

RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS 2020



DIRECTORATE OF RESEARCH
NAVSARI AGRICULTURAL UNIVERSITY
NAVSARI - 396 450 (GUJARAT)

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NAVSARI AGRICULTURAL UNIVERSITY

Navsari Agricultural University
Navsari - 396 450



:: MESSAGE ::

Navsari Agricultural University extends its excellence in tripartite activities *viz.* education, research and extension in agricultural and allied science. As per the mandate of SAUs, the University undertakes research based on the feedback from farmers of seven districts of South Gujarat. Scientists of University have achieved success in developing sustainable technologies to enhance productivity and to improve quality of produce which helps in achieving the goal of nation “Doubling the Farmers Income by 2022”.

NAU has constituted 10 AGRESO Research Sub-Committees to review, monitor and supervise research work annually and thereafter, approved research outline and progress is scrutinized at state level in the presence of experts of all SAUs of Gujarat (Combined Joint AGRESO) before taking varieties/ recommendations/ technologies to farmers.

It is my pleasure to present “Research Accomplishments and Recommendations-2020” covering nine new varieties and 99 need based recommendations/ technologies developed by scientists for the farming and scientific communities during the year 2019-20.

I appreciate the efforts of scientific faculty members and supporting staff of University and congratulate them for bringing useful varieties/ recommendations/ technologies for benefitting farming community. I heartily congratulate Director of Research and Dean P. G. Studies and his team for successfully organizing Combined Joint AGRESO 2019-20 in online mode and also for compilation and publishing this booklet.

Date : 23 /11 /2020

Place : Navsari

(Z. P. Patel)

Vice- Chancellor





Navsari Agricultural University
Navsari - 396 450



:: FOREWORD ::

It is a matter of immense pleasure for me to put forward the publication of “Research Accomplishments and Recommendations-2020”. The prestigious booklet contains new varieties and technologies developed by the scientists of various Research Sub-Committees of Navsari Agricultural University for benefit of farmers, scientists and entrepreneurs. These varieties/ technologies were critically discussed and approved in the 16th Combined Joint AGRESCO meeting held at Navsari Agricultural University, Anand during 18th June to 02nd July, 2020 in online mode.

I congratulate all the scientists of NAU for their continuing efforts to improve research outputs of the University and developing new varieties and technologies for the benefit of farming and scientific community. I am also thankful to all the conveners of various sub-committees of Agricultural Research Council of Navsari Agricultural University for their contribution.

I express my sincere thanks to Hon'ble Vice Chancellor, Dr. Z. P. Patel for his constant guidance and useful inputs in improving the research outcome of NAU. I also take opportunity to appreciate efforts of all technical staff of Directorate of Research for publishing farmer centric booklet.

I also thank Hon'ble Vice Chancellors, Director of Research, Director of IT's, Chairman, Co-chairman and conveners of all SAU's of Gujarat for extending unconditional support for convening all meetings on online mode during adversities of COVID-19 pandemic.

(S. R. Chaudhary)

Director of Research & Dean
Faculty of P.G. Studies

Date : 23/11/2020

Place : Navsari



RESEARCH RESUME

The research work carried out in different fields of agricultural sciences during the year 2019-20 has been very well discussed by different AGRESKO sub-committees of Navsari Agricultural University, Navsari for bringing out useful and beneficial recommendations for farmers and scientific community. Finally, 58 and 50 recommendations for farmers and scientific communities, respectively were approved in the 16th Combined Joint AGRESKO meeting of SAUs and Kamdhenu University held at Navsari Agricultural University, Navsari during 18th June to 02nd July, 2020.

In the Crop Improvement group, total 7 high yielding varieties were identified for release from NAU including 3 varieties of rice, 2 varieties of sorghum and 1 each from Mango Ginger and Elephant Foot Yam. Furthermore, two varieties of cotton of NAU endorsed for cultivation in Gujarat State.

Location specific and economically viable production technologies were recommended by NRM sub-committees that covered various aspects like irrigation schedule, fertigation, cropping sequence, cultural practices and nutrient management in different crops.

The achievements of plant protection group include control of disease and pest, bio efficacy and residue analysis of different pesticides *etc.*

In the pursuit of increasing fruits, vegetables, flower and forest tree production, recommendations emerged out were related to nutrients management, propagation technique, fertigation levels, effect of growth regulators, organic farming technologies, cultural practices in the horticulture & forestry sub-committees.

In Agricultural Engineering group recommendations for solar tunnel dryer, land configuration system and food processing approved for farming community .

The details of different sub-committees, conveners and number of approved recommendations for farmers and scientific communities and approved New Technical Programmes are as under.

S. N.	Name of the Sub-Committees	Name of Convenvener	No. of Recommendations		N T P
			Farmers	Scientific	
1.	Crop Improvement	Dr. P. B. Patel	9	0	1
2.	Natural Resource Management	Dr. J. D. Thanki	18	2	26
3.	Plant Protection	Dr. K. B. Rakholiya	8	17	19
4.	Horticulture	Dr. D. R. Bhanderi	16	3	21
5.	Forestry	Dr. R. P. Gunaga	2	0	8
6.	Agril. Engineering	Dr. P. K. Shrivastva	3	2	7
7.	Basic Science	Dr. A. V.Narvade	1	15	10
8.	Social Science	Dr. Ruchira Shukla	0	1	21
9.	Animal Production & Fisheries Science	Dr. B. P. Brahmkshatri	1	5	6
10.	Animal Health	Dr. C. V. Savalia	0	5	7
Total			58	50	126

RECOMMENDATIONS FOR FARMERS

I CROPIMPROVEMENT

1. RICE: GNR-8 (Aarti)

The early maturing rice culture, NVSR-396 (4700 kg/ha) performed very well in South Gujarat under aerobic condition and it exhibited average 18.6 per cent and 15.2 per cent grain yield superiority with easy threshability over the checks NAUR-1 and GNR-3, respectively. It has long bold grain, more productive tillers and more number of grains per panicle. It contains intermediate amount of amylose content (24.42%), protein content (6.52%) and high head rice recovery (64.2%). The proposed variety is moderately resistant against bacterial leaf blight, grain discoloration and sheath rot. The proposed variety showed tolerant reaction to brown plant hopper and moderately resistant reaction against stem borer, leaf folder and sheath mite. Rice variety NVSR-396 is recommended for aerobic cultivation in South Gujarat areas as GNR-8 (Aarti).



(Associate Research Scientist, MRRC, NAU, Navsari)

2. RICE: GR-18 (Devli Kolam)

The rice variety NVSR-2528 (5462 kg/ha) performed well in Gujarat state where it exhibited overall 29.1 %, and 8.4 % grain yield

superiority over check varieties GR-4 and Mahisagar, respectively. Medium slender grain rice variety NVSR-2528 contains intermediate amylose (22.9%) and high head rice recovery (61.8%). The proposed variety showed moderately resistant against leaf blast, grain discoloration and sheath rot. The proposed variety was moderately tolerant to white backed plant hopper, leaf folder, stem borer and sheath mite. Rice variety NVSR-2528 recommended for rice growing areas of Gujarat as GR-18 (Devli Kolam).



(Associate Research Scientist, RRRS, NAU, Vyara)

3. RICE: GR-19 (Auranga)

The salt tolerant rice culture NVSR-6150 (5305 kg/ha) performed very well in Gujarat where it exhibited average 16.0 per cent and 12.1 per cent grain yield superiority over the checks Dandi and GNR-5, respectively. It has short bold grain, more productive tillers and more number of grains per panicle. It contains intermediate amount of amylose content (25.2%), protein content (6.7%) and high head rice recovery (62.8%). The proposed variety is moderately resistant against bacterial leaf blight, grain discoloration and sheath rot. The proposed variety showed tolerant to brown plant hopper and moderately resistant reaction against stem borer, leaf folder and sheath mite. Rice variety NVSR-6150 is recommended for transplanted rice growing salt affected areas of Gujarat as GR-19 (Auranga).



