Research Accomplishments and Recommendations 2016

DIRECTORATE OF RESEARCH
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RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

2016

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MESSAGE

Anand Agricultural University has been entrusted with the triple functions of imparting agricultural education, research and extension education. Considerable emphasis has been given on expanding its research activities so as to enable the agricultural scientists to tackle the production constraints faced by the farmers of the state. Anand Agricultural University has made impressive progress in the field of research under different faculties.

I am delighted to note that the University is going to publish 'Research Accomplishments and Recommendations 2016' prepared by the Directorate of Research, Anand Agricultural University, Anand. I feel immense pleasure to put forth the informative publication containing location specific and need based technologies developed by the scientists of different faculties of the university for farming community as well as scientific community of the state. I congratulate all the scientists and all others connected with research activities in the university for the valuable work done by them which will help to increase the agricultural production in the state.

I complement Dr. K. B. Kathiria, Director of Research and his team for their sincere efforts in bringing out this valuable scientific publication covering all the new technologies generated by the AAU scientists. I am sure that this booklet will serve as a source of valuable information and update the knowledge of agricultural extension workers, students, scientists, entrepreneurs and others those who are associated with farming community for better output.

N Patel

(N. C. Patel)

ANAND AGRICULTURAL UNIVERSITY
UNIVERSITY BHAVAN
ANAND – 388110

Director of Research and PG Studies

FOREWORD

As a Director of Research and Dean Post-Graduate Studies, I feel immense pleasure to put forth the 'Research Accomplishments and Recommendations 2016'. It contains information on new technologies developed by the scientists of different faculties of Anand Agricultural University. I take this opportunity to express my appreciation to the efforts made by the scientists to contribute for further agricultural development in the state. I also congratulate all the scientists and faculty of Anand Agricultural University for their sincere efforts and dedicated services for developing new technologies in agriculture sector for the benefit of farmers.

I am highly indebted to Dr. N. C. Patel, Hon'ble Vice Chancellor of Anand Agricultural University, Anand for his constant guidance and support provided for bringing out this informative bulletin. I am also thankful to all the technical staff members of the Directorate of Research for compiling the information in time and presenting it in a scientific way.

(K. B. Kathiria)

PREFACE

The research work carried out in different fields of agricultural sciences during the year 2015-16 has been discussed by different AGRESCO sub-committees for bringing out useful and beneficial recommendations for farmers, scientific community, entrepreneurs and other stake holders.

The numbers of recommendations made by different committees are listed below.

Name of the sub-committee / faculty	No. of recommendations	
	For farmers/ entrepreneurs	For scientific community
Crop Improvement	05	--
Crop Production	10	--
Plant Protection	08	39
Dairy Science and FPT & BE	19	08
Agri. Engineering & AIT	05	06
Animal Production	03	05
Animal Health	01	03
Social Science	-	06
Total	51	67

RECOMMENDATIONS FOR FARMING COMMUNITY

CROP IMPROVEMENT

PLANT BREEDING

1. Crop : Guinea grass

Variety : CO (GG)-3

This variety of guinea grass was developed through clonal selection and has already been released by TNAU, Coimbatore. It has light green foliage and robust tillering. This variety produced Green forage yield of 2517 q/ha/year which was 84.0, 92.4 and 83.1% higher than national check varieties BG-1, PGG-616 and Riversdale, respectively. The variety produced dry matter yield of 553.7 q/ha/year which was 54.4, 84.8 and 58.1% higher than BG-1, PGG-616 and Riversdale, respectively. Looking to the above features, it is recommended for whole Gujarat.

(Research Scientist (FC), MFRS, AAU, Anand)

2. Crop : Forage Sorghum

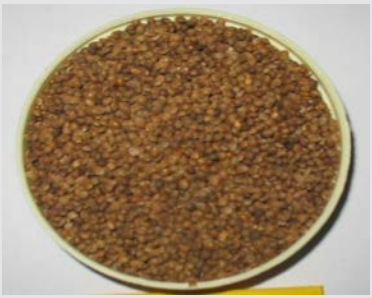
Variety : Gujarat Anand Forage Sorghum-12 (GAFS-12)

This variety of sorghum GAFS-12 has produced Green Forage Yield of 300q/ha which was 19.1, 65.2, 31.5 and 37.1 % higher with Dry Matter Yield of 101q/ha which was 14.4, 66.3, 57.4 and 66.0 % higher than check varieties *viz.* GAFS-11, S-1049, GFS-5 and C-10-2, respectively in middle Gujarat. It has thin stem and higher leaf stem ratio than checks. This variety of sorghum GAFS-12 is recommended for middle Gujarat.

(Research Scientist (FC), MFRS, AAU, Anand)

3. **Crop : Kodo millet**

Variety: Gujarat Anand Kodra-3 (GAK-3)



This variety GAK-3 of kodo millet recorded 2457 kg/ha grain yield which was 27.5 and 37.9 % higher than the local check, GK-2 and national check, GPUK-3, respectively. This variety is recommended for middle Gujarat.

(Research Scientist, Hill Millet Research Station, AAU, Dahod)

CROP PRODUCTION

CULTURAL PRACTICES

1. Site specific nutrient management in soybean – wheat cropping system in middle Gujarat conditions

The farmers of Middle Gujarat Agro climatic Zone growing wheat after soybean are recommended to apply 120-60-120 kg NPK/ha along with 25 kg $ZnSO_4$/ha, 20 kg S/ha (through gypsum @ 150 kg/ha) and one foliar spray of 0.5 % $FeSO_4$ (5 g $FeSO_4$ + 1 g citric acid /l) at 30 days after sowing of wheat to get higher yield and net return.

