti

The farmers of South Gujarat having adult tree of sapota orchard cv. Kalipatti are recommended to apply 50 kg farm yard manure and 80 per cent recommended dose of chemical fertilizer (800-400-400 NPK g/tree in three split of NPK i.e. 200:400:100 g/tree in June, 400:00:200 g/tree in August and 200:00:100 g/tree in October) along with soil application of bio fertilizers (Azatobactor, phosphorus solubilizing bacteria and potash mobilizing bacteria) @ 50 ml/tree of each in June, October and February month for getting higher yield, TSS of fruit and net return.

(Action: Res Sci, RHRS, NAU, Navsari)

16.4.1.19: Effect of graded doses of paclobutrazol on flowering, yield and quality of mango cv. Alphonso

The farmers of South Gujarat having more than 35 years old mango orchard of Alphonso variety are recommended to apply paclobutrazol through soil drenching during 1st fortnight of August in the ratio of 10:5:10:5 g a.i./tree in 1st, 2nd, 3rd and 4th year, respectively along with 150 % RDF (150 kg FYM and 1125:240:1125g NPK per tree) for getting higher fruit yield and net return.

(Action: Res Sci, RHRS, NAU, Navsari)

16.4.1.20: Impact of pre-soaking treatments on germination and growth of mango (*Mangifera indica* L.) stones

Farmers and nurserymen of South Gujarat are recommended to sow the mango stones after soaking in solution of GA3 100 mg/litre for 24 hours to get mango seedlings with better plant growth and higher survival.

(Action: Res Sci, RHRS, NAU, Navsari)

16.4.1.22: Effect of post flowering spray of chemicals on fruit retention and yield of mango cv. Kesar

The farmers of South Gujarat having mango orchard of Kesar variety are recommended to spray 2% novel organic liquid nutrients at pea and marble stage to increase the yield and improve quality of fruits along with higher net return.

(Action: Res Sci, RHRS, NAU, Navsari)

16.4.1.26: Effect of different sources of nutrients and fertigation levels on yield and other horticultural traits in tomato under protected culture

Farmers cultivating tomato in naturally ventilated polyhouse (1000 m^2) are recommended to fertigate the crop with 25: 12.50: 12.50 kg NPK (As per the schedule given in table below) through water soluble fertilizers along with application of 0.5 kg *Trichoderma viride* and *Pseudomonas fluorescens* each, 0.5 L Phosphorous Solubilizing Bacteria (*Bacillus megaterium*) & potash mobilizer- *Frateuria aurantia each*, 2 t FYM and 5.0 kg micro-nutrients (Grade V) at the time of transplanting for higher yield as well as net returns.

Crop Duration	Application of fertilizers			Remarks
	N (kg)	P (kg)	K (kg)	
1st Growth Period (Up to 30 days)	6.22	3.75	1.14	Fertigation should be carried out once a week after 10-15 days of transplanting
2nd Growth Period (31-60 days)	3.13	2.50	2.28	
3rd Growth Period (61-90 days)	3.13	1.25	3.38	
4th Growth Period (91-120 days)	3.13	1.25	2.28	
5th Growth Period (121-150 days)	3.13	1.25	1.14	
6th Growth Period (151-180 days)	3.13	1.25	1.14	
7th Growth Period (181-210 days)	3.13	1.25	1.14	
Total	25.00	12.50	12.50	

(Action: Prof., Veg. Sci., ACHF, NAU, Navsari)

16.4.1.27: Feasibility of tomato cultivation through grafting during rainy season

The tomato growers of South Gujarat are recommended to adopt interspecific grafting of tomato with *Solanum torvum* during rainy season for getting higher yield and net return.

(Action: Prof., Veg. Sci., ACHF, NAU, Navsari)

16.4.1.29: Integrated Nutrient Management in Cabbage (*Brassica oleracea* var. *capitata*)

The cabbage growing farmers of South Gujarat are recommended to apply 20 t/ha FYM at the time of land preparation and fertilize their crop with combination of 50 % recommended dose of nitrogen (100:00:37.5 NPK kg/ha) along with Nitrogen based quantity of Bio compost (12.5 t/ha, containing 0.8 % N). Entire quantity of Bio compost and potash as well as half quantity of nitrogen should be applied as basal. Remaining half dose of nitrogen should be applied as top dressing in two equal splits viz., 30 and 45 DATP to obtain higher yield.