(Associate Research Scientist, RRRC, NAU, Navsari)

4. **SORGHUM: Gujarat Jowar-44 (Madhu)**

The grain sorghum variety GJ-44 (Madhu) is high yielding as compared to state and national checks. It produced average 2762kg/ha grain yield in Gujarat state with increment of 18.1 per cent, 8.4 per cent and 22.3 per cent in grain yield over grain sorghum state checks GJ42, GNJ-1 and National check CSV 20. The average dry fodder yield of SR-2980 is 11836 kg/ha. This variety showed superiority over the checks in respect to lower stem borer infestation and found moderately resistant to the Grain Mold, Ergot, Anthracnose and Leaf blight disease. The grain sorghum variety SR-2980 is recommended for *kharif* season in grain sorghum growing area of Gujarat state as GJ- 44 (Madhu).



(Research Scientist, MSRS, NAU, Surat)

5. SORGHUM: Gujarat Fodder Sorghum-7 (Tapi Chari)

The fodder sorghum variety GFS-7 (Tapi Chari) recorded average 40022 kg/ha green fodder & 13212 kg/ha dry fodder yield, which is 29.3 per cent, 29.3 per cent, 13.2 per cent and 17.1 per cent higher in green fodder yield and 29.5 per cent, 24.4 per cent, 14.7 per cent, and 19.4 per cent in dry fodder as compared to the check varieties viz., GFS-5, GAFS-12, GFS-6 and CSV21F (NC), respectively. This variety showed superiority over the checks in respect to lower infestation of sorghum shoot fly and stem borer and found moderately resistant to the leaf diseases with good fodder quality parameters. The single cut fodder sorghum variety SRF-332 is recommended for *khariif* season in fodder growing area of Gujarat state as GFS-7 (Tapi Chari).



(Research Scientist, MSRS, NAU, Surat)

6. MANGO GINGER: GNMG-1 (Amravanti)

The mango ginger genotype, NVMG-3 recorded 14.08 t/ha average green rhizome yield in South Gujarat. It exhibited overall 33.59 per cent green rhizome yield superiority over check Chikhli local. The other rhizome yield contributing characters with this genotype is having more number of tillers per plant, numbers of mother as well as finger rhizomes, higher rhizome length and width. The strong mango like aroma, presence of curcumin content, higher total oil content, high dry rhizome weight, powder recovery per cent and lower fiber content are the value added traits. NVMG-3 is

resistant to rhizome rot and moderately resistant to leaf blight. Mango ginger genotype NVMG-3 is recommended for mango ginger growing areas of South Gujarat as GNMG-1 (Amravanti).



(Professor, Dept. of GPB, NMCA, NAU, Navsari)

7. ELEPHANT FOOT YAM: GEFY-1 (Swagata)

Elephant foot yam genotype NEFY-7 recorded 44.84 t/ha mean corm yield in Gujarat, where it exhibited overall 26.10 per cent corm yield superiority over national check Gajendra. Its light orange fleshed corm is reported to have appreciable amount of starch, dietary fiber, carbohydrate content, protein, vitamin A, iron, manganese, zinc and calcium in comparison to national check. The acidity feels same like “Gajendra” while consumption. The proposed genotype showed resistant reaction against collar rot disease. Elephant foot yam variety NEFY-7 is recommended for elephant foot yam growing areas of Gujarat as GEFY-1 (Swagata).



(Associate Research Scientist, Hill Millet Research Station, NAU, Waghai)

8. COTTON: G.Cot-40

The *hirsutum* cotton variety GSHV 172 recorded 2505 kg/ha average seed cotton yield in Gujarat where it exhibited seed cotton yield advantage of 78.2, 36.2, 18.9, 36.4, 26.8 and 30.4 per cent higher than G.Cot.10, G.Cot.16, G.Cot.18, G.Cot.20, GN.Cot.22 and zonal check, respectively under irrigated condition. The average lint yield in GSHV 172 was 901 kg/ha which was due to higher ginning outturn (36.1 %). GSHV 172 showed disease free to moderately resistant reaction against Bacterial Leaf Blight as well as Alternaria Leaf Spot and disease free to moderately susceptible for grey mildew. The sucking pests and open boll / locule damage in GSHV 172 was below ETL as compared to checks. ETL population of leaf hopper with JIG (Grade I) was found below ETL. Thus, *hirsutum* cotton variety GSHV 172 is recommended for endorsement in Gujarat as “G. Cot. 40”.



(Research Scientist, MCRS, NAU, Surat)

9. COTTON: G.Cot-42

The *hirsutum* cotton variety GSHV 180 recorded 2542 kg/ha average seed cotton yield in South Gujarat under rainfed condition where it exhibited cotton yield advantage of 32.2, 56.8, 23.7 and 4.0 per cent over check varieties G.Cot.16, G.Cot.20, Suraj and G.Cot.34, respectively with narrow spacing at 60 x 15 cm. The average lint yield in GSHV 180 was 815 kg/ha. It has 32.4 per cent ginning outturn. GSHV 180 showed disease free reaction for

Bacterial Leaf Blight and disease free to susceptible for Alternaria Leaf Spot. It showed moderate to lower population of leaf hopper where as boll worm damage was found below ETL. This variety is medium late in maturity. Thus, *hirsutum* cotton variety GSHV 180 is recommended for endorsement in South Gujarat under rainfed conditions for high density planting as “G.Cot.42”.



(Research Scientist, MCRS, NAU, Surat)

II NATURAL RESOURCE MANAGEMENT

1. Study on drip system layout for different row spacing in vegetable Indian bean-sweet corn cropping sequence.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone following vegetable Indian bean (*rabi*)-sweet corn (summer) crop sequence under drip irrigation are recommended to keep lateral spacing of 1.60 m for 4 rows of Indian bean sown at 30 cm x 10 cm spacing and 3 rows of sweet corn sown at 53 cm x 20 cm spacing and use drippers of 8 lph discharge rate for getting higher yield and net return.

System details

Lateral spacing	: 160 cm
Dripper spacing	: 60 cm
Dripper discharge	: 8 lph
Operating pressure	: 1.2 kg/cm ²

- Operating period : Twice in a week
 Operating time
 Indian bean (*rabi*)
 Dec to March : 1 hr to 1 hrs 20 minute (0.6 PEF)
 Sweetcorn (summer)
 April to May : 1 hrs 30 minute to 2 hrs (0.6 PEF)



(Research Scientist, SWMRU, NAU, Navsari)

2. Effect of different levels of irrigation and fertigation on *rabi* sorghum-vegetable cowpea cropping sequence.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone following *rabi* sorghum-vegetable cowpea (summer) crop sequence are recommended to irrigate the crops with drip irrigation system at 0.6 PEF and apply 6 kg N/ha and 40 kg P₂O₅/ha as basal and remaining 58 kg N/ha in 6 equal splits at weekly interval starting from 20 DAS through fertigation to sorghum and 40 kg P₂O₅/ha as basal and 20 kg N/ha in 3 equal splits at weekly interval to cowpea for securing higher yield and net return.

