Navsari Agricultural University
Navsari - 396 450

MESSAGE

The coming years challenge to agriculture would be producing sufficient supply of food to sustain growing world population. The world has, the technology either available or well advanced in the pipeline, to feed. The new technology needs to be promoted in a big way in coming years to bring about major changes in the agricultural scenario of India, especially Gujarat. The technology can become the driving force of economic development and can make significant contribution in ascertaining food, nutritional and economic security of the country. Our scientists have worked in this direction and developed new technologies which will help to enhance profitability of the farmers by improving productivity. Compilation of these technologies in the form of a booklet would serve as a ready source of information to guide the extension agencies and farmers of the region. The effort put forth by the Director of Research and Dean PG Studies, N.A.U., Navsari and his team for compiling and bring out a compendium of "Research Accomplishment and Recommendations - 2014" emanated from research work done by various faculties is commendable. I also congratulate all the scientists for their contribution in the field of their specialization.

Navsari

(A. R. Pathak)
Vice- Chancellor

Navsari Agricultural University
Navsari - 396 450

FOREWORD

I feel immense pleasure to put forth the latest edition of "Research Accomplishment and Recommendations - 2014" containing location specific and need based technologies developed by the scientists of different faculties of this University for farming as well as scientific community of the state. I congratulate all the scientists who directly or indirectly involved in development of new crop varieties viz., paddy variety Purna, cotton variety GN Cot. Hy.-14, Indian bean variety GNIB-21, Pointed Gourd variety GNPG-1, Nagli (Finger Millet) variety GNN-6 and generating the new economically viable production technologies for various field crop and horticulture crops as well as new technologies in the field of agricultural engineering, post harvest and veterinary science. I am also thankful to all the conveners of respective AGRESCO sub-committee of Agicultural Research Council of Navsari Agricultural University and staff members of Directorate of Research, N.A.U., Navsari for preparation of this booklet.

I am highly indebted to Dr. A. R. Pathak, Hon'ble Vice Chancellor of Navsari Agricultural University, Navsari for his constant guidance and support provided for bringing out this publication.

I hope that this booklet will be highly useful for those associated with agriculture and its allied fields. The technologies developed will definitely help to improve the agricultural production and welfare of the farming community of the state.

Navsari

(A. N. Sabalpara)
Director of Research & Dean
Faculty of PG Studies

RESEARCH RESUME

The research work carried out in different fields of agricultural sciences during the year 2013-14 has been very well discussed by different AGRESCO sub-committees of Navsari Agricultural University, Navsari for bring out useful and beneficial recommendations for farmers and scientific community. Finally, the recommendations for farmers and scientific communities were approved in the 10th Combined Joint AGRESCO meeting of SAUs held at JAU, Junagadh during on 9-11 April, 2014.

The details of different Sub-Committees, Conveners, date of meeting held and number of approved recommendations for farmers and scientific communities are as under.

Sr. No.	Name of the Sub-Committees	Name of Convener	date of meeting	No. of Recommendations	
				Farmers	Scientific community
1.	Animal Production and Fisheries Science	Dr. A.B. Fulsounder	13-2-2014	2	2
2.	Animal Health	Dr. J.N. Mistry	13-2-2014	-	3
3.	Social Science	Dr. H.R. Pandya	17-2-2014	-	-
4.	Basic Science	Dr. V. Kumar	18-2-2014	1	-
5.	Agril. Engineering	Er. S.P. Shukla	19-2-2014	5	1
6.	Crop Improvement	Dr. D.U. Patel	20 & 21-2-2014	5	-
7.	Plant Protection	Dr. V.A. Solanki	25 & 26-2-2014	10	12
8.	Horticulture and Agro-forestry	Dr. B.V. Padhiar	6 & 7-3-2014	10	2
9.	Natural Resource Management	Dr. J.D. Thanki	12 & 13-3-2014	8	1
10.	Joint AGRESCO		15-3-2014		
	Total			**41**	**21**


कृषिमूला समृद्धिः
NAVSARI AGRICULTURAL UNIVERSITY

Recommendations for Farmers

I CROP IMPROVEMENT

1. Paddy : Purna

The variety of rice IET-18654 (Purna) is derived from a cross between Annada x RR 151-3 at CRURRS, Hazirabaug, Jharkhand. It performed well in south Gujarat and produced 22 % and 8.8 % higher grain yield over checks GR-5 and GR-9, respectively. This variety is approved for release in upland rice growing region of south Gujarat.

(Associate Research Scientist (AB), RRRS, NAU, Vyara)

2. Cotton : Gujarat Navsari Hybrid Cotton-14 (GN.Cot.Hy.-14)

The hybrid GSHH-2729 of cotton was developed from crossing two diverse parents in 2008. It gave 2552 kg/ha seed cotton yield on overall basis which is 26.1%, 16.2% and 70.6% higher than G. Cot. Hy-10, G. Cot. Hy-12 and Ankur-651, respectively. It recorded lint yield of 831 kg/ha which is 30.4%, 16.3% and 66.0% higher than G. Cot. Hy-10, G. Cot. Hy-12 and Ankur-651, respectively. This hybrid is approved for release in irrigated area of Gujarat.

(Research Scientist (Cotton). MCRS, NAU, Surat)

3. Indian bean : Gujarat Navsari Indian bean-21 (GNIB-21)

The variety of Indian bean is developed from cross of Arka Jay x Katargam. It recorded 10.08 % higher green pod yield over Katargam. It recorded near about 4 t/ha green pod yield at even closer distance due to its erect nature. On large scale demonstration on farmer's field it has given 53 % higher green pod yield over check under productive management. This variety is approved for release in south Gujarat Heavy Rainfall Zone.