(Action: Prof., Veg. Sci., ACHF, NAU, Navsari)

16.4.1.30: Validation of organic farming technologies in elephant foot yam

The farmers of South Gujarat Heavy Rainfall Zone, intending to grow elephant foot yam cv. Gajendra organically are recommended to use organic treatment as per below mentioned management:

- Raise green manure of cowpea with 20 kg ha^{-1} seed rate and incorporate it at 45-60 days before planting of elephant foot yam.
- Take organically produced planting material of 500 g weight and treat it with bucket full of cow dung slurry containing 1- 2 kg neem cake and *Trichoderma harzianum* (5 g per kg seed corm) and then dry under shade before planting.
- At the time of planting, apply FYM: neem cake mixture (in 10:1 ratio) @ 36 t ha^{-1} incorporated with *Trichoderma harzianum* @ 2.5 kg per tonne of FYM neem cake mixture along with neem cake @ 1 t ha-1 in pits.
- Raise green manure cowpea again with 20 kg ha^{-1} seed rate in-between fallow space of elephant foot yam plants and incorporate at 45-60 days in pits along with 3 t ha^{-1} of ash.

(Action: Prof., Veg. Sci., ACHF, NAU, Navsari)

16.4.1.32: Integrated nutrient management in rose (*Rosa chinensis* L.)

Farmers of South Gujarat growing rose are recommended to apply RDF (10 t/ha FYM + 200: 200: 200 NPK kg/ha) after pruning in first week of May and November in four equal split (May, August, November and February months) by 50 % RDN through chemical fertilizers and 50% RDN through Neem Cake along with Biofertilizers i.e. Azotobactor + Phosphate Solubilizing Bacteria (PSB) + Potash 140 Mobilizing Bacteria (KMB) each @ 1.25 l /ha as soil application and 1 % (10 ml/l) foliar spray of Novel organic liquid nutrient four times (June, September, December and March months) for getting higher production of flowers as well as net return.

(Action: Professor& Head, FLA, ACHF, NAU, Navsari)

16.4.1.37: Effect of different organic sources on yield and quality of banana under certified organic farm

For achieving higher yield as well as net income, the farmers of south Gujarat growing banana, variety Grand Nain, organically are recommended to apply 150 g N/plant *i.e.* 14.7 kg NADEP compost (containing 1.02% N) in three equal splits at basal, 30 and 60 DAP, along with *Azotobacte*r @5 l/ha + KMB@5 l/ha + PSB@5 l/ha at planting and green manuring two times.

Detail management:

- Planting: Prepare the pit at 1.5 m x 1.2 m x 2.4 m distance and apply the first split of NADEP compost (1.02% N) @ 4.9 kg per pit along with *Azatobactor,* PSB and KMB @ 5.0 l/ha each at the time of planting. Apply second and third split application of NADEP compost @ 4.9 kg/plant at 30 and 60 DAP, respectively.
- Grow *dhaincha* as green manure continuously two times in between the wider spaces of banana. First at the time of planting and subsequently second after incorporation of first green manuring and incorporate it in soil at 45 DAS.

(Action: Assoc. Prof., Dept. of SSAC, ACHF, NAU Navsari)

B. For Scientific

16.4.2.3: Effect of different light sources on growth and quality of micro-greens

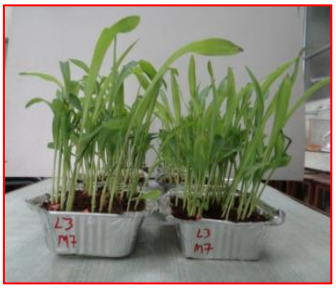
1. Scientists are informed that based on the performance of different microgreens for growth parameters like days to first harvest, leaf area (cm^2), fresh weight and quality parameters *viz*., ascorbic acid, β - carotene, N, P, K, Ca, total antioxidant activity and overall acceptability under different light sources, electroluminescent light is recommended for growing microgreens inside growing chamber/chamber/room.
2. Fenugreek, beet root, red cabbage, displayed significantly maximum ascorbic acid, N, Ca; β-carotene, K; antioxidant activity. Based on sensory evaluation, highest score for overall acceptability was obtained by Amaranth microgreens, which was followed by beet root and red cabbage microgreens.