System details

- Crop spacing : 30 x 15 (4) : 60 cm
 Lateral spacing : 180 cm
 Dripper spacing : 60 cm

- Dripper discharge : 4 lph
 Operating pressure : 1.2 kg/cm²
 Operating period : Twice in a week
 Operating time
 Sorghum (rabi)
 Dec to March : 2 hrs 20 minute to 3 hrs 15 minute (0.6 PEF)
 Cowpea (summer)
 April to May : 3 hrs 20 minute to 3 hrs 45 minute (0.6 PEF)



(Research Scientist, SWMRU, NAU, Navsari)

3. Nutrient management in Indian bean (var. GNIB 21) and its ratoon crop sequence.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing vegetable Indian bean (var. GNIB-21) during *rabi* season are recommended to apply either 20-40-00 N-P₂O₅-K₂O kg/ha as basal or 5 t/ha FYM at the time of land preparation to plant crop and 20-30-00 N-P₂O₅-



K_2O kg/ha to ratoon crop after harvest of plant crop for getting higher yield and net return.

(Nodal Officer (Megaseed) & Unit Head, PCRS, NAU, Navsari)

4. Response of *rabi* castor to row spacings under different sowing window with or without intercrop of Indian bean (var. GNIB-21).

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing castor (GNCH-1) during *rabi* season are recommended to sow the crop in last week of October at 150 cm x 90 cm spacing and intercrop (1:1) vegetable Indian bean (var. GNIB-21) for obtaining higher yield and net return.



(Nodal Officer (Megaseed) & Unit Head, PCRS, NAU, Navsari)

5. Canopy management through mepiquat chloride under high density planting system of cotton (G. Cot 16) in irrigated conditions.

Hirsutum cotton (variety: G.Cot. 16) growers of South Gujarat Agro-climatic Zone are recommended to adopt high density planting system by sowing the crop at 45 cm x 20 cm or 60 cm x 20 cm spacing for obtaining higher seed cotton yield and net profit. Further, mepiquat chloride spray was not found effective in increasing seed cotton yield.

(Research Scientist, MCRS, NAU, Surat)

6. Weed management in *kharif* grain sorghum.

The farmers of South Gujarat Agro-climatic Zone growing *kharif* sorghum are recommended to carry out two hand weeding at 25 and 50 DAS and one inter culturing at 50 DAS for effective weed control and achieving higher yield and net return.

(Research Scientist, MSRS, NAU, Surat)

7. Response of summer sesame to nutrient management and irrigation scheduling.

The farmers of South Gujarat Agro-climatic Zone growing summer sesame are recommended to give 8 irrigations each of 60 mm depth of which first irrigation should be given at sowing, second at 12-14 days after first irrigation, third and fourth at 10-12 days interval after second irrigation and remaining four irrigations at 8-10 days interval after fourth irrigation and apply 62.5-31.25-50 N-P₂O₅-K₂O kg/ha (half N and full dose of P₂O₅ and K₂O as basal and remaining half N at 30 DAS) along with 20 kg S/ha as a basal through gypsum for getting higher seed yield and net return.

(Asstt. Research Scientist, ARS, NAU, Achhalia)

8. Effect of levels of nitrogen phosphorus and sulphur application on growth, yield and quality of linseed (*Linum usitatissimum* L.) under south Gujarat condition.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing linseed are recommended to apply 75 kg N/ha, 50 kg P₂O₅/ha as DAP and 20 kg S/ha as elemental sulphur (full dose of sulphur one week before sowing, half dose of N and full dose of P₂O₅ at sowing and remaining half dose of N at 30 DAS) for getting higher yield and net return.

(Prof. & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

9. Integrated weed management in *rabi* maize.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing *rabi* maize are recommended to apply atrazine 1.0 kg/ha as pre-emergence *fb* one interculturing at 40 DAS or carry out two interculturing along with hand weeding at 20 and 40 DAS for effective weed control and to obtain higher yield and net income.

(Prof. & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

10. Integrated weed management in fodder oat.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing fodder oat are recommended to adopt cross sowing method

at 30 cm x 30 cm spacing (using 1.5 times seed rate) for getting higher yield and net return.

(Prof. & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

11. Production potential of fodder maize (*Zea mays* L.) with different fodder intercrops.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing summer fodder maize are recommended to adopt fodder maize + fodder cowpea intercropping in 1:1 (maize spacing 30 cm) or 2:2 ratio (maize spacing paired row 15-45-15 cm) for getting higher yield and net return.

(Prof. & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

12. Evaluation of different phosphorus management practices in *rabi* sorghum-summer green gram cropping sequence under south Gujarat condition.

The farmers of South Gujarat Heavy Rainfall Zone following *rabi* sorghum-summer green gram cropping sequence are recommended to apply 30 kg P₂O₅ and Arbuscular Mycorrhizae (3000 IP/g) 250 g/ha (along with bio-compost 5 t/ha and 40 kg N/ha at sowing and 40 kg N/ha at 30 DAS) to sorghum and 15 kg N and 30 kg P₂O₅/ha to summer green gram for getting higher yield and net return.

(Prof. & Head, Dept. of SSAC, NMCA, NAU, Navsari)

13. 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% enriched banana pseudostem sap three times (30, 45 and 60 DAS) for obtaining higher yield and net profit.

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

14. Response of little millet (*Vari*) to organics.

The farmers of South Gujarat Heavy Rainfall Agro-climatic

Zone growing *kharif* little millet are recommended to apply 40 kg N/ha through either FYM (8 to 9 t/ha) or biocompost (3 t/ha) alongwith soil application of *Azotobacter* and PSB each 2 lit/ha immediately after seedling establishment for getting higher yield and net profit.

(*Assoc. Prof., Agronomy, COA, NAU, Waghai*)

15. Nutrient management in Dill Seed under south Gujarat condition.

The farmers of South Gujarat Agro-climatic Zone growing dillseed are recommended to fertilize the crop with 60-30-00 N-P₂O₅-K₂O kg/ha (30-30-00 N-P₂O₅-K₂O kg/ha as basal and 30 kg N/ha at 40 DAS) for getting higher yield and net return.

(*Prof. of Agronomy, COA, NAU, Bharuch*)

16. Evaluation of castor based relay cropping sequences under rainfed condition of South Gujarat.

The farmers of South Gujarat Agro-climatic Zone growing late *kharif* (First week of September) rainfed castor are recommended to adopt green gram-castor or black gram-castor relay cropping system for obtaining higher yield and net profit.



(*Prof. of Agronomy, COA, NAU, Bharuch*)

17. Response of sugarcane to tillage and different intercropping system under south Gujarat condition.

The farmers of South Gujarat Agro-climatic Zone growing sugarcane are recommended to carry out sub-soiling of 45 cm depth within alternate row at 2 m distance followed by cultivation with cultivator for obtaining higher yield and net profit. Further, intercropping of gram, fenugreek and Indian bean in sugarcane was not found remunerative.

(Prof. of Agronomy, COA, NAU, Bharuch)

18. Weed control in tomato (*Lycopersicon esculentum* Mill.) through mulching and herbicides under drip irrigation conditions.

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing drip irrigated tomato are recommended to adopt mulching with black plastic (50 μ , 84.66% coverage) for weed control and obtaining higher yield and net return.

(Asstt. Prof., Horticulture Polytechnic, Paria)

III PLANT PROTECTION

[A] Agricultural Entomology

1. Evaluation of different races of eri silkworm under laboratory condition for its suitability.

The eri silkworm rearing farmers of South Gujarat Zone AES III are advised to rear eri silkworm race, Borduar or Lakhimpur or Ambagaon to get better quality and economic traits.[Source of Availability of DFLs: Central Muga Eri Research and Training Institute (CMERTI), Jorhat (Assam)]

(Professor & Head, Dept. of Entomology, NMCA, NAU, Navsari)

2. Standardize the height of pheromone traps in pigeonpea ecosystem for the mass trapping of *Helicoverpa armigera* (Hubner).

The pigeonpea growers of south Gujarat are advised to maintain the height of pheromone trap 1.5 feet above the crop canopy at 50

per cent flowering stage for trapping maximum male moths of *Helicoverpa armigera* (Hubner).