(Professor & Head, Dept. of Agril. Chem. & Soil Sci., BACA, AAU, Anand)

2. Effect of method of sowing and seed rate on wheat in rice-wheat cropping system

The farmers of Middle Gujarat Agro climatic Zone growing wheat after transplanted rice are recommended for line sowing (22.5 cm) of wheat in dry seedbed with seed @ 150 kg/ha followed by irrigation after sowing for higher yield and net return.

(Associate Research Scientist (Agron.), RRS, AAU, Anand)

3. Performance of dual purpose forage crops under different cutting management system

The farmers of middle Gujarat agro climatic zone interested to grow oat (JHO 822) as dual purpose are recommended to harvest first cut at 60 days after sowing for green forage and leave it for grain production to get quality forage with higher grain yield and net return.

(Research Scientist, MFRS, AAU, Anand)

4. **Response of *rabi* maize (GM 3 and HQPM 1) to tassel removal on maize productivity**

The farmers of Middle Gujarat Agro climatic Zone growing rabi maize (GM-3 and HQPM 1) are recommended to remove tassel after 15 days of anthesis in alternate rows for getting higher yield and net return.

(Asstt. Res. Sci. (Agron.), MMRS, AAU, Godhra)

5. **Production potential and economic feasibility of pigeon pea based intercropping system with different planting pattern**

The farmers of middle Gujarat agro climatic zone growing pigeon pea are recommended to grow one row of black gram as intercrop in pigeon pea grown at 120 cm inter row spacing for getting higher yield and net return.

(Research Scientist, Pulse Research Station, AAU, Vadodara)

NUTRIENT MANAGEMENT

6. **Response of different levels of nitrogen, phosphorus and bio-fertilizers on rice (*Oryza sativa* L.) under middle Gujarat condition**

The farmers of AES-V (Nawagam area) and AES-II (Thasra area) of middle Gujarat agro climatic zone growing paddy (GAR 13) are recommended to fertilize the crop with 120 kg N/ha only whereas, 100 kg N/ha for farmers of AES-III (Dabhoi area) to get higher yield and net return. Application of phosphorus is not beneficial to the crop.

(Research Scientist, MRRS, AAU, Nawagam)

7. Assessment of Natural Organic Liquid (NOL) and inorganic nutrient supply on yield of rabi fennel (GF 1)

The farmers of middle Gujarat agro climatic zone growing rabi fennel are recommended to apply recommended dose of fertilizer (90-45-00 kg NPK /ha) along with application of FYM @ 10 t/ha and seed treatment with AAU PGPR (Plant Growth Promoting Rhizobacteria) consortium @ 5 ml/kg of seed and apply NOL @ 500 l/ha drenching near plants as well as foliar spray of NOL @ 50 l/ha at 30 and 45 days after sowing for getting higher yield and net return.

Materials required	Quantity of materials required	
	NOL for soil application (A)	NOL for foliar spray (B)
Water (l)	500	10
Desi cow dung (kg)	50	1
Desi cow urine (l)	25	0.5
Jaggery / Molasses (kg)	5	0.1
Butter milk (l)	5	0.1
Pulse flour (kg)	5	0.1
Soil under banyan tree (kg)	2.5	0.05
Mix the above materials (A) in barrel or tank and keep it 2 to 7 days for soil drenching. Mix the above materials (B) in barrel or tank and keep it 48 hours for foliar spray and use 1 lit. mixture in 10 lit. of water. Both the mixtures should be stirred daily two times.		

8. Long term effect of organic manures on soil, yield and quality of groundnut (*kharif*) – wheat crop sequence

The farmers of middle Gujarat agro climatic zone interested to grow groundnut (Kharif)-wheat crop sequence organically are recommended to apply 50 % N (12.5 kg N/ha) through FYM (2.5 t/ha) to groundnut and 50 % N (60 kg N/ha) through FYM (12.5 t/ha) to wheat. The remaining 50 % N to groundnut and wheat should be given through castor cake @ 0.3 and 1.3 t/ha, respectively for getting higher yield, net return and maintaining soil health.

(Professor and Head, Department of Agronomy, BACA, Anand)

WATER MANAGEMENT

9. Improving use efficiency of inputs (water and nutrients) in *Bt.* cotton (G. Cot Hy-8 BG II)

The farmers of middle Gujarat agro climatic zone growing *Bt* cotton (G Cot. Hy-8, BG II) in paired rows (60 x 180 x 60 cm) are recommended to adopt drip irrigation at 0.8 PEF and fertilize the crop with 240 kg N/ha in four equal splits (60 kg N as a basal and remaining 180 kg N in three equal splits at one month interval through fertigation) to get higher yield and net return with 20 % water saving.

System details:

1. Lateral spacing: 2.40 m
2. Dripper spacing: 45 cm
3. Dripper discharge: 4 lph
4. Operating pressure: 1.2 kg/ cm^2
5. Operating frequency: Alternate day
6. Operating time: 84 minutes

(Res. Sci. (Agron.), TRTC, AAU, Devgadh Baria)

WEED MANAGEMENT

10. Weed management in drilled paddy

The farmers of Middle Gujarat Agro climatic Zone growing drilled paddy are recommended to go for two hand weeding at 20 and 40 days after sowing for higher yield and return. In case of paucity of labours, farmers can go for chemical weed control using oxadiargyl @ 90 g/ha as pre-emergence (3 DAS) followed by bispyribac sodium @ 25 g /ha at 20 DAS.