(Assoc. Res. Sci., Pulse Res. Station, NAU, Navsari)

4. Pointed Gourd: Gujarat Navsari Pointed Gourd-1 (GNPG-1)

Pointed Gourd variety GNPG-1 is a selection from local germplasm. It has recorded 47.13% higher fruit yield over the local variety. The variety has long, light green fruit with fair whitish strip. This variety is approved for release in south Gujarat

(Prof. & Head, Vegetable Res. Scheme, ACOHF, Navsari)

5. Nagli (Finger Millet): Gujarat Navsari Nagli -6 (GNN-6)

The variety of Nagli GNN 6 was developed through selection from local germplasm collected from The Dang

district. It gave 17.91 % and 30.52 % higher yield than checks GN-4 and VR-708, respectively. This variety is approved for release in dry lands/ hilly / tribal region of south Gujarat and Panchmahal districts of middle Gujarat.

(Asso. Res. Sci., HMRS, NAU, Waghai)

II NATURAL RESOURCE MANAGEMENT

[A] Cropping system

1. Crop sequence study under raised and sunken bed configuration on coastal salt affected soils of south Gujarat

The farmers of coastal area of south Gujarat (AES-IV) are recommended to follow raised bed (top width: 1.8m) and sunken bed (bottom width: 3.6 m) configuration and grow brinjal on raised bed (*kharif* - *rabi*) and paddy (*kharif*)-wheat (*rabi*) in sunken bed for realizing higher yield and net return as compared to sole paddy - wheat sequence only.

Brinjal on raised bed - paddy in sunken bed

Castor on raised bed - paddy in sunken bed

Alternatively, they are advised to grow either castor (*kharif-rabi*) and paddy (*kharif*) - wheat (*rabi*) in the same land configuration or sole brinjal during *kharif-rabi* seasons on flat bed.

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

[B] Cultural practices

1. Planting geometry and mulching study in water melon under drip irrigation

The farmers of south Gujarat growing water melon on raised bed during summer season are advised to follow paired row planting (1 m x 0.8 m: 3.2 m) with drip irrigation and mulching using black plastic (thickness: 50µ and 38% area coverage) for getting higher fruit yield and net return besides 29 per cent water saving over conventional method of irrigation. Full dose of P and 10% each of N and K should be applied as basal and the remaining N and K should be applied through drip system in 8 equal splits at an interval of 8 days starting from 3-4 leaves stage.

System details:

1	Lateral spacing	:	4 m
2	Dripper spacing	:	1m
3	Dripper discharge	:	8 lph
4	Operating pressure	:	1.2 kg/cm^2
5	Operating frequency	:	Alternate days
6	Operating time	:	March: 3.5-4.0 hr April : 4.0-4.5 hr May to June: 4.5-5.25 hr

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

2. Evaluation of productivity of off-season planted banana in relation to cover crop and fertilizer schedule

The banana growers of south Gujarat planting their crop during off-season (January - February) are advised to sow two rows of til as nurse crop on both the sides of banana row after 25-30 days of planting. The nurse crop should be harvested 2 months after sowing (around flowering stage) and the biomass should be applied as mulch. Further, they are also advised to follow fertilizer schedule as given below beside 5 kg FYM/plant as basal.

Fertilizer schedule (% of RDF *i.e.*, 180-90-120 N-P_2O_5-K_2O g/plant):

Element	Planting (basal)	Days after planting					
		30	60	90	120	150	180
N	10	10	20	30	30	-	-
P	100	-	-	-	-	-	-
K	10	10	10	10	20	20	20

Adoption of this technology gives higher fruit yield as well as net return.

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

3. Desuckering of banana through use of conventional fertilizers

The banana growers of south Gujarat are advised to apply 3 to 5 drops/sucker of 2,4-D (60 g/lit. solution) for

effective sucker control. Alternatively, they can apply 4 g SSP/sucker. The use of SSP minimizes emergence of new side suckers. Further, the quantity of SSP applied for controlling suckers should be subtracted from the RD of P (approximately 64 g SSP/plant).

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

4. Response of *rabi* greengram (*Vigna radiata* L.) to land configuration and inorganic fertilizer with and without FYM under south Gujarat condition

The farmers of AES-III of south Gujarat heavy rainfall zone growing *rabi* greengram (Co-4) in *kyari* land are advised to adopt raised bed system of sowing and fertilize the crop as per recommended dose (20-40-0 N-P_2O_5-K_2O kg/ha) for obtaining higher yield and net return.

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

[C] Nutrient management

1. Effect of enriched sap of banana pseudo stem at pre-flowering stage on production and quality of banana var. Grand Naine

The banana growers of south Gujarat region are recommended to apply banana pseudo stem enriched sap @ 120 ml/plant in three equal splits through cone feeding at monthly interval starting from 3 months after planting or

apply whole 120 ml/plant at 6 month after planting or apply sap @ 240 ml/plant in 6 equal splits by injection at 15 days interval starting from 3 months after planting for getting higher yield and net return.