(Professor & Head, Dept. of Entomology, NMCA, NAU, Navsari)

3. Study the activity period of honey bees in pointed gourd.

Higher activity period of honey bee in pointed gourd is observed between 11.30 AM to 3.30 PM in South Gujarat Heavy Rainfall Zone-II.

(Professor & Head, Dept. of Entomology, NMCA, NAU, Navsari)

4. Pollinators fauna in lucerne flora.

Higher activity period of pollinators viz., honey bees, butterflies, dipteran insects, wasps, etc. in lucerne is between 11.00 to 14.00 hrs in AES-III of South Gujarat Heavy Rainfall Zone-II.

(Professor & Head, Dept. of Entomology, NMCA, NAU, Navsari)

5. Evaluation of different oils against sorghum shoot fly.

Sorghum growing farmers of south Gujarat are advised to spray Neem oil 0.5 % or Karanj oil 0.5 % (50ml + 3 g detergent /10 lit water) at 7 and 17 days after emergence of crop for effective management of sorghum shoot fly.

(Asstt. Research Scientist (Ento.), MSRS, NAU, Surat)

[B] Plant Pathology

1. Biological management of foot rot in finger millet.

Finger millet growing farmers of South Gujarat are advised to give seed treatment with *Pseudomonas fluorescens* 1.5% (1×10^8 cfu/ml) @ 10ml/kg of seeds + two soil applications of *Pseudomonas fluorescens* 1.5% @ 2.5 l /ha in 250 kg FYM at transplanting and at 50% flowering for effective management of finger millet foot rot.

(Asstt. Professor, College of Agriculture, NAU, Waghai)

2. Evaluation of fungicides for the management of false smut of rice.

The Paddy growers of South Gujarat Agro-climate zone are advised to apply two sprays of trifloxystrobin 25 + tebuconazole 50 (75 WG) 0.03 per cent (4 gm/10 l.) or propiconazole 25 EC, 0.025

per cent (10 ml/10 l.) for effective control of false smut. The first spray should be given at boot leaf stage and the second spray at milking stage. PHI 21 days for trifloxystrobin 25 + tebuconazole 50 (75 WG) or 30 days for propiconazole 25 EC.

(Asstt. Research Scientist, MRRC, SWMRU, NAU, Navsari)

3. Management of rice seedling rot caused by *Sclerotium rolfsii*.

Summer paddy growers in South Gujarat are advised to seed soaking with azoxystrobin 23SC at 0.046% solution, 1ml /500 ml water soaked in one kg seeds for two hrs + Soil application with *Trichoderma harzianum* 1.5% wp (2×10^6 cfu/gm) @ 1g/m² or seed treatment with azoxystrobin 23SC at 0.046% solution, 1ml /500 ml water soaked in one kg seeds for two hrs for better plant population, minimum seedling mortality along with good seedling vigor.

(Asstt. Research Scientist, RRRS, NAU, Vyara)

IV HORTICULTURE

1. 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 (*Azotobactor*, 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.

(Research Scientist. RHRS, NAU, Navsari)

2. 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.

(Research Scientist, RHRS, NAU, Navsari)

3. 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.

(Research Scientist, RHRS, NAU, Navsari)

4. 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.

(Research Scientist, RHRS, NAU, Navsari)

5. Effect of biofertilizers, growth regulator and micronutrients on fruit growth, yield and quality of Sapota cv. Kalipatti

The farmers of South Gujarat having sapota cv. Kalipatti orchards are recommended to apply FYM 75 kg in June month and 750-375-375 g/tree NPK application in June and October month (Two equal splits), Bio-fertilizers -*Azospirillum* + PSB @ 40ml/tree application in July, 50 ppm GA₃ spray in November and 0.5% Grade 4 micronutrients spray in December month for getting higher yield and income.

(Assoc. Res. Sci., FRS, NAU, Gandevi)

6. Effect of tip pruning and foliar application of KNO₃ on early flowering and yield of mango cv. Kesar.

The farmers of South Gujarat having mango orchard cv. Kesar (Planted at 10 x 10 m) are recommended to apply foliar spray of 4% KNO₃ at 4th to 5th month after shoot tip pruning having approximately 1.0 cm diameter (Immediately after harvest) for getting early fruit maturity with higher yield and maximum net return.

(Principal, Horti. Poly Tech., ACHF, NAU, Navsari)

7. 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 m²) 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 ratio of fertilizers (kg)			Remarks
	N	P	K	
1 st 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.
2 nd Growth Period (31-60 days)	3.13	2.50	2.28	
3 rd Growth Period (61-90 days)	3.13	1.25	3.38	
4 th Growth Period (91-120 days)	3.13	1.25	2.28	
5 th Growth Period (121-150 days)	3.13	1.25	1.14	
6 th Growth Period (151-180 days)	3.13	1.25	1.14	
7 th Growth Period (181-210 days)	3.13	1.25	1.14	
Total	25.00	12.50	12.50	

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

8. 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.

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

9. 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.

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

10. 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.

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

11. Standardization of soil less media for brinjal plug tray nursery.

The farmers and nursery men raising brinjal seedling in plug tray nursery are recommended to use media of Vermicompost: Cocopeat as 1:1 or 2:1 ratio for maximum germination percentage, good seedling vigour, higher return and maximum survival of seedling in plug tray as well as in main field.

(Principal, Horti. Poly Tech, NAU, Paria)

12. 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.* *Azotobacter* + Phosphate Solubilizing Bacteria (PSB) + Potash 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.

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

13. Residues of paclobutrazol in mango under South Gujarat conditions.

The mango growers of South Gujarat are recommended that application of paclobutrazol 25 SC as growth promoter at the rate of 7.5 g *a.i./tree* *i.e.* 30 ml/10 l water in mango tree through drenching method in the month of July under condition do not pose the problem of paclobutrazol residues in mature and ripe mango fruits as its residues were well below the MRL values fixed by National and International regulatory agencies for mango.

(Professor & Head, FQTL, NMCA, NAU, Navsari)

14. 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 150g 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 *Azotobacter* @ 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 x 1.2 x 2.4 m distance and apply the first split of NADEP compost (containing 1.02 % N) @ 4.9 kg per pit along with *Azotobacter*, 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.

(Professor, NRM, ACHF, NAU, Navsari)

15. 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 °Brix) followed by increase of syrup strength (10 °Brix per day) up to 70 °Brix, 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.

(Professor & Head, PHT, ACHF, NAU, Navsari)

16. 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.

(Professor & Head, PHT, ACHF, NAU, Navsari)

V FORESTRY

1. Determination of critical limit of water salinity for *Ailanthus* spp. (Arduso) seedlings .

Farmers and nursery growers are informed that seedlings of *Ailanthus* species (*i.e.* *A. excelsa* and *A. triphysa*) are moderately salt tolerant for irrigating with saline water upto 8.0 dS/m.

(HoD, NRM, CoF, NAU, Navsari)

2. Vegetative Propagation of Dambel (*Tylophora indica*).

It is recommended to the farmers and nurseryman that the vegetative propagation of Dambel can be achieved by dipping 10 cm cutting in 1 g/l IBA solution for 10 minutes and growing in coco-peat or red soil media under net house conditions.

(HoD, FPU, CoF, NAU, Navsari)

VI AGRICULTURAL ENGINEERING

1. Evaluation of solar tunnel dryer for feasibility of green leaves drying for herbal production in Dediapada.

Semi circular solar tunnel dryer (covered with UV stabilized 200 micron polythene sheet) having 30 m² area (10m x 3m x 2m size) is recommended to farmer community in South Gujarat for low temperature drying of *Sargava* and *Mahendi* leaves as well as *Keshuda* flowers for herbal products with 33 % less drying time compare to sun drying with higher net present worth.