(Action: Prof., Veg. Sci., ACHF, NAU, Navsari)









16.4.2.4: Integrated weed management in elephant foot yam

The scientists are informed that spraying of post emergence herbicide-Glyphosate 41 % S. L. 1 kg a.i./ha at 30, 60 and 90 DAP in-between row space of elephant foot yam cv. Gajendra for effective weed management.

(Action: Prof., Veg. Sci., ACHF, NAU, Navsari)

16.5 Basic Science

A. For Farmer

16.5.1.3: Effect of exogenous application of brassinosteroid on yield and quality of tomato (*Solanum lycopersicum* L.)

The farmers of South Gujarat growing tomato variety GT-2 are advised to spray brassinolide 10 mg per 10 liters at 25, 50 and 75 days after transplanting for enhancing lycopene, total sugar, post harvest quality up to 7 days and obtaining higher yield and net return.

(Action: Prof & Head, Dept. of Plant Molecular Biology & Biotech, ACHF, NAU, Navsari)

B. For Scientific

16.5.2.5: Identification and validation of sex-linked markers in Palmyra palm (*Borassus flabillifer*)

The scientific community are advised to use male sex-linked PCR based marker NAU_PALMYRAPALM_SCAR620 for early-stage identification of male Palmyra palm (*Borassus flabellifer* L.) from the population to maintain the male: female tree sex ratio in the new plantation.

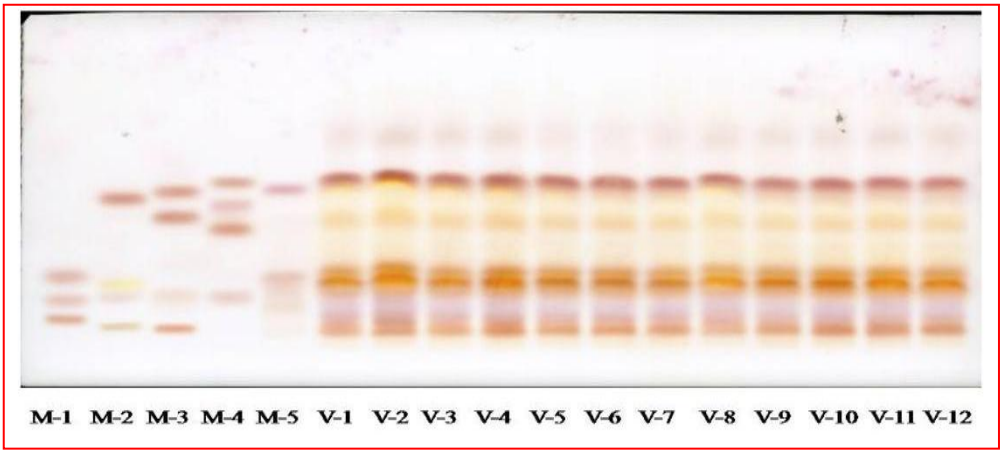
(Action: Professor & Head, Dept. of Basic Science, ACHF, Navsari)

16.5.2.19: Amino acid profiling of released varieties of pigeon pea from SAUs of Gujarat

It is informed to the scientific community that among 12 pigeonpea varieties analyzed, highest amount of free amino acids (1.00%) was found in GT-103, whereas highest protein content (22.21%) was present in BP-16-261. The genotypes with higher essential amino acids as mentioned below in ascending order can be considered for future pigeonpea breeding

Sr. No.	Essential amino acid	Genotypes
1	Arginine	Banas (19.69), GNP-2 (18.85), GT-101 (18.65)
2	Histidine	GT-103 (9.18), GT-102 (7.65), GT-101 (6.50)
3	Valine	GT-102 (1.36), AGT-2 (1.26), GT-1 (1.21)
4	Methionine	GT-103 (4.10), GT-102 (3.50), GNP-3 (3.32)
5	Phenyl alanine	AGT-2 (26.07), GJP-1 (25.11), GT-103 (24.23)
6	Trytophan	Banas (11.77), GJP-1 (11.14), AGT-2 (10.25)
7	Lysine	GJP-1 (6.58), GT-101 (6.23), GJP-1 (6.58)
8	Leucine	AVPP-1 (12.05), Banas (11.89), GJP-1 (11.85)