Cone feeding of banana pseudo stem enriched sap

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

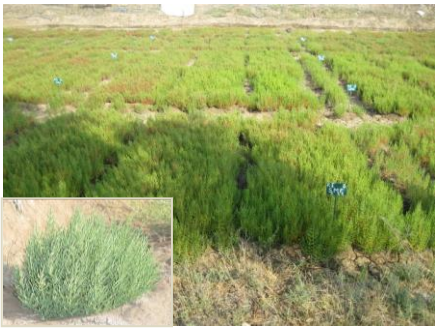
2. Effect of soil conditioners and nitrogen levels sugarcane

Sugarcane growers of south Gujarat heavy rainfall zone (AES-III) are advised to apply either biocompost @ 15 t/ha or poultry manure @ 5 t/ha or castor cake @ 2 t/ha and fertilize the crop with 125% recommended dose of nitrogen (312.5 kg/ha in plant and 375 kg/ha in *ratoon* crop) and 100% recommended dose of phosphorus and potassium (125-125 kg P_2O_5-K_2O/ha in plant and 62.5-125 kg P_2O_5-K_2O in *ratoon* crop, respectively) along with *Acetobactor*-ACN-1 ($1x10^8$ cfu/ml) 2 kg/ha as soil application to sugarcane variety CoN 05071 for obtaining higher cane yield, net return and sustaining soil health.

(Res. Scientist, Sugarcane, MSRS, NAU, Navsari)

[D] Water management

1. Feasibility study on use of aquaculture effluent as irrigation water for salicornia (*S. brachiata* Roxb.)



The brackish water aquaculture farmers of south Gujarat heavy rainfall zone (AES- IV) adopting brackish water aquaculture are advised to grow salicornia on the waste land available around the ponds. Further, they are recommended to use aquaculture effluent water for irrigating salicornia along with application of fertilizer @ 250-75-50 N-P_2O_5-K_2O kg/ha to get higher fresh biomass yield and net return.

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

III HORTICULTURE AND FORESTRY

[A] Fruit crops

1. Effect of foliar application of Ca, Zn, Fe and B on growth, yield and quality of papaya cv. Taiwan Red Lady

The farmers of south Gujarat heavy rainfall zone growing papaya cv. Taiwan Red Lady are advised to spray Calcium nitrate – 1000 + Borax – 30 + Zinc sulphate - 200 + Ferrous sulphate – 200 mg/l at 60, 90 and 120 days after transplanting along with the application of RDF. By adopting 3 foliar sprays of combined micronutrients, farmers can

increase the yield with better quality of fruits along with higher net realization.

(*Research Scientist, RHRS, ACHF, NAU, Navsari)*

2. Feasibility of organic farming in mango cv. Kesar

The farmers of south Gujarat heavy rainfall zone intend to adopt organic farming in mango cv. Kesar (20 years old tree) are advised to apply 100 % RDN through 17 kg Neem cake (4.5 % nitrogen) with 100 kg FYM + *Azotobacter* (Navsari isolate) @ 250 g + PSB (Navsari isolate) @ 250 g/plant in the month of June. By adopting this organic farming, farmers can get higher yield and better quality fruits in terms of TSS, acidity and shelf life and higher net realization as compared to inorganic farming. It also improves the soil properties.

(*Research Scientist, RHRS, ACHF, NAU, Navsari)*

3. Pruning for rejuvenation of over crowed orchards of mango cv. Alphonso

The farmers of Gujarat growing mango cv. Alphonso and have an overcrowded orchard are advised to thinning up to the crowded branches and centre opening for obtaining higher number of fruits and yield with higher economic returns.

(Research Scientist, AES, Paria)

4. Effect of different chemicals on regulation of flowering and fruiting in mango cv. Kesar

The farmers of Gujarat growing mango cv. Kesar are advised to spray 1% KH_2PO_4 (Potassium dihydrogen orthophosphate) alone or with 1% KNO_3 (Potassium nitrate) during last week of October to first week of November (45

days after new vegetative flush) for obtaining higher yield and economic returns.

(Research Scientist, AES, Paria)

5. Effect of foliar application of chemical on yield and quality of sapota cv. Kalipatti

The farmers of south Gujarat, growing sapota cv. Kalipatti are advised to spray 1 g Gibbrelic Acid (GA_3) in 10 litre of water in first week of November, December and January for getting higher production of better sized quality fruits in winter season with higher economic returns.

(Research Scientist, AES, Paria)

[B] Vegetable crops

1. Effect of plant density and sett size on growth and yield of elephant foot yam cv. Gajendra

The farmers of south Gujarat heavy rainfall agro-climatic zone growing elephant foot yam cv. Gajendra are advised to plant elephant foot yam at the distance of 60 cm × 60 cm by using seed corm sett of 250 g weight for obtaining higher BCR. By this way, farmers can obtain higher yield and save the seed corm cost.

(*Professor, Vegetable Science, ACHF, NAU, Navsari)*

2. Effect of banana pseudostem sap and vermiwash spray on organically grown onion

The farmers of south Gujarat heavy rainfall zone growing onion organically are advised to apply recommended 125 kg N/ha through organic manure as

well as apply liquid organic fertilizer as per scheduled given bellow to get higher yield and net profit.

- After transplanting, 62.5 kg N/ha should be applied through 1.2 t/ha Biocompost (1.74% nitrogen), 0.45 t/ha castor cake (4.63% nitrogen) and 1.6 t/ha vermicompost (1.32% nitrogen). Repeat the same dose one month after transplanting.

- Foliar spray of enriched banana pseudo stem sap @ 2% should be applied after transplanting at 15, 30 and 45 days.

Note:

- Treat the seedlings with 0.1% *Tricoderma* (Navsari isolate) solution for about 5 minutes and transplant at 15 cm x 10 cm spacing on raised bed.

- Maize should be grown as trap crop at the border.

- Sticky trap should be used @ 40/ha.