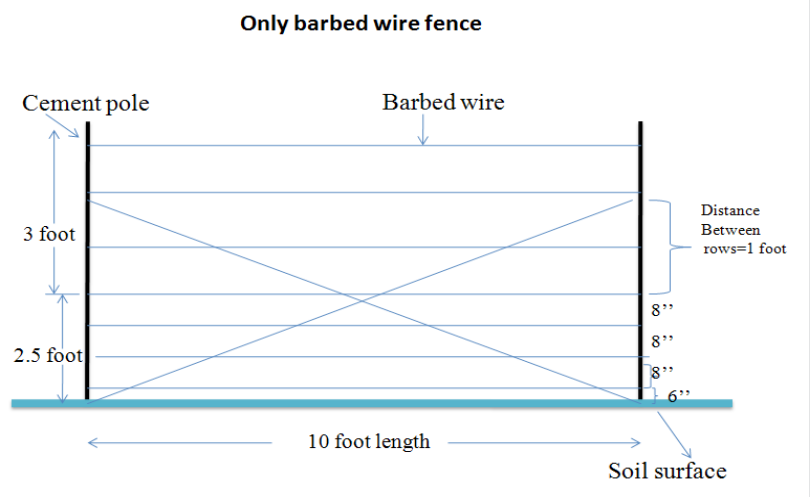
(Associate Research Scientist, ARS, AAU, Derol)

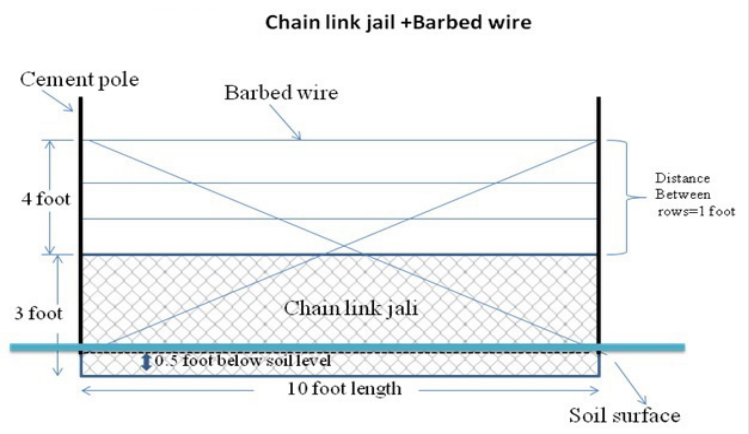
PLANT PROTECTION

AGRICULTURAL ENTOMOLOGY

1. Documentation and evaluation of indigenous techniques for wild boar management

Install barbed wire fence (as per figure) on farm periphery with posting cement poles at 10' (3.05 m) interval and tie 7 parallel rows of barbed wire one above other and 2 rows diagonally crossing each other at centre between two adjoining poles to restrict boar (*Sus scrofa*) entering into crop field. Tie parallel rows of barbed wires, starting from 6″ (15.24 cm) above ground, lower 4 rows 8″ (20.32 cm) apart and upper 3 rows 12″ (30.48 cm) apart. By replacing lower 3 rows of barbed wire with chain linked net pushing 6″ (15.24 cm) inside ground can increase the effectiveness.





(Res. Sci. (Ornitho.), AINPVPM: Agril. Ornithology, AAU, Anand)

2. Bio-efficacy of newer insecticides against brinjal shoot and fruit borer, *Leucinodes orbonalis* (Guenee)

For effective control of shoot and fruit borer (*Leucinodes orbonalis*) and getting higher fruit yield in brinjal, the farmers of middle Gujarat are recommended to spray emamectin benzoate 5 SG 0.0025 per cent (5 g/ 10 litre of water; 12.5 g a.i./ha) or chlorantraniliprole 18.5 SC 0.006 per cent (3 ml/ 10 litre of water; 30 g a.i./ha) when the pest crosses 5 per cent shoot damage and subsequent two sprays at 15 days after first spray application.

Year	Crop	Pest	Pesticides with formulation	Dosage				Appl. schedule	Waiting period /PHI (Days)
				g. a.i./ ha	Quantity of formulation/ ha	Conc. (%)	Dilution in 10 litre water		
2016	Brinjal	Shoot & fruit borer	Emamectin benzoate 5 SG	12.5	250 g	0.0025	5 g	First foliar spray application at 5% damage of shoots and subsequent two at 15 days after first application	1
			Chlorantraniliprole 18.5 SC	30	150 ml	0.006	3 ml		22

(Asstt. Res. Sci. (Ento.), MVRS, AAU, Anand)

3. Evaluation of new molecules of insecticides against leaf folder of paddy

Farmers of middle Gujarat growing transplanted rice are recommended to spray flubendiamide 480 SC 0.015 per cent (3 ml/10 litre of water; 72 g a.i./ha) or indoxacarb 15.8 EC 0.015 per cent (10 ml/10 litre of water; 79 g a.i./ha) or acephate 75 SP 0.075 per cent (10 g/10 litre of water; 375 g a.i./ha) for the control of leaf folder at initiation of pest incidence.

Year	Crop	Pest	Insecticides with formulation	Dosage				Appli. schedule	Waiting period /PHI (Days)
				g.a.i. /ha	Quantity of formulation/ha	Conc. (%)	Dilution in 10 litre water		
2015	Rice	Leaf folder and Stem borer	Flubendiamide 480 SC	72	150 ml	0.015	3 ml	Initiation of pest incidence	Safe at harvest as per CIB
			Indoxacarb 15.8 EC	79	500 ml	0.015	10 ml		
			Acephate 75 SP	375	500 g	0.075	10 g		

(Asstt. Res. Sci. (Ento.), MRRS, AAU, Nawagam)

PLANT PATHOLOGY AND NEMATOLOGY

4. Management of wilt and root rot of chickpea through seed biopriming and soil application of bio-agents

The farmers of middle Gujarat growing chickpea are recommended for application of *Trichoderma viride* or *T. harzianum* ($2x10^8$ cfu/g) enriched FYM (10 kg bioagent/ton FYM) in furrow @ 1 ton/ha, followed by seed biopriming at the time of sowing i.e. soaking of seeds for 10 hrs in

suspension of talc based formulation 1 % WP ($2x10^8$ cfu/g) of *T. viride* or *T. harzianum,* respectively @ 50 g product / 250 ml of water/ kg of seed and shade dried, for the effective management of wilt - root rot complex.