(Value in the brackets is concentration of amino acid in mg g^{-1} unit)
(Action: Prof & Head, Dept. of Pl. Molecular Biology & Biotech, ACHF, NAU, Navsari)



Separation of amino acid of different pigeonpea genotypes on HPTLC aluminum plate 20x10 cm
(Silica gel 60 F_{254} Merck)

16.5.2.20: Identification and trouble shooting of microbial contamination occurs during canning of mango pulp

It is informed to scientific community that unpasteurized Kesar mango pulp has been reported to have microorganisms such as *Klebsiella pneumoniae*, *Micrococcus endophyticus* and *Chryseobacterium indologenes*. To avoid contamination of canned mango pulp by these type of microorganisms and to troubleshoot the problem of can spoilage, proper canning of mango pulp should be carried out as shown in the following chart,

Flow chart of mango pulp canning process

Washing of ripe Kesar mangoes using 3.0 ppm chlorinated water

↓

Sorting and Cutting of mangoes on inspection cum cutting conveyer by skilled persons

↓

Mango pulp extraction using two stage pulper by separation of stone, skin and fibers

↓

Mixing of pulp in 200 kg tanks

↓

Pasteurization of mango pulp in scrape surface pasteurizer at 90°C and adjust 0.4 % acidity. On reaching 90°C temperature, transfer of pulp to storage tank for filling

↓

Cleaning of each can by hot water steam followed by filling of pulp (850g/Cans) and Sealing of cans by double seamer machine

↓

Retorting of filled cans (100oC for 30 min)

↓

Cooling of cans to ambient temperature

↓

Storage (upto 2 months)

(Action: Professor & Head, Dept. of PHT, ACHF, NAU, Navsari)

16.9 Agricultural Engineering

A. For Farmer

16.9.1.19: Development of technology for ready to use freeze dried tomato (*Solanum lycopersicum* L.) slice

The processors are recommended that to prepare freeze dried tomato chips, slice the tomato at 10 mm thickness then, blanch at 80°C for 2min and freeze at (–20°C) for 6h followed by freeze drying under -760 mm of Hg (vacuum) at 50°C drying temperature for 17.45 h and packing in 75 micron HDPE bags to store up to 3 months without altering quality.

(Action: Professor & Head, CEPHT& PE, ACHF, NAU)

16.10 Dairy Sci & FPTBE

A. For Farmer

16.10.1.28: Standardization of technology for preparation of candy from ripe papaya (*Carica papaya* Linn.) fruit

The entrepreneurs and fruit processors interested in production of papaya candy are recommended to use the processing technology developed by the Navsari Agricultural University. The technology involves osmotic dehydration of ripe papaya cuboids in sugar syrup (50 oBrix) followed by increase of syrup strength (10 oBrix per day) up to 70 oBrix, quick rinsing and drying in tray dryer at 60°C. It results in good quality sweetened dehydrated papaya candy (moisture ~12%) which retains more than 40% of the ascorbic acid present in the fresh sample. The candy so produced and packed in polypropylene bags (400 gauges) found acceptable upto six months.

(Action: Prof & Head, PHT Dept., ACHF, NAU)



16.10.1.29: Home scale ripening of Banana cv. Grand Naine

The farmers of South Gujarat heavy rainfall zone are recommended to ripe banana at home scale by spraying 100 ppm etharel (39% Ethaphone) on unripe banana and covering them by gunny bags for 4-5 days for early ripening and give good quality ripe fruits on 5th day.