(*Prof., Ag. Chem. & Soil Sci., ACHF, NAU, Navsari)*

3. Organic farming in tomato cv. Junagadh Tomato -3

The farmers of south Gujarat heavy rainfall zone growing tomato organically are advised to apply recommended 75 kg N/ha through organic manures as per schedule given bellow to get higher yield and net profit.

- At the time of transplanting, 1.03 t/ha biocompost (1.74% N) + 0.44 t/ha castor cake (4.63% N) or 0.21 t/ha neem cake (4.5% N) + 2.32 t/ha vermicompost (1.32% N) should be applied. Repeat the same dose one month after transplanting.

Note:

- Apply common dose of *Azotobacter* (Navsari isolate) biofertilizer @ 2 kg/ha.
- Treat the seedlings with 0.1% *Tricoderma* (Navsari isolate) solution for about 5 minutes and transplant at 60 cm x 60 cm spacing.
- After transplanting apply foliar spray of vermiwash @ 0.5% and cow urine @ 1% at monthly interval.
- Maize should be grown as trap crop at the border.

(*Professor, Ag. Chem. & Soil Sci., ACHF, NAU, Navsari)*

[C] Post Harvest Technology

1. Standardization of banana pseudostem central core candy processing

The processors are recommended to prepare banana pseudostem central core candy which is rich in iron, digestible fibre and vitamins. Further, flavoured candy can also be prepared by using any natural as well as synthetic flavour. Candy prepared from central core is delicious with acceptable sensory parameters. Since, the procedure for preparing banana pseudostem central core candy is patented by NAU, Navsari, the processors need to take licence for commercial scale production and marketing of banana central core candy.

(Professor, PHT, ACHF, NAU, Navsari)

2. Standardization of pickle from central core of banana pseudostem

Housewives/processors are recommended to prepare traditional pickles by using 25% banana pseudo stem central core cube with other raw materials using groundnut oil + fenugreek + unripe mango and lime. This

reduces the processing cost without affecting quality of pickles.

(Professor, PHT, ACHF, NAU, Navsari).

IV PLANT PROTECTION

[A] Agricultural Entomology

1. Studies on varietals preference of mulberry silk worm (*Bombyx mori*)

For successful rearing of mulberry silkworm race PM X CSR_2, mulberry varieties S-30, S-36 and TR-10 are found more suitable and recommended to farmers of south Gujarat.

(Prof.& Head , Dept. of Ento., NMCA, Navsari)

2. Cost effective management strategies against fruit flies in mango

Mango growers of south Gujarat are advised to install commercially available methyl eugenol impregnated wooden block in plastic bottle used for mineral water as a trap @10/ha at marble stage of fruits to trap higher number of male fruit flies in mango orchard.

(Res. Scientist, Agril. Experimental Station, NAU, Paria)

3. Residues and dissipation of imidacloprid 17.8 SL in mango

For the control of hopper in mango, need base application of imidacloprid 17.8 SL at 15 days interval @ 3 ml/10 litre water /tree (0.53 g a.i./tree) up to marble stage do not pose residue problem. Considering the MRL of imidacloprid (0.2 µg/g) for mango, PHI of one day is

recommended for the harvest of mango under south Gujarat conditions.

(Prof.& Head , FQTL, NAU, Navsari)

[B] Plant Pathology

1. Testing of different modules for the management of sigatoka leaf spot, leaf blight, wilts and rhizome rot of banana

The farmers of south Gujarat heavy rain fall zone AES-III are advised to adopt the following integrated disease management module of banana for the effective management of sigatoka leaf spot and leaf blight for higher fruit yield.

IDM Module:

- Selection of healthy rhizome
- Rhizome's dip in *Trichoderma viride* (Navsari isolate) (CFU- 10^7/g) @ 10 g/litre for 30 minutes
- Soil application of *Trichoderma viride* (Navsari isolate) (CFU- 10^7/g) @ 50 g/plant + *Pseudomonas fluorescens* (Navsari isolate) (CFU- 10^8/g) @ 15 ml/plant + *Paecilomyces lilacinus* (Navsari isolate) (CFU- 10^7/g) @ 10 g/plant at the time of planting
- Spraying of *Pseudomonas fluorescens* (Navsari isolate) (CFU- 10^8/ml) @ 5 ml/l after 8^{th} month of planting and then spraying of propiconazole 25 EC @ 1 ml/l (0.025%; 150 g a.i./ha) after 9^{th} and 10^{th} month of planting with detergent powder (0.5 g/l) as sticker. PHI for propiconazloe is 45 days

Year		2014
Crop		Banana
Pest		Cigatoka leaf spot & leaf blight
Pesticide with formulation		Propiconazole 25 EC
Dosage /ha	a.i. (g)	150
	Formulation (ml)	600
	Water requirement (liter)	600
Formulation in water (10 lit)		10 ml
Appl. schedule		spray during 9^{th} & 10^{th} month after planting
Waiting period/ PHI (Days)		45
Remark		-

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

2. Effect of various biofertilizers on yield of banana fruits, soil and crop health

The farmers of south Gujarat heavy rainfall zone AES-III are advised to use 10 ml/plant each of native *azotobacter* (NAUAZN-1) (cfu-10^8/ml) and native PSB (NAUPSB-1) (cfu-10^8/ml) mixed with 500 g FYM/plant two times, first at the time of planting and second at three months after the planting to improve the soil and crop health with saving of 50% chemical fertilizers (N & P) and realize higher yield of banana.