Year	Crop	Pest	Pesticides with formulation	Dosage				Application schedule	Waiting period/ PHI (days)	Remark
				a.i./ha	Quantity of formulation/ ha	Conc. (%)	Dilution in water			
2016	Chickpea	Wilt and root rot	*T. viride* or *T. harzianum* 1 % WP	--	--	1.0	--	Application of *Trichoderma viride* or *T. harzianum* ($2x10^8$ cfu/g) enriched FYM (10 kg bioagent/ ton FYM) in furrow @ 1 ton/ha, followed by seed biopriming at the time of sowing *i.e.* soaking of seeds for 10 hrs in suspension of talc based formulation ($2x10^8$ cfu/g) of *T.viride* or *T. harzianum,* respectively @ 50 g product/ 250 ml of water/ kg of seed.	--	--

(Prof. & Head, Dept. of Plant Pathology, BACA, AAU, Anand)

5. Evaluation of bioagents for management of soil-borne diseases in mungbean through seed treatment and soil application

The farmers of middle Gujarat growing mungbean are recommended for application of *Trichoderma harzianum* or *T. viride* ($2x10^8$ cfu/g) enriched FYM (10 kg bioagent / ton FYM) in furrow @ 1 ton/ha, followed by seed treatment with *T. harzianum* or *T. viride* 1 % WP ($2x10^8$ cfu/g) @ 10 g

/kg seeds, respectively at the time of sowing for the effective management of root rot disease.

Year	Crop	Pest	Pesticides with formulation	Dosage				Application schedule	Waiting period/PHI (days)	Remark
				a.i./ha	Quantity of formulation/ ha	Conc. (%)	Dilution in water			
2016	Mungbean	Root rot	*T. harzianum* or *T. viride* 1 % WP	--	--	1.0	--	Application of *Trichoderma harzianum* or *T. viride* ($2x10^8$ cfu/g) enriched FYM (10 kg bioagent/ ton FYM) in furrow @ 1 ton/ ha, followed by seed treatment with *T. harzianum* or *T. viride* ($2x10^8$ cfu/g)@ 10 g / kg seeds, respectively.	--	--

(Prof. & Head, Dept. of Plant Pathology, BACA, AAU, Anand)

6. Evaluation of bioagents for management of soil-borne diseases in soybean through seed treatment and soil application

The farmers of middle Gujarat growing soybean are recommended for application of *Trichoderma viride* or *T. harzianum* ($2x10^8$ cfu/g- 1% WP) enriched FYM (10 kg bioagent/ ton FYM) in furrow @ 1 ton/ha, followed by seed treatment with *T. viride* or *T. harzianum* ($2x10^8$ cfu/g)@ 10 g/kg seeds, respectively at the time of sowing for the effective management of root rot disease.

Year	Crop	Pest	Pesticides with formulation	Dosage				Application schedule	Waiting period/ PHI (days)	Remark
				a.i./ha	Quantity of formulation/ ha	Conc. (%)	Dilution in water			
2016	Soybean	Root rot	*T. viride* or *T. harzianum* 1 % WP	--	--	1.0	--	Application of *Trichoderma viride* or *T. harzianum* ($2x10^8$ cfu/g)enriched FYM (10 kg bioagent/ ton FYM) in furrow @ 1 ton/ ha, followed by seed treatment with *T. viride* or *T. harzianum* ($2x10^8$ cfu/g)@ 10 g/kg seeds, respectively.	--	--

(Prof. & Head, Dept. of Plant Pathology, BACA, AAU, Anand)

7. Effects of different dates of sowing on occurrence of root-knot disease in bidi tobacco nursery

Farmers of middle Gujarat growing bidi tobacco are recommended to raise the nursery by sowing the seeds up to third week of July to minimize root- knot nematode disease and thereby getting more number of healthy seedlings.

(Res. Sci. (Pl. Path.), Bidi Tobacco Research Station, AAU, Anand)

8. Evaluation of bio-fungicides for management of maydis leaf blight, turcicum leaf blight and curvularia leaf spot diseases in maize

Farmers of middle Gujarat growing *kharif* and *rabi* maize are recommended to treat the seeds with talc based formulation of *Trichoderma viride* 1% WP ($2x10^8$ cfu/g) @ 7 g/ kg seeds

at the time of sowing, followed by four sprays of cow urine 10 per cent (1 litre / 10 litre of water) or neem leaf extract 10 per cent (1 litre / 10 litre of water) at 30, 40, 50 and 60 days after sowing for the management of maydis and turcicum leaf blight and curvularia leaf spot diseases.

(Asst. Res. Sci. (Pl.Path.), MMRS, AAU, Godhra)

BASIC SCIENCES

PLANT PHYSIOLOGY

1. Influence of chemicals and PGRs on growth and dry biomass yield of Dodi (*Leptadenia reticulata* (Retz.) W. & A.)

The farmers of middle Gujarat agro-climatic zone-III growing dodi crop in *kharif* season are recommended to spray urea 2% with potassium chloride (KCl) 2% at 45 and 75 days after planting for getting higher dry biomass yield as well as net return.