(Assoc. Prof. & Head, REE, CAET, NAU, Dediapada)

2. Influence of land configuration on productivity of Sorghum (*Sorghum bicolor* L.) crop in Vertisol of South Gujarat.

The farmers of South Gujarat heavy rainfall zone growing rabi sorghum are recommended to adopt improved land configuration system i.e. double row planting system with laser levelled field, with leveling index as 0.72, to improve the crop yield, irrigation water saving and higher net return.

(Professor & Head, Agricultural Engineering, NMCA, NAU)

3. **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 75micron HDPE bags to store up to 3 months without altering quality.

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

VII BASIC SCIENCE

1. **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.

(Prof.&Head, Dept. of Plant Molecular Bio.& Biotech, ACHF, NAU, Navsari)

VIII ANIMAL PRODUCTION AND FISHERIES

1. **Effect of heat ameliorative measures during dry period on production performance in subsequent lactation in Surti buffaloes.**

Farmers of south Gujarat rearing Surti buffaloes are advised to keep Surti buffaloes in the pukka shed having fans and lime painted on roof top during summer season, before two months of calving (dry buffaloes) as it improves immune status and milk fat during subsequent lactation.

(PI through HOD, Veterinary Physiology and Biochemistry, NAU, Navsari)

RECOMMENDATION SCIENTIFIC COMMUNITY

I NATURAL RESOURCE MANAGEMENT

1. Weed management in *kharif* grain sorghum

Application of atrazine 1.5 kg/ha as a pre-emergence *fb* one hand weeding at 40 DAS was found effective for weed control in *kharif* sorghum. Residue analysis of the herbicide was carried out and found below detectable level.

(Research Scientist, MSRS, NAU, Surat)

2. Integrated weed management in fodder oat

Application of either pendimethalin @ 1 kg/ha as PE or 2,4-D amine salt 0.5 kg/ha or metsulfuron methyl 4 g/ha as PoE at 30 DAS gave effective weed control with higher yield and net return in fodder oat. Residue analysis of these herbicides was carried out and found below detectable level.

(Prof. & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

II PLANT PROTECTION

[A] Plant Pathology

1. Screening of little millet (*Panicum miliare* L.) varieties and germplasms against blast.

Seven little millet germplasms *viz.*, WV-124, WV-126, WV-130, WV-143, WV-145, WV-146, WV-151 and two varieties *viz.*, GV-2 and GNV-3 were found resistant against blast and grain smut. OLM-203 variety was found highly resistant to grain smut.

(Asstt. Professor, College of Agriculture, NAU, Waghai)

2. Screening of mungbean entries against mungbean yellow mosaic (LSET-I & SSET).

Mungbean entries *viz.*, NKM-15-08, NKM-15-12, NKM-15-05, NKM-15-13, NKM-15-14 and NKM-15-15 were found Highly Resistant against mungbean yellow mosaic disease in South Gujarat Heavy Rainfall Zone under natural condition.

(Asstt. Res.Sci. (Patho), Pulses and Castor Research Station, NAU, Navsari)

3. Screening of urdbean entries against mungbean yellow mosaic (SSET).

Urdbean entries viz., NUK-15-02, NUK-15-06 & NUK-15-10 were found Highly Resistant and NUK-15-09 was found Resistant against mungbean yellow mosaic disease in South Gujarat Heavy Rainfall Zone under natural condition.

(Asstt. Res.Sci. (Patho), Pulses and Castor Research Station, NAU, Navsari)

4. Screening of cowpea entries against yellow mosaic (SSET & PET).

Cowpea entries viz., NCK-15-08, NCK-15-09, NCK-15-11, NCK-15-12, NCK-15-02 & NCK-15-04 were found Highly Resistant and NCK-15-07 was found Resistant against yellow mosaic disease in South Gujarat Heavy Rainfall Zone under natural condition.

(Asstt. Res. Sci.(Patho), Pulses and Castor Research Station, NAU, Navsari)

5. Screening of Indian bean entries against yellow mosaic and powdery mildew (SSET).

Indian bean entries viz., NIBD-14-01 was found Highly Resistant against yellow mosaic disease. While, NIBD-14-01, NIBD-14-02, NIBD-14-03 & NIBD-14-06 were found Moderately Resistant against powdery mildew disease in South Gujarat Heavy Rainfall Zone under natural condition.

(Asstt. Res. Sci.(Patho), Pulses and Castor Research Station, NAU, Navsari)

6. Integrated management of papaya diseases

Following module was found effective with minimum infection of diseases viz., Fruit Rot, Collar rot and Papaya Ring Spot Virus and higher marketable papaya fruits yield.

Module :

Seed treatment with captan 50 WP @ 5 g per 100g seed, seedling raising under Nylon net (40-60 mesh) and spraying of acephate 75 SP, 1.5g/l three days before transplanting in main field. Growing of two rows of maize and castor/sesbania as border crop.

After 10 days

Drench with Dimethomorph 50 WP, 0.4g + Mancozeb 75 WP , 2g /l

After 15 days

Neem Oil 2% Foliar application + 0.5ml/L sticker at 30 days interval till flowering

After 15 days

Foliar Application of Urea @10g + Zinc Sulphate @ 15g + Boron @ 10g/l

After 7 days

Application of Hexaconazole 5 EC, 2 ml + Zineb75WP, 2g + 0.5ml sticker/l

After 7 days

Neem oil 2% foliar application + 0.5ml sticker/l

After 7 days

Application of Hexaconazole 5 EC, 2 ml + Zineb 75WP, ,2g + 0.5ml sticker/l

After 7 days

Foliar Application of Urea @10g + Zinc Sulphate @ 15g + Boron @ 10 g/l

After 15 days

Neem oil 2% foliar application + 0.5ml sticker/l

After 15 days

Application of Urea @ 10g + Zinc Sulphate @ 15g + Boron @ 10g/l

After 15 days

Difenoconazole 25 EC @0.5ml + 0.5ml sticker/l

(Asstt. Res. Sci. (Patho), Fruit Research Station, NAU, Gandevi)

[B] Agricultural Entomology

1. Evaluation of different substrates for mass culturing of *Beauveria bassiana* (Bals.) Vuill.

For mass multiplication of *Beauveria bassiana* (Bals.) Vuill., 100g of sorghum grain soaked overnight in water, then autoclave for

20 minutes at 121°C temperature. The fungus can be inoculated at 10ml conidial suspension of *B. bassiana* (5×10^7 conidia/ ml) after cooling aseptically and incubated for 15 days at $25 \pm 1^\circ\text{C}$ temperature to get maximum cfu (13.67×10^8). Moreover, the clumps should be broken manually by rubbing HDPE bag for uniform growth of the *fungus*.

(Professor & Head, Dept. of Entomology, NMCA, NAU, Navsari)

2. Screening of pigeon pea genotypes against pod borer and pod fly under natural field condition.

Infestation of pod borers and pod fly was less in the pigeon pea entries viz., NPEK-15-03, NPEK-15-25, ICPL-87119, NPEK-15-09, BP-15-23, GJP-1303, SKNP-1413, AGT-2 and BP-15-11.

(Asstt. Res. Sci. (Ento), College of Agriculture, NARP, NAU, Bharuch)

3. Screening of promising genotypes for multiple resistance against stem borer (*Scirpophaga incertulas*), leaf folder (*Cnaphalocrocis medinalis*) and sheath mite (*Steneotarsonemus spinki*) of rice.

Rice genotypes viz., NVSR-329, NVSR-355 and NVSR-384 were found to have multiple resistant reaction against yellow stem borer (*Scirpophaga incertulas* Walker), leaf folder, (*Cnaphalocrocis medinalis* Guenee) and sheath mite (*Steneotarsonemus spinki* Smiley) under field conditions.