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

3. Field evaluation of different fungicides for the control of turmeric leaf spot

The farmers of south Gujarat heavy rainfall zone AES-III are advised for two sprays of propiconazole 25 EC

@ 1 ml/litre (0.025%; 150 g a.i./ha) or carbendazim 50 WP @ 0.5 g/litre (0.025%; 150 g a.i./ha) at initiation of disease and second at 15 days after first spray for effective management of the turmeric leaf spot. The PHI for these fungicides is 70 days.

Year		2014	
Crop		Turmeric	
Pest		Colletotrichum leaf spot	
Pesticide with formulation		Carbendazim 50 WP	Propiconazole 25 EC
Dosage /ha	a.i. (g)	150	150
	Formulation (g/ml)	300	600
	Water requirement (liter)	600	600
Formulation in water (10 lit)		5 g	10 ml
Appl. schedule		spray at diseases initiation & after 15 days	
Waiting period/ PHI (Days)		70	
Remark		-	-

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

4. Field evaluation of various fungicides, bioagents and phytoextracts for the management of finger millet blast

Finger millet growing farmers of south Gujarat are advised for three sprays of tricyclazole 75 WP @ 0.6 g/litre (0.045%; 225 g. a.i./ha) of water starting from initiation of disease and two subsequent sprays at an interval of 15 days for effective and economical management of blast disease. PHI for this fungicide is 35 days.

Year		2014
Crop		Finger millet
Pest		Blast
Pesticide with formulation		Tricyclazole 75 WP
Dosage /ha	a.i. (g)	225
	Formulation (g)	300
	Water requirement (liter)	500
Formulation in water (10 lit)		6 g
Appl. schedule		first spray at initiation of disease and two spray at 15 days interval
Waiting period/ PHI (Days)		35
Remark		-

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

5. Efficacy of foliar sprays on intensity of foliar diseases of niger

Niger growing farmers of south Gujarat are advised for the effective management of Alternaria and Cercospora leaf spot diseases of niger, two sprays of carbendazim 12% + mancozeb 63%, 75 WP @ 2 g/lit. (0.15%; 600 g. a.i./ha) first at the initiation of the disease and second at 15 days after first spray is recommended. PHI for this fungicide is 35 days.

Year		2014
Crop		Niger
Pest		Alternaria & Cercospora leafspot
Pesticide with formulation		Carbendazim 12% + Mancozeb 63% 75 WP

Dosage /ha	a.i. (g)	600
	Formulation (g)	800
	Water requirement (liter)	400
Formulation in water (10 lit)		20 g
Appl. schedule		first spray at initiation of diseases and two spray at 15 days interval
Waiting period/ PHI (Days)		35
Remark		-

(Assoc. Res. Scientist, Niger Res. Station, NAU, Vanarasi)

6. Integrated management of bacterial rhizome rot (*Erwinia* sp.) of banana cv. Grand Naine

Farmers of south Gujarat heavy rainfall zone-I growing banana cv. Grand Naine are advised to plant healthy sucker of banana followed by drenching of Streptocyclin sulphate 9% + Tetracyclin hydroxide 1% -SP @ 500 ppm (0.5 g/litre) 1 litre (0.005%; 150 g a.i./ha) solution per plant at 15 days, 2 month and 4 months after planting with green manuring of sunhemp (three times) in the interspaces till 6 months of planting for effective management of bacterial rhizome rot disease. The PHI for this combination product is 180 days.

Year		2014
Crop		Banana
Pest		Bacterial rhizome rot
Pesticide with formulation		Streptocyclin 9% + Tetracyclin Hydrochloride 1%-SP
Dosage /ha	a.i. (g)	150
	Formulation (g)	1500

	Water requirement (liter)	3000
Formulation in water (10 lit)		5 g.
Appl. schedule		Drenching at 15 days, 2 month, 4 month after planting
Waiting period/ PHI (Days)		180
Remark		-

(Assoc. Res. Scientist, Fruit Res.Station, NAU, Gandevi)

7. Integrated management of papaya ring spot virus

The farmers of south Gujarat heavy rainfall zone-I, growing papaya are advised to raise the papaya seedlings under Nylon net (40-60 mesh) and spraying of acephate 75 SP 1.5 g/lit. of water at 3 days before planting as well as grow two rows of border crop of maize sown 15 days before planting. Apply 1% Neem oil @ 2 ml/litre with acephate 75 SP 1.5 g/lit. of water (0.11%; 675 g a.i./ha) at 15 days interval up to 5 month for effective management of papaya ring spot virus disease. PHI for Acephate is 240 days.

Year		2014
Crop		Papaya
Pest		Papaya ring spot virus
Pesticide with formulation		Acephate 75 SC
Dosage /ha	a.i. (g)	675
	Formulation (g)	900
	Water requirement (liter)	600
Formulation in water (10 lit)		15 g.
Appl. schedule		Spray 15 days after transplanting to up to 5 months at 15 days

		interval
Waiting period/ PHI (Days)		240
Remark		-

(Assoc. Res. Sci, Fruit Res.Station, NAU, Gandevi)

V AGRICULTURAL ENGINEERING

1. Effect of pre-cooling treatments and packaging materials for extending the initiation of ripening and shelf life of mango c.v. *Alphonso*.

Farmers and merchants are advised to pre-cool the Alphonso mango fruit at 10°C in pre-cooling room with air movement of 300-350 m^3/min for 8 h to achieve the fruit core temperature of 10±1 ºC, and pack them in 75 micron polypropylene bag to store at 11±1 ºC with 90-95% RH. This could delay the initiation of ripening process up to 15 days of storage and extend the shelf life up to 30 days.