(Res. Sci., Medicinal and Aromatic Plants Research Station, AAU, Anand)

2. Influence of source manipulation through decapitation and PGRs on growth, yield and quality of cluster bean (*Cyamopsis tetragonaloba* L. Taub.) seed cv. 'Pusa Navbahar'

Farmers of middle Gujarat agro-climatic zone-III growing cluster bean cv. Pusa Navbahar in *kharif* season for seed production are recommended to spray GA3 20 mg/l at 45 DAS with decapitation of the plant at 70 DAS for getting higher seed yield as well as net profit.

(Res. Sci., MVRS, AAU, Anand)

DAIRY SCIENCE / FPT & BE

DAIRY SCIENCE

1. Use of Basil (Tulsi leaves) as flavouring ingredient in the manufacture of ice cream

A technology for making acceptable basil flavoured ice cream has been developed by Anand Agricultural University, Anand using basil juice (6% TSS) @ 6.0% or freeze dried basil powder (5% moisture) @ 1.0% in ice cream mix. Basil powder is preferred over basil juice.

(Prof. & Head, Department of DT, DSC, AAU, Anand)

2. Evaluating the effect of partial homogenization of milk on the quality of Mozzarella cheese

The technology developed by Anand Agricultural University for Mozzarella cheese making from partially homogenized milk enables obtaining product with higher yield, superior appearance and baking qualities, and greater cost returns compared to the one prepared from unhomogenized milk.

(Prof. & Head, Department of DT, DSC, AAU, Anand)

3. Formulation of ready mix carrot halwa from dried carrot shreds

A technology to prepare Carrot Halwa ready-mix has been developed by Anand Agricultural University using carrot shreds mixed with Khoa and Ghee, followed by drying under vacuum. The prepared Ready-mix for Carrot Halwa had a shelf-life of 45 and 30 days at 7±2°C and 30±2°C, respectively when packed in Met-Polyester/Polyfilm pouches (85 µm) and packed under CO_2 environment. The ready-mix and water (85°C) in the proportion of 1:2 (w/v), along with sugar (28 - 36% by weight) can be mixed to get good quality carrot Halwa.

(Prof. & Head, Department of DPO, DSC, AAU, Anand)

4. Screening of qualitative tests for detection of adulterants in milk

Large numbers of qualitative tests for detection of adulterants in milk are reported in literature with wide procedural variations. Among all the tests compared and evaluated at AAU, Anand, following tests were found to give the best results and hence are suggested for practical application.

PART I Qualitative tests suggested for detection of adulterants in milk

Sr. No.	Adulterant	Test	Reported by
1	Detergent	Methylene blue	Paradkar *et al.* (2000), FSSAI (2015)
2	Urea	DMAB	Bector *et al.* (1998), Dixit (2012), Sharma *et al.* (2012), FSSAI (2015)
3	Ammonium salts	Phenol	Mittal & Roy (1976), Srivastava (2010), FSSAI (2015)
4	Glucose	Barfoed	Roy & Mittal (1977), Sharma *et al.* (2012), Dixit (2012), FSSAI (2015)
5	Sucrose	Seliwanoff (solid)	Sharma *et al.* (2012)
6	Maltodextrin	Iodine	Dairy Development Department of Maharashtra (2013)

7	Starch	Iodine	BIS (1960), Anon. (2006), Dixit (2012), Sharma *et al*. (2012)
8	Nitrate	Diphenylamine	FAO (1986)
9	Sulphate	Barium chloride	Sharma *et al.* (2012), FSSAI (2015)
10	Gelatine	Picric acid	Jacobs & Jaffe (1932), DGHS (2005), FSSAI (2015)
11	Formaldehyde	Leach	Williams & Sherman (1905), BIS (1961)
12	Hydrogen peroxide	*p*-Phenylenediamine	Draaiyer *et al*. (2009)
13	Neutralizers	Rosolic acid	DGHS (2005)
14	Borax & Boric acid	Turmeric paper	Anon. (2006), Dairy for all (2006), Singh *et al.* (2012), Dixit (2012)
15	Salicylic acid	Ferric chloride	Dixit (2012)
16	Benzoic acid	Ferric chloride	Singh *et al.* (2012), Dixit (2012)

Note: For sodium chloride, potassium chromate test needs modification to increase the test accuracy for detection (Anon. 2006, Dairy for all 2006, Anon. 2009, Srivastava 2010, Singh *et al*. 2012, Dixit 2012, Sharma *et al.* 2012, Kamthania *et al.* 2014, FSSAI 2015).

PART II If qualitative test for detection of adulterant is performed in milk itself; it is suggested to perform at optimum temperature as given below.

Sr. No.	Adulterant	Test	Optimum temperature
1	Detergent	Methylene blue (FSSAI 2015)	20 to 30°C
2	Urea	Urease (Paradkar *et al.* 2000)	40°C
		Phenol (Paradkar *et al.* 2000)	20°C
3	Starch	Iodine (BIS 1960, Anon. 2006, Dixit 2012, Sharma *et al.* 2012)	20°C
4	Maltodextrin	Iodine (Sharma *et al.* 2012)	30°C
5	Hydrogen peroxide	*p*-phenylenediamine (Draaiyer *et al.* 2009)	20°C
		Iodometry (Sharma *et al.* 2012, FSSAI 2015)	10°C
6	Borax & Boric acid	Turmeric paper (Dairy for all 2006, Dixit 2012, Singh *et al.* 2012)	20 to 30°C

Note: No influence of temperature of milk (10-40°C) was found on performance of DMAB test for urea (Anon. 2009, Dixit 2012, Sharma *et al.* 2012, FSSAI 2015), Rosolic acid test for neutralizer (DGHS 2005), Ferric chloride test for benzoic acid (Dixit 2012, Singh *et al.* 2012) and Ferric chloride test for salicylic acid (Dixit 2012) detection.