(Asstt. Res. Sci. (Ento), College of Agriculture, NARP, NAU, Bharuch)

4. Study the incidence of insect-pest in high density mango plantation under drip irrigation.

Mango (cv Kesar) orchard under high density (5m x 5m) planting under drip irrigation in south Gujarat conditions recorded mango hopper, thrips and mite during 1st to 3rd, 5^{2nd} to 2nd and 7th to 10th standard meteorological week, respectively.

(Assoc. Res. Sci. (Ento), MRRC, SWMRU, NAU, Navsari)

5. Varietal preference of insect-pest incidence in ultra high-density mango plantation under drip irrigation.

Mango (cv Kesar) orchard under ultra high density (2.5m x 2.5m) planting under drip irrigation in south Gujarat conditions recorded higher population of mango hopper, thrips and mites in Ratna and less population of these pests in Totapuri variety.

(Asstt. Res. Sci. (Ento), SWMRU, NAU, Navsari)

6. To assess the crop loss due to insect pests and diseases in sorghum.

The avoidable yield loss due to insects viz., shoot fly and stem borer and due to disease viz., grain mold and sugary disease was anticipated up to 50.00 per cent in sorghum.

(Asstt. Res. Sci. (Ento), MSRS, NAU, Surat)

7. Documentation and monitoring population of pollinators on mango.

Total thirteen insect species were observed visiting on mango flowers and maximum population of floral visitors belonging to Diptera (Blow flies, *Chrysomya megacephala* Fab.; Syrphid flies, *Syrphus* sp. and *Eristalinus arvorum* Fab. and house fly, *Musca domestica* L.) followed by Hymenopteran bees (*Apis florea* Fab.; *Apis cerana indica* Fab.; *Apis mellifera* L.; *Apis dorsata* Fab. and *Tetragonula iridipennis* Smith), Wasp, *Vespula orientalis* L.; Red ant, *Oecophylla smaragdina* (Fab.); Dragon fly and Butterflies during full bloom stage. The maximum activity was recorded in south direction followed by north, west and east direction. The intensity of pollinators or visitors was found significantly higher in unsprayed trees as compared to sprayed trees.

(Asstt. Research Scientist (Ento), AES, NAU, Paria)

8. Studies on natural parasitization of sugarcane shoot borer.

Shoot borer viz., *Sesamia* sp. and *Chilo* sp. were important pests of sugarcane which were naturally parasitized by parasitoids viz., *Tachinid* sp. and *Apanteles* sp under south Gujarat condition.

(Scientist (Pl. Protection) KVK, NAU, Vyara)

9. Effect of ozonized water washing on pesticide residues and shelf-life of green chilli and okra.

The home-makers, consumers and food processors are advised to rinse okra and chilli fruits with ozonized water for 8 minutes with commercially available ozone purifier based on Vortex Ozone Technology having ozone producing capacity of 0.5kg/hour to decontaminate the acetamiprid and ethion residues in the range of 39.18-59.43 and 51.39-59.28 %, respectively and prolongs the shelf-life of the fruits.

(Asstt. Professor, Food Quality Testing Laboratory, NAU, Navsari)

10. Status of pesticide residues in seasonal green leafy vegetables in South Gujarat.

The survey of pesticide residues in five leafy vegetables (coriander, colocasia, fenugreek, spinach, amaranthus) different markets of South Gujarat reveals that 48.75 % samples were positive for different pesticides.

- More than 50% samples of spinach and colocasia were positive for different pesticides.
- Buprofezin was the most frequently detected pesticides from different leafy vegetables.
- None of vegetable sample was found exceeding the Maximum permissible limit for different elements.

(Asstt. Professor, Food Quality Testing Laboratory, NAU, Navsari)

11. Pollinators fauna in lucerne flora.

Pollinators viz., honey bees, butterflies, dipteran insects, wasps, etc. in lucerne are very active between 10.00 AM to 2.00 PM in South Gujarat Heavy Rainfall Zone-II.

(Professor and Head, Department of Entomology, NMCA, NAU, Navsari)

III HORTICULTURE

1. Effect of different light sources on growth and quality of micro-greens

- 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/room.
- 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.

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

2. 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.

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

3. Residues of paclobutrazol in Sapota under South Gujarat conditions

The scientific community is informed that sapota fruits exceeded the MRL values fixed by National and International regulatory agencies for Paclobutrazol residues which were collected during 90-120 days from the sapota tree drenched with paclobutrazol 25 SC at the rate of 7.5 g *a.i./ha* i.e. 30 ml/10 l water in the month of September under South Gujarat conditions.

(Professor & Head, FQTL, NMCA, NAU, Navsari)

IV AGRICULTURAL ENGINEERING

1. Assessment of water resources of Navsari and Dang district using water quality index and GIS.

Analysis of surface water quality using Water Quality Index (WQI) and GIS indicated that WQI for Navsari district varies from 41.31 to 189.09 in Pre-monsoon and from 48.49 to 196.0 in Post-monsoon; whereas for Dang district, WQI varies from 37.83 to 121.68 in Pre-monsoon and from 40.09 to 152.83 in Post-monsoon season. Water samples plotted on US Salinity diagram indicated that, samples of Navsari district under C3S4 and C4S4 category are 'poor zone of water quality' and this water cannot be used for irrigation on soils with restricted drainage and requires special management for salinity control. Surface water in other locations of Navsari and all locations of Dang district belongs to 'acceptable to suitable' class of water for irrigation.

(Principal, CoA, NAU, Waghai)

2. Effect of different colour shade nets on biomass and quality of leafy vegetables.

The scientific community is informed that fenugreek / coriander / garlic crops grown for green leafy vegetable purpose, during winter season (last week of November to first week of January) in the South Gujarat heavy rainfall agroclimatic zone, in their established net houses having colour shade net, are advised to prefer crop under suitable colour shade net with 50 % shading for getting higher production and good quality green biomass.

Crop	Shade net colour
Fenugreek	Yellow / white / blue/ green
Coriander	Yellow / red /white
Garlic	Yellow /white / red

(Research Scientist, SWMRU, NAU, Navsari)

V BASIC SCIENCE

1. Effect of phosphate solubilizing microbes in wheat (*Triticum aestivum*) under saline conditions.

It is informed to scientific community to use native isolates *Bacillus subtilis* PSB-S (1×10^8 cfu/ml) + *Cladosporium herbarum* PSF-S (1×10^7 cfu/ml) along with 100% recommended dose of chemical phosphatic fertilizers in wheat for maximum phosphate solubilization in the soil with EC up to 3.79 (dS/m).

(Professor & Head, Dept. of Plant Pathology, NMCA, NAU, Navsari)

2. 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.

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

3. Optimization of denovo regeneration protocol and selection of glyphosate tolerant line for *Cynodon dactylon* variety Selection 1.

It is informed to the scientific community to use MS+4.0 mg/l 2,4-D for higher callus induction frequency for *in vitro* regeneration of *Cynodon dactylon* using node as an explant. The media treatments MS+0.1mg/l BAP and MS+0.1 mg/l IBA must be used for maximum shoot and root regeneration, respectively. Best hardening was observed with coco peat, vermicompost and sand in the ratio of 2:1:1. LD₅₀ was 1.0% glyphosate for *in vitro* induce callus of *Cynodon dactylon* variety Selection 1.

(Principal, ASBI, NAU, Surat)

4. Optimization of amylase production by soil isolate under solid state fermentation (SSF).

It is informed to the scientific community that native *Bacillus subtilis* strain VSP4, gave maximum amylase production (169.72 U/gds) under solid state fermentation using 5 g wheatbran supplemented with 0.05 g of starch, 0.1 g of yeast extract and 5 mM CaCl₂ having media pH 10.0 after 60 hrs of incubation at 60°C in incubator.