Alphonso mango after 30 days of storage in vacuum packing

(I/c. Prof., PHTC, NAU, Navsari)

2. Study on ripening of banana using ethylene gas

The farmers and venders are recommended to ripe the Grand Naine banana in sealed ripening chamber for 48 hours at 16 ^{0}c and 90-95% RH with air movement of 150-200 m^3/min as well as 100 ppm ethylene gas concentration and then

putting the banana under same circulatory air for 48 hours which resulted in uniform yellow colour and ripening.

Ripening stage of banana in recommended procedure

(*I/c.Prof., PHTC, NAU, Navsari*)

3. Study on roof water harvesting to tackle the problem of drinking water scarcity in rural areas of south Gujarat

Part-A

Roof top rain water harvesting is recommended for collecting potable water. Storage capacity of tank should be approximately 1000 L/ capita/yr. constructed in such a way that no light or air enters inside to prevent bacterial growth and the tank may at least 0.5 m above ground level to prevent direct entry of runoff water. Water from the tank could be pumped out by means of hand pump or electric operated self priming shallow lift pump.

Precautions to be adopted are:

- Roof tops and conveyance pipes should be thoroughly cleaned at the time of onset of monsoon. First flush of rain water should be allowed to bypass the storage tank, as well as during long gaps between two rainy events.
- Roof water may be allowed to pass through gravel – sand filter, consisting of layers (30 -50 cm) of coarse sand, 25 mm gravel, 50 mm gravel to remove organic impurity.
- Calcium Carbonate powder kept in earthen pots (7 L capacity / 5000 L), tied with muslin cloth on the mouth may be submerged into the storage tank.
- Walls of tank could be white washed with lime solution.

- Anaerobic bacteria may develop with time which could be removed by boiling / adding 0.5 g tablet of chlorine in 20 L of water / storage of water in copper vessel for 8 – 10 hrs / by using commercially available UV filter.

Part-B

To disinfect drinking water against any microbial activity, water could be safely stored in a copper vessel for 12 h and 24 h to reduce total Coliform by 85% and 90 % and total bacterial count by 67 and 81 %, respectively.

(*Professor and Head, NRM, COF, Navsari)*

4. Rainfall analysis of Dediapada taluka of Narmada district of Gujarat

Farmers of Dediapada taluka are recommended to proceed for *kharif* sowing operations from 27th SMW (onset of monsoon). Farmers are also advised for *in-situ* moisture conservation and runoff collection in tanks during active monsoon for providing supplemental irrigation at critical stages of rain-fed crops after the withdrawal of rainfall *i.e.* 36th SMW (first week of September) to get maximum production.

(Principal, PAE, NAU, Dediapada)

5. Effect of irrigation and mulching on productivity of summer sesamum in south Gujarat condition

The farmers of south Gujarat heavy rainfall zone-I are advised to grow sesamum during summer instead of paddy by keeping row spacing of 45 cm on flat bed or 4 rows at 30 cm on raised bed of 120 cm top width and furrow of 60 cm wide and 15-20 cm deep. They are further advised to apply total of 8-9 irrigations at an interval of 10-12 days. Mulching with paddy straw was not found economical in sesamum (s) crop despite of significant increase in seed yield due to mulching.

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

VI BASIC SCIENCE

1. Effect of growth substances on growth and yield of rice variety NAUR-1 in summer season

The farmers of AES III of south Gujarat zone growing transplanted rice during summer are advised to treat the seed with thiourea @1000 ppm (1 g/1 litre of water) for 12 h for raising the seedlings and also spray thiourea solution of 1000 ppm (10 g/10 litre of water) at second leaf stage of rice nursery for obtaining higher grain yield.

(Research Scientist (Soil & Water), SWMRU, NAU, Navsari)

VII ANIMAL PRODUCTION AND FISHERIES

1. Feeding of sugar beet (*Beta vulgaris* L.) as a replacer of green fodder in lactating buffaloes.

It is recommended to the farmers that feeding of ration containing concentrate (25%), cotton seed cake (7%), hybrid napier grass (28%) and paddy straw (40%) can be replaced during lean period by a ration containing 19% concentrate mixture, 13% cotton seed cake, 14% hybrid napier grass, 37% paddy straw and 17% sugar beet tubers without affecting milk production, composition and cost of feeding in Surti buffalo.

(Res. Scientist, LRS, NAU, Navsari)

2. Study on milking behaviour of Surti buffalo

It is recommended to farming community that the primiparous Surti buffalos having docile temperament produce more milk (492.1 *vs*. 328.6 kg) during early lactation (100 days) than the animals having restless-nervous temperament. Therefore, farmers are advised to interact more generously with them particularly with first calver Surti buffaloes.

(Prof. & Head, Dept. of LPM, CVSAH, NAU, Navsari)

Recommendations for Scientific Community

I NATURAL RESOURCE MANAGEMENT

1. Study the influence of different temperature regimes on growth and yield of rice

On the basis of two seasons experiment under controlled environmental conditions, it has been realized that there is need to develop new rice varieties in context of future global warming. The significant yield reduction was recorded in all three rice varieties *viz.* Jaya, Gurjari and GNR 2. The yield reduction was to the tune of 18% and 36.6% when rice crop experienced rise of 1.3 ^{0}C and 2.7 ^{0}C, respectively, in average daily temperature above average temperature of last 10 years (Max. 32.1 ^{0}C and Min. 21.6 ^{0}C).