PART III If qualitative test for detection of adulterant is performed in milk itself; it is suggested to perform at optimum temperature as given below.

Sr. No.	Adulterant	Test	Optimum heating period
1	Ammonium salts	Phenol (Mittal & Roy 1976, DGHS 2005, Srivastava 2010, FSSAI 2015)	20 sec
2	Glucose	Barfoed (in milk) (Roy & Mittal 1977, Vishweshwar & Krishnaiah 2005, Anon. 2006, Singh *et al.* 2012, Sharma *et al.* 2012, Dixit 2012, Kamthania *et al.* 2014, FSSAI 2015)	3 min

3	Sucrose	Seliwanoff (resorcinol solid) (Sharma *et al.* 2012)	4 min
		Seliwanoff (resorcinol solution) (Srivastava 2010)	5 min
4	Formaldehyde	Leach (heating by direct flame) (Williams & Sherman 1905, BIS 1961, Vishweshwar & Krishnaiah 2005)	1 min
		Leach (heating in boiling water bath) (Sharma *et al.* 2012)	4 min

(Prof. & Head, Department of DC, DSC, AAU, Anand)

5. Studies on physico-chemical and sensory characteristics of iron rich biscuits

Anand Agricultural University has developed a technology for preparation of Iron-rich biscuits with improved protein content which can be prepared using a mixture comprising of rajagira (rajgaro) flour, bengal gram flour, refined wheat flour and wheat flour along with whey powder, coconut powder, amaranth leaves powder, cocoa powder, sesame seeds, spices and condiments.

(Prof. & Head, Department of DC, DSC, AAU, Anand)

6. Optimization of biomass production for probiotic *Lactobacillus helveticus* MTCC 5463

Cheddar cheese whey supplemented with 0.95% each of yeast extract and proteose peptone at pH 6.25 and inoculated with 6% (v/v) active culture of *Lactobacillus helveticus* MTCC 5463 and fermented at 40°C for 24 hours can yield 3.25 g/l dry cell biomass and 14.82 log cfu/g total viable count.

(Prof. & Head, Department of DM, DSC, AAU, Anand)

7. ACE Inhibitory activity of *Lactobacillus helveticus* MTCC 5463 in fermented milk added with honey

A technology developed by Anand Agricultural University is recommended for the preparation of fermented milk rich in ACE inhibitory activity (antihypertensive property), which can be prepared using toned milk and fermented by *L. helveticus* MTCC 5463 at the rate of 2% for 24 hours at 42^0C.

(Prof. & Head, Department of DM, DSC, AAU, Anand)

8. Utilization of Whey Protein Concentrate (WPC) in the selected cultured dairy product i.e. fermented milk drink

A technology for making acceptable 'Mango based fermented milk drink' is recommended by Anand Agricultural University using Double Toned Milk, 1.23% Whey Protein Concentrate (WPC-70), 0.1% Pectin and 18.24% Mango pulp. The shelf life of fermented milk drink at 7±2°C was 9 days.

(Prof. & Head, Department of DM, DSC, AAU, Anand)

9. Development of commercial process for manufacture of 'carrot halwa'

Commercial process for the manufacture of carrot halwa using scraped surface heat exchanger developed by Anand Agricultural University is recommended. The process saves about 66% of processing time with 67% saving in the thermal energy and in-canned sterilized carrot halwa has better sensory and nutritive attributes with extended shelf-life up to 6 months as compared to carrot halwa prepared by traditional method.

(Prof. & Head, Department of DE, DSC, AAU, Anand)

10. Development of commercial process for manufacture of 'bottle gourd halwa'

Commercial process for the manufacture of bottle gourd halwa using scraped surface heat exchanger developed by Anand Agricultural University is recommended. The process saves about 63% of processing time with 66% saving in the thermal energy and in-canned sterilized bottle gourd halwa has better sensory and nutritive attributes with extended shelf-life up to 6 months as compared to bottle gourd halwa prepared by traditional method.

(Prof. & Head, Department of DE, DSC, AAU, Anand)

11. Evaluation of energy conservation potential of soft starter in dairy industry

Application of soft starters in operating machinery up to 5 kW is recommended which results in saving of average instantaneous energy and average overall energy in the range of 4.00 to 17.16 and 0.10 to 4.57%, respectively, depending on the loading conditions.

(Prof. & Head, Department of DE, DSC, AAU, Anand)

FOOD PROCESSING TECHNOLOGY AND BIO-ENERGY

12. Edible coating material for extending the shelf life of tomato fruits

Farmers, Entrepreneurs and Agro-processing units involved in post-harvest handling of tomato fruits are advised to use the technology of edible coating developed by AAU, for extension of shelf life. For storage of pre-breaker stage tomatoes at ambient conditions (27±3°C), the coating formulation of Bee wax 20%, oleic acid 2%, sodium hydroxide 4%, glycerol monostearate 1%, remaining 73% hot distilled water is recommended which will extend shelf

life by 24 days. For low temperature storage (15±2°C), the coating formulation comprising of Bee wax 20%, mineral oil 15%, oleic acid 2%, sodium hydroxide 4%, glycerol monostearate 1 %, remaining 58% hot distilled water is recommended which will extend the shelf life of tomatoes by 15 days compared to non-coated tomatoes stored at same temperature.