(Action: PI, Prof & Head, PHT Dept.,ACHF, NAU)

17.1. Plant Breeding and Genetics

A. For Farmer

17.1.1.8: Okra variety Nol-17-05 (GNO 1: Purna Rakshak)

Okra growing farmers of south Gujarat region are advised for cultivation of okra variety NOL-17-05 (GNO-1: Purna Rakshak). The average fruit yield of okra variety NOL-17-05 (GNO-1: Purna Rakshak) is 12.72 t/ha. It exhibited overall yield advantages of 10.70 %, 13.52 % and 12.59 % in *Kharif* season over the check varieties GAO-5, Pusa Sawani and GO-6, respectively. It matures within 89-112 days (medium group), having good in fruit size and plant structure. It has high yield potential and moderately resistant against YVMV, Powdery mildew, ELCV disease as well as moderately resistant against pod borer, jassid and whitefly.

(Action: Professor and Head, Veg. Sci., ACHF, NAU, Navsari)



17.2 Crop Production and NRM

A. For Farmer

17.2.1.36: Agronomical evaluation of different paddy varieties under organic farming

The farmers of south Gujarat heavy rainfall agro-climatic zone growing rice (variety: GNR-7 or GNR-3) organically are recommended to apply 100% RDN (100 kg/ha) through NADEP compost (8.9 t/ha NADEP compost containing 1.12%N) for achieving higher yield and net profit. Further, they have to give root dipping treatment to the seedlings with *Azospirilum* and PSB each of 0.5% along with three spray of Novel organic liquid nutrient @ 1% at 15, 45 and 60 DAT.

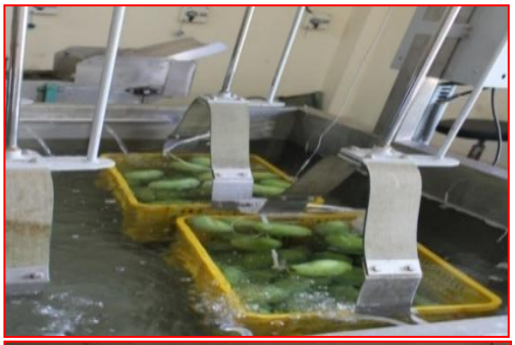
(Action: Assoc. Prof., Dept. of SSAC, ACHF, NAU Navsari)

17.3 Plant Protection

A. For Farmer

17.3.1.37: Management of post-harvest diseases of mango using hot water treatment

Farmers, consumer and entrepreneurs are recommended to manage postharvest diseases and pest *viz;* anthracnose, stem end rot and fruit fly by dipping mango fruits after the harvesting in hot water at 48ºC for 60 min or 50ºC for 20 min, or 52ºC for 10 min without any adverse effect on fruits.
(Action: Prof. & Head, Pl Prot, ACHF, NAU, Navsari)



B. For Scientific

17.3.2.46 : Dynamics of diseases in gerbera under protected cultivation

Under the protected cultivation of gerbera, leaf blight disease (*Alternaria alternata)* was observed from July to August (29th to 35th SMW) with its maximum intensity and showed significant positive correlation with relative humidity and negative with average temperature.

(Action: Prof. & Head, Pl Prot, ACHF, NAU, Navsari)

Leaf blight disease of gerbera

17.4 Horticulture & Forestry

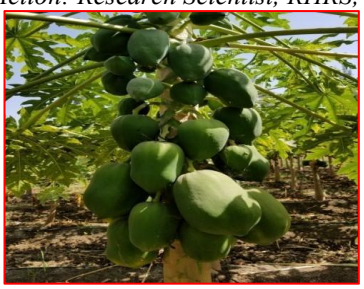
A. For Farmer

17.4.1.13: Evaluation of different bio fertilizers with graded chemical fertilizers for nutrient management in papaya var. Red Lady

The farmers of South Gujarat growing papaya var. Red Lady are recommended to apply 60 per cent recommended dose of chemical fertilizer (120-120-150 NPK g/plant, as per the schedule given in table below) along with soil application of biofertilizers (*Azotobacter, Phosphate solubilizing bacteria, Potash mobilizing bacteria*) @ 20 ml per plant of each at the time of planting, 3 and 6months after planting for getting higher yield and net realization.