(Professor, NRM, ACHF, Navsari)

II PLANT PROTECTION

[A] Agricultural Entomology

1. Residue and dissipation pattern of indoxacarb, bifenthrin, fipronil and novaluron in brinjal

Foliar application of indoxacarb 15.8 EC, bifenthrin 10 EC and novaluron 10 EC @ 0.22, 0.125 and 0.5 kg a.i./ ha respectively, do not pose residue problem in brinjal when harvested one day after spray and therefore, PHI of one day is recommended in brinjal.

(Prof.& Head, FQTL, NAU, Navsari)

2. Residue and dissipation pattern of indoxacarb, bifenthrin, fipronil and novaluron in okra

Foliar application of indoxacarb 15.8 EC, bifenthrin 10 EC and novaluron 10 EC @ 0.22, 0.125 and 0.5 kg a.i./ ha respectively, do not pose residue problem in okra when harvested one day after spray and therefore, PHI of one day is recommended in okra.

(Prof.& Head, FQTL, NAU, Navsari)

3. Residue and dissipation pattern of fipronil in okra and brinjal

Application of fipronil 5 SC @ 0.05 kg a.i./ha, do not pose residue problem in okra and brinjal when harvested 5 and 7 days, respectively after spray.

(Prof.& Head, FQTL, NAU, Navsari)

4. Relative toxicity of newer insecticides to egg parasitoid *Trichogramma chilonis* (Ishii)

Imidacloprid 17.8 SL 0.005%, acetamiprid 20 SP 0.004% and spinosad 45 SC 0.002% were found safer to the *Trichogramma* wasp.

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

5. Relative toxicity of newer insecticides to predatory green lace wing, *Chrysoperla zastrowi sillemi* (Esben-Petersen)

Imidacloprid 17.8 SL 0.005%, thiamethoxam 25 WG 0.005%, clothianidin 50 WG 0.003%, and spinosad 45 SL 0.002% were found safer to the larvae of *Chrysoperla zastrowi sillemi* under laboratory condition.

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

6. Screening of sapota varieties against sapota mite *Tuckrerlla kumaonensis* Gupta (Acari:Tuckerelliae)

The sapota fruit mite, *Tuckrella kumaonensis* Gupta (Acari:Tuckrellidae) remains active round the year under south Gujarat conditions. However, the sapota varieties Cricket ball, Kalipatti, Murabba, Challa Collection-3 and Paria collection showed higher population of mite than the variety Zumakhiya

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

7. Status of insecticide residue in farm gate samples of okra, brinjal and chilli

Farm gate samples of brinjal collected from Navsari (AES-III) found free from 41 pesticides but some of okra and chilli samples found positive with organophosphate insecticide such as monocrotophos, ethion and triazophos.

(Prof.& Head, FQTL, NAU, Navsari)

8. Monitoring of pesticide residue in market samples of okra and brinjal

Market samples of brinjal obtained from different talukas of Navsari, Surat and Tapi district were free from pesticide while that of okra samples were positive with organophosphate insecticides among them, monocrotophos was frequently detected.

(Prof.& Head, FQTL, NAU, Navsari)

9. *Helicoverpa armigera* moth catches in pigeonpea through sex pheromones

The peak activity of moths and larvae of *Helicoverpa armigera* in pigeonpea were showed during mid of November to March and end of October to December, respectively. Seasonal & yearly moth and seasonal larval activities of *H. armigera* were significantly negatively correlated with minimum temperature, morning & evening

relative humidity, rainfall and rainy days, while it was significantly positive correlated with sun shine hours. *H. armigera* moths were significantly negatively correlated with maximum temperature and wind speed during crop season and year, respectively. Seasonal larval incidence and moth catches of *H. armigera* were showed significantly positive correlation

(Res. Scientist, N.A.R.P., NAU, Bharuch)

[B] Plant Pathology

1. Screening of sugarcane varieties for smut resistance

Sugarcane genotypes Co 07008 and Co 07009 showed resistant reaction against smut disease, while Co 07012, PI 07131 and Co 07010 exhibited moderately resistant.

(Res. Scientist, MSRS, NAU, Navsari)

2. Evaluation of the drinking water of Navsari and surroundings

Potable water samples collected from the Navsari and its surroundings were free from 41 pesticides while other chemical properties were under the acceptable limit *Escherichia coli* (bacteria) were detected across the seasons but found higher in winter followed by monsoon and summer seasons.

(Prof. & Head, FQTL, NMCA, NAU, Navsari)

3. Analysis of the microbial contaminant and adulteration in milk

The branded pasteurized milk samples procured from Navsari and its surrounding places found excellent to good while some of the raw milk samples were poor from the microbial quality point of view, across the seasons.

Some of the raw milk samples were found positive with *Escherichia coli* (bacteria) out of which maximum positive samples were in winter followed by monsoon and summer. None of the pasteurized milk sample found positive with *E. coli* and none of the milk samples were found positive to chemical adulterant

(Prof. & Head, FQTL, NMCA, NAU, Navsari)

III HORTICULTURE AND FORESTRY

1. Qualitative analysis of mango varieties, Kesar and Alphonso

The nutritional quality of mango varied with variety, crop management practices under south Gujarat condition. The findings are mentioned below:

- Nutritional quality of Alphonso and Kesar was more or less same but Fe, Mn, Zn, P, K, Ca, Mg, and Na contents were higher in Alphonso.

- Organically grown mango was superior in protein, total antioxidant capacity, vitamin-C, folic acid, P, K, Mg, Fe, Mn, Zn and Cu content than inorganically grown mangoes.
- Total antioxidant power, vitamin-C, folic acid, Ca and Cu content in non-irrigated mango were higher than irrigated mango.