(Principal, ASBI, NAU, Surat)

5. Influence of various nanoparticles on contamination in micropropagation of banana.

It is informed to the scientific community that silver nanoparticles (~ 13.0 nm) at 10.0 mg/l concentration with MS medium can reduce the contamination up to 12.6 % in *in vitro* regeneration of banana.

(Principal, ASBI, NAU, Surat)

6. Screening of cotton genotypes for salinity tolerance.

It is informed to the scientific community that cotton genotypes GISV-218 and G.Cot-16 are salinity tolerance up to EC_{1,2,5} (13.14 dS/m) while G.Cot-10 and G.Cot-100 are salinity sensitive.

(Research Scientist, MCRS, NAU, Surat)

7. Biochemical traits in relation to insect tolerance of wild species and cross derivatives involving wild species of cotton.

It is informed to scientific community that the WS08- {(G.6 X G.ano) X G.tom} X G.Cot-100, WS07- ALB X *G.anomalum*, WS05-(G.67 X MOCO)F1 X G.Cot-11, WS25- Large Mango Leaves and WS06- ALB X *G.anomalum* showed most lowered sucking pest infestation and square damage among the wild entry and cross derivatives selected for analysis. Among these five genotype, {(G.6 X G.ano) X G.tom} X G.Cot-100 showed higher

total phenol, tannin and surface wax content at sucking pest infestation. {(G.6 X *G.ano*) X *G.tom*} X G.Cot-100 also showed higher trichome density and hairiness character. While Large Mango Leaves and ALB X *G.anomalum* showed higher gossypol content at boll worm infestation and hence recommend for further breeding programs.

(Research Scientist, MCRS, NAU, Surat)

8. Assessment of various anti-nutritional factors from different varieties of pigeon pea.

It is informed to the scientific community that out of 10 genotypes of pigeon pea studied, AVPP-1 and GNP-2 are prominent for their anti-nutritional content in whole seed.

(Principal, CoA, NAU, Bharuch)

9. Isolation and characterization of endophytic bacteria from Finger millet.

It is informed to the scientific community that finger millet root endophytic isolates native *Bacillus subtilis* (EP 6) and *Achromobacter xylosoxidans* (EP 17) show multiple plant growth promoting abilities under *in vitro* conditions.

(Principal, CoA, NAU, Waghai)

10. Study of starch quality in greater yam *Dioscorea alata*.

It is informed to the scientific community that greater yam genotypes NGY9, NGY3 and NGY1 had highest resistant starch, refrigeration stability (syneresis %) and starch gel clarity (transmittance %), respectively.

(Prof. & Head, Dept. of Soil Sci. & Agri. Chem., NMCA, NAU, Navsari)

11. Isolation and characterization of plant growth promoting Actinomycetes from rhizospheric soil.

It is informed to the scientific community that *Streptomyces enissocaesilis* IB 7.2 found most potent for multiple plant growth

promotion characters like nutrient solubilization, antagonistic potential, extracellular hydrolytic enzyme secretion and plant growth hormone production under *in vitro* conditions.

(Professor & Head, Dept. of Plant Pathology, NMCA, NAU, Navsari)

12. Optimization of micropropagation protocol for different genotypes of banana.

It is informed to the scientific community that out of ten diverse banana genotype; *Cheankadali*, *Lalkel* and *Rajapuri* genotypes had better growth response to micropropagation protocol comprised of shoot tip explants surface sterilization treatment [Carbendazim (0.125%) + Chloramphenicol (500 mg/l) for 45 minutes + 1.0 % HgCl₂ solution for 10 minutes] followed by shoot multiplication [MS + BA (3.0 mg/l) + adenine sulphate (2.0 mg/l)] and root induction [$\frac{1}{2}$ MS + 1.0 mg/l IBA] treatment.

(Dept. of GPB (Plant Physiology), NMCA, Navsari)

13. Status of heavy metals in green leafy vegetables grown under South Gujarat region.

It is informed to scientific community that none of vegetable sample was found exceeding the maximum permissible limit for different elements except nickel in spinach and fenugreek. Moreover, the survey of pesticides residues in randomly taken 10 samples of the three leafy vegetables that is fenugreek, spinach and amranthus from different markets of South Gujarat were detected below permissible value for different pesticides.

(Prof. & Head, Dept. Food Quality Testing Lab., NMCA, NAU, Navsari)

14. 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 programme:

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.	Tryptophan	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.

(Prof. & Head, Dept. of Plant Molecular Bio. & Biotech, ACHF, NAU, Navsari)

15. Surveillance of aflatoxin in pasteurized and raw milk.

Navsari Agricultural University analyzed 45 milk samples from Navsari for Aflatoxin presence. It was observed that occurrence of Aflatoxin M1 was higher in winter season followed by monsoon season. Aflatoxin M1 was more in buffalo milk in comparison to cow milk samples. Pasteurized buffalo milk samples showed higher Aflatoxin M1 than raw milk whereas it was absent in pasteurized cow milk samples.

(Professor & Head, Dept. Food Quality Testing Lab., NMCA, NAU, Navsari)

VI SOCIAL SCIENCE

1. Professionalism in management of primary dairy cooperatives in South Gujarat

Perception of professionalism in management of primary milk cooperative societies of South Gujarat can be augmented by knowledge about principles, benefits, faith, group motivation and attitude towards cooperative societies.

(HoD, Extension Education, NMCA, NAU, Navsari)

VII ANIMAL PRODUCTION AND FISHERIES

1. Measurement of heat stress and its impact on behaviour and production performance in surti buffaloes in different seasons.

THI of 72.15 based on NRC 1971, observed in winter season beneficially improves fat and lactose percentage in milk and milk yield in Surti buffaloes.

(PI through HOD, VPB, NAU, Navsari)

2. Cutaneous thermal profiling of Surti does in different seasons.

Surface temperature of eye and udder using infrared thermography may be used as a non-invasive alternative to rectal temperature for assessment of body temperature as well as heat stress in Surti goats.

(PI through HOD, VPB, NAU, Navsari)

3. Study of genetic polymorphism in growth related genes and its association with growth parameters in Surti goats.

Surti goats with BB (366 and 56 bps) genotype are found with higher body weight at 6 months of age as compared to AB (422, 366 and 56 bps) genotype when growth hormone (GH) gene is amplified using forward primer 5' CTCTGCCTGCCCTGGACT 3' and reverse primer 5' GGAGAAGCAGAAGGCAACC 3' and digested with *HaeIII* restriction enzyme.

(PI through HOD, AGB, NAU, Navsari)

4. Relative gene expression study on casein protein and its regulatory genes in mammary epithelial cells of surti goat.

- (A) The Mammary Epithelial Cells can be successfully recovered in sufficient quantity from optimum amount of milk (800 ml) of Surti goats using antibody mediated magnetic bead separation and can be further used for recovering RNA for down step quantification of major milk Casein protein gene and its regulatory gene's expression.
- (B) The relative gene expression of *CSN1S1*, *CSN1S2*, *CSN3* and *C/EBP* genes show upregulation with advancement of lactation from 30 days to 90 days post partum in Surti goats with 7.79, 32.87, 21.41 and 24.68 fold increase respectively. The relative gene expression of *CSN1S2*, *CSN3* and *C/EBP* genes show positive correlation with protein percent at 30 days and 90 days post partum in Surti goats. Positive correlations also shown by *CSN2* with Test Day Milk Yield and *CSN3* with Cumulative Milk Yield at day 30 post partum in Surti goats.

(PI through HOD, AGB, NAU, Navsari)

5. Nutrient composition, *in vitro* feed degradation and microbial biomass yield estimation of unconventional feed resources for ruminants in south Gujarat.