Time of fertilizer application	Application of fertilizers					
	N	P	K	*Azotobacter*	*PSB*	*KMB*
	(g/plant)			($1x10^8$cfu/ml)	(ml/plant)	
At the time of planting	-	-	-	7.00	7.00	7.00
Two months after planting	30	30	37.5	-	-	-
Three months after planting	-	-	-	6.50	6.50	6.50
Four months after planting	30	30	37.5	-	-	-
Six months after planting	30	30	37.5	6.50	6.50	6.50
Eight months after planting	30	30	37.5	-	-	-

(Action: Research Scientist, RHRS, ACHF, Navsari)



17.4.1.21: Artificial oscillation for increasing fruit set and performance of tomato in polyhouse under South Gujarat conditions

Farmers cultivating tomato in naturally ventilated polyhouse are recommended to vibrate tomato truss with electric pollinator on every 3rd day starting from the day of first flowering for 10 seconds during morning hours between 7.30 am to 9.00 am for better fruit set, higher yield and net returns.

(Action: Professor and Head, Veg. Sci., ACHF, NAU, Navsari)

17.4.1.23: Effect of IBA and number of nodes on stem cutting on propagation of little gourd

The farmers/nurserymen of South Gujarat are recommended to select one year old little gourd vine cutting with two nodes dipped in 80mg/l IBA solution for 30 minute and plant in growing media Soil: FYM: Sand (1:1:1) increases survival percentage of little gourd cutting.

(Action: Professor and Head, Veg. Sci., ACHF, NAU, Navsari)

Root length in 1 node and 2 nodes cutting

Vine length difference in 1 node & 2 nodes cutting

Sprouting and growth of little gourd cutting

17.4.1.25: Effect of different growing media on Haworthia pot plant

Nurserymen raising haworthia as pot culture under naturally ventilated polyhouse are recommended to grow in media comprising of Sand : Vermicompost (9 : 1 v/v) for better plant growth and quality.

(Action: Professor and Head, Deptt. of Floriculture, ACHF, Navsari)

17.4.1.26: Development of plant architecture through pinching and pruning in adenium pot plant under soilless growing system

Nursery men or farmers raising adeniums as pot culture are recommended to follow the pruning treatment (leaving 2 inches of new growth) after four and eight months of grafting to obtain better architecture with plant canopy as well as more flower clusters per plant and flowers per cluster.

(Action: Professor and Head, Deptt. of Floriculture, ACHF, Navsari)

17.4.1.27: Effect of different growing media and foliar application of nitrogen on Garlic, Fenugreek and Spinach

Farmers growing green garlic and spinach under polyhouse in off-season are recommended as below:

1) To grow green garlic: Fill tray with sand media and apply foliar spray of nitrogen @ 150 mg/l at weekly interval for higher yield with good pungency.
2) To grow spinach: Fill tray with sand media and apply foliar spray of nitrogen @ 150 mg/l at weekly interval for higher yield.

(Action: Professor and Head, Deptt. of Floriculture, ACHF, Navsari)

17.4.1.32: Adenium variety GUJARAT NAVSARI ADENIUM-3 [GNAd-3: Aabha)

The farmers and entrepreneurs are recommended to use banana pseudostem sap from banana field planted through suckers having drip irrigation to get maximum fresh sap with better quality for fresh use as well as for enrichment purpose.

(Action: Professor and Head, Deptt. of Floriculture, ACHF, Navsari)

17.4.1.33: Adenium variety GUJARAT NAVSARI ADENIUM-4 [GNAd-4: Shobhita]

The nursery men dealing with ornamental plants, landscape designers and plant lovers are recommended to grow adenium variety GNAd 4 (Shobhita) under polyhouse for higher commercial value as well as in garden and house plant. Adenium variety GNAd 4 is novel that it bears flowers having single whorl of pinkish red coloured petals (5) with dark red coloured margin and pointed tip and scores higher in terms of number of flowers/ clusters, maximum open flowers / cluster, and flowers/plant/ year. It can be propagated by grafting on local pink root stock.

(Action: Professor and Head, Deptt. of Floriculture, ACHF, Navsari)

B. For Scientific

17.4.2.1: Response of media, fertilizer and chemicals application on growth of mango rootstock

Scientists those who are working on raising of mango rootstock are recommended to sow the mango stone in poly bag having potting media of red soil + FYM + vermicompost (2:1:0.5) and to fertilize @ 75:16:75 mg NPK /Kg through soil application with foliar application of Novel organic liquid nutrients 10 ml per litre at 2nd and 3rd MAS for better germination, growth and higher survival of mango rootstock.