(*Professor, FQTL, NAU, Navsari)*

2. Standardization of preservative solution for different fruits as sample

The fresh fruits of different varieties of mango and citrus can be preserved with their natural colour at acceptable level up to six months in Ethanol 75% solution compared to other solutions *viz.* general solution (50 ml

Formaldehyde 40% + 300 ml Ethyl Alcohol 95% + 2000 ml water) and Hessler's solution. Banana fruits could not be preserved in any tested solution.

(Research Scientist, RHRS, ACHF, NAU, Navsari)

IV AGRICULTURAL SCIENCE

1. Rainfall analysis of Dediapada taluka of Narmada district of Gujarat

- 27th SMW receives 24 mm, 26 mm and 35 mm rainfall amount at 75 %, 71 % and 60% probability respectively.
- Rainfall is withdrawn after 39th, 38th and 36th SMW at 50 %, 60 % and 75 % probability respectively.
- The length of *kharif* season is 112, 105 and 70 days at 50 %, 60 % and 75 % probability respectively.
- There are 60 and 75 % probability to get sufficient rainfall for rainfed crops (> 10 mm) for continuous 11 SMW (77 days) with 31 rainy days from 27th to 37th week and 10 SMW (70 days) with 21 rainy days from 27th to 36th week respectively. Supplementary irrigation is not required during this period.
- Log-Pearson type III distribution is best fitted among the Normal, Log-normal, Pearson, Log-Pearson and Gumbel distribution for maximum one-day rainfall as it gives lowest chi-square value of 22.83.
- Spillway may be designed for maximum one-day rainfall for different returns periods from Log-Pearson type III distribution i. e. 5, 10, 15, 20, 25, 50 and 100 years are respectively 189, 245, 280, 307, 329, 405 and 493 mm.

(Principal, PAE, NAU, Dediapada)

V ANIMAL PRODUCTION

1. Influence of body condition score on performance and blood-biochemical profile in Surti buffalo

It is advised to maintain body condition score of Surti buffaloes between 3.25 and 3.5 at calving as it improves milk production (465.1 *vs*. 330.9 Kg/100 days & peak yield 7.3 *vs*. 5.8 Kg), postpartum interval to estrus (32.4 *vs*. 46.5 days), service period (61.9 *vs*. 75.5 days) and estrus intensity score (3.6 *vs*. 2.5).

(Prof. & Head, Dept. of LPM, CVSAH, NAU, Navsari)

2. To study diaphoretic pattern of Surti buffalo

It is advised to prefer neck dorsum & lateral brisket and fore flank regions over other body regions for diaphoretic study in Surti buffalo.

*(**Action:** Prof.&Head, Dept. of Vet. Phy.&Bio., CVSAH, NAU, Navsari)*

V ANIMAL HEALTH

1. A. Studies on pharmacokinetics and pharmacodynamic relationship of Cefpirome in cow calves

B. Studies on pharmacokinetics and pharmacodynamic relationship of Cefpirome in goats

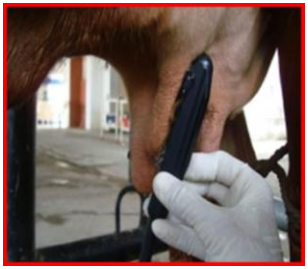
It is recommended to scientific community that Cefpirome is to be administrated at 10 mg/kg body weight intravenously then repeated at 8 hour interval or intramuscularly at 12 hour interval in cattle and goat.

(PI, Dept. of Vet. Pharm. & Toxicol.., CVSAH, NAU, Navsari)

2. Diagnosis of udder and teat disorders using ultrasonography in bovines

It is recommended to scientific community that the direct contact technique of ultrasonography provides better

visualization of proximal and middle portion of the teat whereas use of water bath technique provides better visualization of distal portion of the teat.



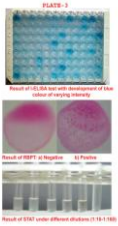
USG Direct contact tech

USG water bath tech

(PI, Dept. of Vet. Surg. & Radio., CVSAH, NAU, Navsari)

3. Epidemiological and techno-economic aspect of bovine brucellosis in south Gujarat

It is recommended to scientific community that the overall prevalence of bovine brucellosis was 14.18% amongst various reproductive disorders in bovines in south Gujarat. Out of these reproductive disorders, the highest prevalence was in cases of abortion (39.44%) followed by retention of placenta (13.51%), metritis/endometritis (13.33%), repeat breeding (5.65%) and still birth (4.62%).



The milk-ELISA proved best for screening of herd and individual animals in comparison to STAT, RBPT and MRT and is recommended for the use by veterinarians at field level.

(PI, Dept. of Vet. Medi., CVSAH, NAU, Navsari)

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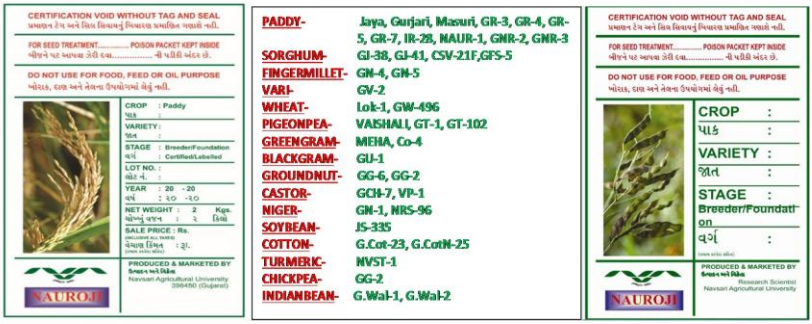

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