- (A) Based on average dry and organic matter digestibility (70.60% and 79.99%), total volatile fatty acid (12.13 mMol/dl) and microbial biomass production (292.47 mg/200 mg DM) of tree leaves, *Gliricidia sepium* (Gliricidia), *Gmelina arborea* (Sevan), *Dalbergia latifolia* (Sisam) and *Dalbergia sissoo* (Sisu), show better fermentation characteristics and having potential to fulfil the maintenance requirement of small ruminants as promising alternative feed resources.

- (B) Beyond 6% of total tannin content of tree leaves decreases *in vitro* dry matter and organic matter digestibility as well as total volatile fatty acid with negative correlation coefficients of -0.866, -0.811 and -0.679 respectively, therefore the total tannin content of the diet should not exceed 6 % while selecting *Gliricidia*, *Gmelina* (Sevan), *Dalbergia* (Sisu) and *Terminalia* spp. (Harade and Baheda) tree leaves for ration formulation of Goats.

(PI through HOD, Animal Nutrition, NAU, Navsari)

VIII ANIMAL HEALTH

1. Formulation and *in-vitro* evaluation of quercetin loaded micro emulsion for pharmacological properties.

Quercetin microemulsion (1 mg/ml) formulation prepared with 1M NaOH, Tween 80 and Water in the ratio of 0.2:0.2:19.6 showed good antioxidant property with IC₅₀ values 3.75 µg/ml and 1791.8µg/ml in ABTS and DPPH assay, respectively.

(PI through HoD, Vet. Pharmacology & Toxicology)

2. *In vitro* evaluation of combination effect of Rutin with Enrofloxacin, Gentamicin sulphate and Ceftriaxone.

In vitro combination of Rutin (78.13 µg/ml) and Enrofloxacin has antibacterial synergistic action at the concentrations of 0.12 µg/ml against *Salmonella* Typhimurium, *Proteus mirabilis* and *Bacillus subtilis* and 0.24 µg/ml against *Pseudomonas aeruginosa*, respectively.

(PI through HoD, Vet. Pharmacology & Toxicology)

3. *In vitro* evaluation of combination effect of Rutin with Enrofloxacin, Gentamicin sulphate and Ceftriaxone.

In vitro combination of Rutin (78.13 µg/ml) and Gentamicin sulfate has antibacterial synergistic action with the concentrations of 3.91 µg/ml against *Escherichia coli* and *Pseudomonas aeruginosa*, 0.98 µg/ml against *Salmonella* Typhimurium and

Streptococcus pyogenes, 1.95 ì g/ml against *Proteus mirabilis* and 7.81 ì g/ml against *Staphylococcus aureus*, respectively.

(PI through HoD, Vet. Pharmacology & Toxicology)

4. **In vitro evaluation of combination effect of Rutin with Enrofloxacin, Gentamicin sulphate and Ceftriaxone.**

In vitro combination of Rutin (78.13 ì g/ml) and Ceftriaxone has antibacterial synergistic action with the concentrations of 0.98 ì g/ml against *Salmonella* Typhimurium and *Pseudomonas aeruginosa* and 1.95 ì g/ml against *Streptococcus pyogenes*, respectively.

(PI through HoD, Vet. Pharmacology & Toxicology)

5. **Evaluation of in vivo anti-inflammatory and antibacterial activities of Ellagic acid following intramuscular administration in albino rats.**

Ellagic acid has good anti-inflammatory activity at 75 mg/kg body weight intramuscularly in carrageenan induced rat paw edema model.

(PI through HoD, Vet. Pharmacology & Toxicology)



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યુનિવર્સિટી દ્વારા બહાર પાડવામાં આવેલ જુદા જુદા પાકોની નવી જાતોની ઉપલબ્ધતા
Availability of new varieties seeds of different crops produced by the University

૧. ડાંગર :- એન.એ.જી.આર.-૧, જી.એન.આર.-૨, જી.એન.આર.-૩, જી.એન.આર.-૪, પૂર્ણ
૨. જુવાર :- જી.એ.-૩૯, જી.એ.-૪૨, સી.એ.વી.૨૧ એક (ખાસગર માર્ક)
૩. નાનારી :- જી.એન.-૪, જી.એન.-૫, જી.એન.એન.-૯
૪. વડી :- જી.વી.-૧, જી.વી.-૨
૫. ખટ્તરાણી :- જી.એન.-૨
૬. તુવેર :- વૈશાલી, જી.ટી.-૧૦૨, બી.કી.એન.-૭૧૧
૭. ઝામ :- સી.એ.-૪, જી.વી.એમ.-૧
૮. પામીલાલ :- જી.એન.આઈ.બી.-૨૧, જી.વાલ-૧, જી.વાલ-૨
૯. ડામર :- જી.સી.કે.ભાઈકે-૮, જી.સી.કે.ભાઈકે-૯, જી.સી.કે.ભાઈકે-૧૦,
૧૦. ડામર :- જી.એન.ટી.-૧
૧૧. ટીકરી :- જી.એક.-૪, જી.એક.-૫, જી.એક.-૬, જી.એક.-૭, જી.એક.-૮

1. Paddy:- NAUR-1, GNR-2, GNR-3, GNR-4, Purna
2. Sorghum:- GJ-38, GJ-42, CSV-21-F
3. Finger millet:- GN-4, GN-5, GNN-6
4. Little millet:- GV-1, GV-2
5. Niger:- GN-2
6. Pigeonpea:- Vaishali, GT-102, BDN-711
7. Mungbean:- CO-4, GBM-1
8. Indainbean:- GNIB-21, G.Wal-1, G.Wal-2
9. Cotton:- G.Cot.Hy-6, G.Cot.Hy-8, G.Cot.Hy-10, G.Cot.Hy-12(BG-II), G.Cot-20, G.N.Cot-25
10. Turmeric:- GNT-1
11. Sugarcane:- GS-4, GS-5, GS-6, GS-7, GS-8

ખાસિયતો

જાતીલીક શુદ્ધ અને ઉચ્ચ ગુણવત્તાનુકૃત બિયારણ
વિજ્ઞાનિક સમીક્ષાથી તૈયાર કરેલ પ્રમાણીત બિયારણ

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નવસારી - ૩૯૬ ૪૫૦
ફોન નં - (૦૨) ૦૨૬૩૭-૨૮૨૧૦૩



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Navsari Agricultural University
Navsari - 396 450
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નોરોજી

NOVEL



નોવેલ

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Organic Liquid Fertilizer

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- It contains NPK as well as micro nutrients.
- It contains naturally occurring growth promoters.
- It is a growth promoter, it is very helpful in nursery plants.
- It enhance total plant growth, number of flower, maximum conversion of flowers into fruits and pods
- Enhance vigorous root development and growth

ફાયદાઓ

- સંપૂર્ણ સેન્દ્રિય પ્રવાહી ખાતર છે.
- નાઈટ્રોજન, ફોસ્ફરસ, પોટાશ ઉપરાંત શુદ્ધ તત્ત્વો પણ ધરાવે છે.
- કુદરતી રીતે પેદા થતાં વૃદ્ધિવર્ધક ધરાવે છે.
- જુદા જુદા પાકમાં ફુલ, ફળ અવરચાએ છંટકાવ કરવાથી ઉત્પાદન વધે છે.
- વૃદ્ધિવર્ધક હોય નરંરી તબક્કા માં છોડનો વૃદ્ધિ અને વિકાસ ઝડપી થાય છે.

ઉત્પાદક અને વિકેતા

બનાના સ્યુડોસ્ટેમ પ્રોસેસીંગ યુનિટ
જળ અને જમીન વ્યવસ્થાપન સંશોધન એકમ
નવસારી કૃષિ યુનિવર્સિટી, નવસારી. ફોન : ૦૨૬૩૭-૨૮૨૧૦૩



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