(Prof. & Head, Department of PHE, FPT & BE, AAU, Anand)

13. Biodiesel conversion technology

Entrepreneurs interested in producing biodiesel from sunflower oil and cotton seed oil are advised to use the biodiesel conversion technology developed by AAU, Anand. The process involves transesterification with methanol in presence of specific catalyst (Sodium hydroxide) under controlled reaction followed by separation of glycerol and other downstream processes.

(Prof. & Head, Department of PHE, FPT & BE, AAU, Anand)

14. Design and development of multi-chamber equipment for online measurement of rate of respiration of fruits and vegetables

Entrepreneurs and instrument manufacturers interested in online measurement of rate of respiration of fruits and vegetables or equipment for above purpose are advised to use the design of multi-chamber equipment for online continuous measurement of respiration rate developed by AAU, Anand. The system is quick, accurate, versatile and user friendly for continuous determination of the rate of respiration under varying storage environments for different fruits and vegetables.

(Prof. & Head, Department of PHE, FPT & BE, AAU, Anand)

15. Development of osmotically dehydrated whole aonla fruits

The entrepreneurs and fruit processors interested in production of osmotically dehydrated whole Aonla are advised to use processing technology developed for the purpose by AAU, Anand. The technology involves ultrasonication, osmotic dehydration in sugar syrup (580 Brix) followed by hot air drying and results in good quality whole sweetened dehydrated Aonla. Final product packed in HDPE (200 gauge) bags can be stored at ambient storage condition (27±2°C, 65% RH) for six months.

(Prof. & Head, Department of FPT, FPT & BE, AAU, Anand)

16. Production technology for superior quality malt flour from moth bean

The entrepreneurs and food processors interested in manufacture of malt based products are advised to adopt the production technology of mothbean malt developed by AAU, Anand. The technology involves soaking and germination of mothbean for 12 and 36 hours, respectively, followed by drying at 60˚C and milling. This process reduces the anti-nutrients thereby improving the assimilable nutrients (proteins, carbohydrates and minerals) in malted mothbean.

(Prof. & Head, Department of FPT, FPT & BE, AAU, Anand)

17. Supercritical fluid extraction of carotenoids from vacuum dried pumpkin powder

The entrepreneurs and food processors interested in production of carotenoids from pumpkin powder are advised to use supercritical extraction technology developed by AAU, Anand. This technology involves extraction of

carotenoid from vacuum dried pumpkin powder using blanching, sulphitation, drying, sieving and super critical fluid extraction using CO_2 at controlled pressure and temperature. The process enables to achieve the maximum yield of solvent-free carotenoid (0.6 g/100 g) having higher β-carotene content (151.47 mg/100 g). This extract is stable up to 45 days at -18°C temperature.

(Prof. & Head, Department of FPT, FPT & BE, AAU, Anand)

18. Development of High Protein Pumpkin Bar

The food processors interested in development of nutritious protein fortified pumpkin bar are advised to follow the protocol developed for this purpose by AAU, Anand. The technology involves addition of whey protein concentrate (5%), maltodextrin (0.1%), pectin (0.2%) and citric acid (0.86%) to pumpkin pulp, cooking, drying and packaging of final product in metallized cast polypropylene (MPP).

(Prof. & Head, Department of FQA, FPT & BE, AAU, Anand)

19. Super critical fluid extraction of oleoresins from red chilli

The entrepreneurs and food processors interested in production of oleoresins, capsaicin and pigment compounds from red chillies are advised to use supercritical extraction technology developed for this purpose by AAU, Anand. This technology involves better recovery of oleoresins (6.5%), capsaicin (2.2%) and pigment compounds having 16024 Nesslerimeter Colour Value (NCV) using drying, sieving and CO_2 supercritical fluid extraction at controlled pressure and temperature. The process results in superior quality oleoresins, capsaicin and pigment compounds as compared to conventional extraction methods.

(Prof. & Head, Department of FQA, FPT & BE, AAU, Anand)

AGRICULTURAL ENGINEERING AND AIT

AGRICULTURAL ENGINEERING

1. Development and evaluation of a multipurpose tool bar for mini tractor suitable for the cropping pattern of middle Gujarat region

A mini tractor (15-20 HP) drawn multipurpose tillage tool developed by Anand Agricultural University is suitable for seed bed preparation at wapsa conditions under sandy loam soil of middle Gujarat Agro-climatic zone in a single operation. The implement consisting of iron ploughs for tillage and clod crusher for breaking clods is useful for preparation of seed bed in a single pass with a saving of upto 50% in the cost of operation as compared to the cultivator. Therefore, it is recommended for farmers of the region to prepare the seedbed by using the developed implement.

(Prof. & Head, Dept. of FMPE, CAET, AAU, Godhra)

2. Modification of three point linkage system of medium tractor drawn sowing machine to operate by mini tractor

By modifying the three point hitching system of the sowing machines designed for medium size tractor (35-40 HP), it can be easily operated by the mini tractor (15-20 HP) and saving upto 20 % in sowing operation can be achieved as compared to the medium sized tractor. A 100 kg front ballasting in the mini tractor will be required. The manufacturers of the seed drill are advised to follow the hitching specifications given below for fabrication of the new seed drill so that the machine can be operated by the mini tractor also : (1) Maximum distance between lower hitching points has to be set in the range of 60-70 cm and

(2) Vertical distance between top hitching point and lower hitching point has to be set in the range of 50-60 cm.