(Action: Research Scientist, RHRS, ACHF, Navsari)

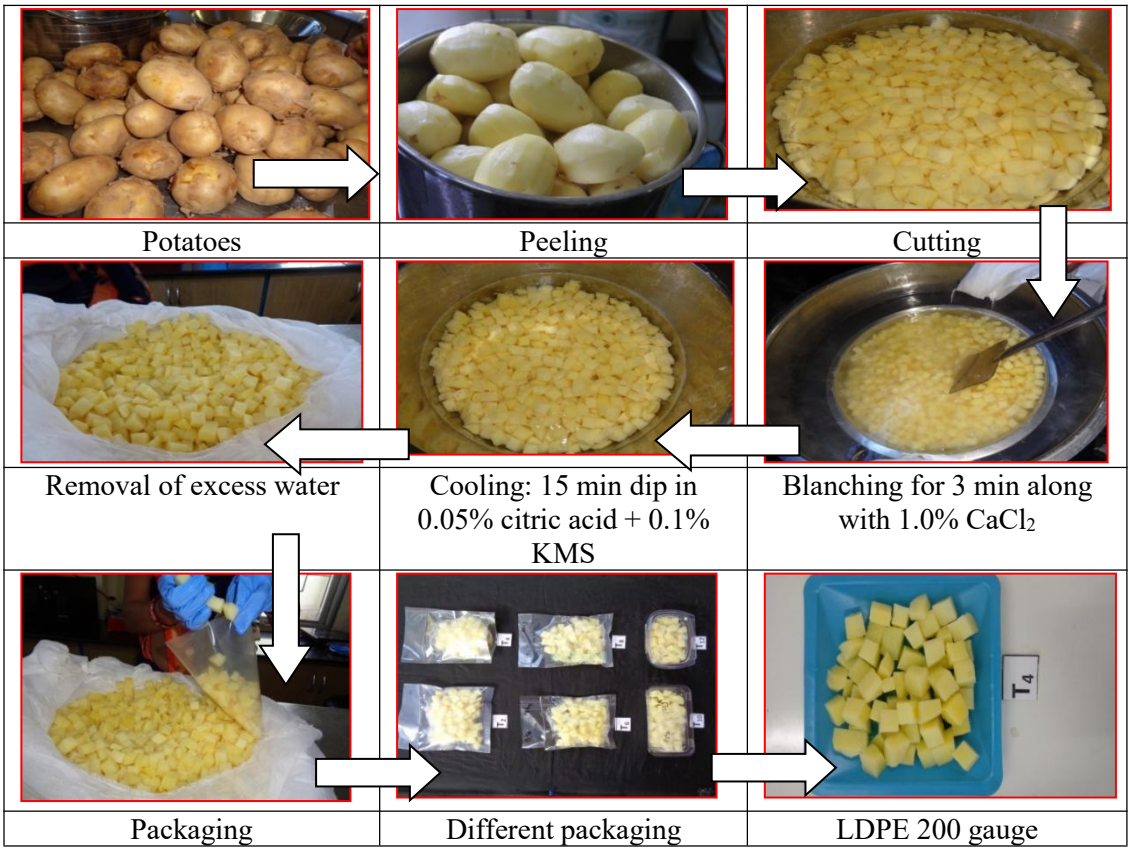
17.10 Dairy Sci & FPTBE

A. For Farmer

17.10.1.16: Standardization of technology for minimal processing of fresh cut potatoes (*Solanum tuberosum* L.)

It is recommended to the processors and entrepreneurs that minimally processed fresh cut potatoes can be prepared by hot water blanching for 3 minutes at 95°C along with 1.0 per cent calcium chloride ($CaCl_2$) and cooling for 15 minutes by dipping in the solution of 0.05 per cent citric acid and 0.1 percent potassium meta bisulphite (KMS) followed by excess water removal. The fresh cut potatoes can be successfully stored for 16 days at refrigerated temperature when packed in 200 gauge LDPE bags with acceptable quality.

(Action: PI, Prof & Head, PHT Dept., ACHF, NAU)



NOTE


OF HORTICULTURE AND FORESTRY