(Prof. & Head, Dept. of FMPE, CAET, AAU, Godhra)

3. Development and evaluation of mini tractor drawn semi automatic potato planter

A mini tractor (15-20 hp) drawn two row semi-automatic potato planter developed by AAU is recommended for the farmers for planting the potato crop. The planter places the potato tubers and fertilizer at appropriate depths in a single operation. In the planter the distance between two rows (45-70 cm) can be adjusted as per requirement. Use of this planter with mini tractor will save about 40% cost of the potato planting as compared to the medium size tractor (35-40 hp) operated planter. The cost of the planter is estimated as Rs. 26000/-

(Prof. & Head, Dept. of FMPE, CAET, AAU, Godhra)

4. Design and Development of a Throat Type Up Draft Biomass Gasifier For Thermal Application

The throat type updraft biomass gasifier developed by AAU is recommended for thermal applications at community kitchen, restaurants, *dhabas* and similar establishments' owners who are interested in shifting to biomass gasifier system. The developed gasifier can be successfully operated using maize cobs, sized wood and saw dust briquettes. Maize cob is found more suitable for throat type updraft gasifier as compared to other two fuels. The newly developed gasifier remains about 50% cheaper in operation as compared to that with LPG system.

(HOD, Dept. of REE, CAET, AAU, Godhra)

AIT

5. Development of Mobile based application for farmers

Anand Agricultural University has started "i-khedut" mobile application. This application provides package of practices and animal husbandry related information in Gujarati language and hence recommended for use by farmers of Gujarat.

(Director IT, AAU, Anand)

ANIMAL PRODUCTION

1. Study on Nutritional Status of dairy animals of Botad district

The farmers of Botad district are advised to feed daily additional 1.0 and 1.5 kg compound concentrate mixture to cows and buffaloes yielding 5.0 to 9.0 and 9.0 to 13.0 kg milk daily, respectively throughout the year in order to fulfill their nutrient requirement.

(Res. Sci., ANRS, Vet. College, AAU, Anand)

2. To study the effects of feeding different quality maize on production performance and egg quality parameters of White Leghorn birds

Significantly higher content of β-Carotene (8.559 ppm), protein (13.22%) and deep yellow colour of egg yolk are observed in the eggs of White Leghorn birds fed on layer ration prepared by using yellow maize (Gujarat Anand Yellow Maize Hybrid-1) as compared to white maize (Gujarat Maize-3), High Quality Protein Maize-1 (HQPM-1) and purple maize; thus resulting in value addition and satisfying consumer's preference for deep yellow yolk. Hence, it is

recommended to use yellow maize (Gujarat Anand Yellow Maize Hybrid-1) in preparation of layer ration.

(Res. Sci., Poultry Complex, Vet. College, AAU, Anand)

3. Performance of Indigenous Sheep under Water Restriction and Rehydration in middle Gujarat Agro climatic zone

Marwari and Patanwadi hoggets can be maintained on 2.0 litres of water, daily.

(Prof. and Head, Department of LPM, Veterinary College, AAU, Anand)

ANIMAL HEALTH

1. Studies on Clinico-biochemical aspects of Ancylostomosis in dogs

The prevalence of Ancylostomosis (14-37%) has been observed round the year in pet dogs of Anand district. Hence, the pet owners are advised to follow the deworming schedule prescribed by veterinarians.

(Prof. and Head, Dept. of Vet. Parasitology, Veterinary College, AAU, Anand)

RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY AND ENTREPRENEURS

PLANT PROTECTION

AGRICULTURAL ENTOMOLOGY

1. Bio-efficacy of different insecticides against anar butterfly, *Virachola isocrates* (Fabricius) infesting pomegranate

Two sprays of flubendiamide 39.35 SC 0.015 per cent (3 ml/10 litre of water) or chlorantraniliprole 18.5 SC 0.006 per cent (3 ml/10 litre of water) or emamectin benzoate 5 SG 0.0025 per cent (5 g/10 litre of water) first at initiation of the pest and second at 30 days after first spray proved effective for the control of anar butterfly, *Virachola isocrates* (Fabricius) infesting pomegranate in *mrug bahar*.

(Prof. & Head, Department of Entomology, BACA, AAU, Anand)

2. Residue and persistence of ethion 50 EC in/on cabbage

Two foliar sprays of ethion 50 EC in cabbage at 10-day interval @ 500 g a.i./ ha starting from 50 per cent head formation resulted in its residue below the limit of quantitation of 0.05 µg/g in cabbage heads if harvested from 7th day after the last spray. Therefore, PHI of 7 days could be suggested if ethion 50 EC is recommended in cabbage with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

3. Residue and persistence of acephate 75 SP in/on cabbage

Two foliar sprays of acephate 75 SP in cabbage at 10 days interval @ 560 g a.i./ha starting from 50 per cent head

formation resulted in cabbage head residue below the MRL 2.0 µg/g (CODEX) immediately after the last application. Therefore, PHI of 1 day could be suggested if acephate 75 SP is recommended in cabbage.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

4. Residue and persistence of triazophos 40 EC in/on cabbage

Two foliar sprays of triazophos 40 EC in cabbage at 10 days interval @ 500 g a.i./ha starting from 50 per cent head formation resulted in its residue below the limit of quantitation of 0.05 µg/g in cabbage heads if harvested from 10th day after the last spray. Therefore, PHI of 10 days could be suggested if triazophos 40 EC is recommended in cabbage with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

5. Residue and persistence of carbendazim 50 WP in/on cabbage

Two foliar sprays of carbendazim 50 WP in cabbage at 10 days interval @ 250 g a.i./ha starting from 50 per cent head formation resulted 0.70 µg/g residues even on the 15th day of the last application which being higher than limit of quantitation of 0.05 µg/g, label claim of carbendazim 50 WP can be considered for cabbage based on the risk assessment.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

6. Residue and persistence of quinalphos 25 EC in/on cabbage

Two foliar sprays of quinalphos 25 EC in cabbage at 10 days interval @ 250 g a.i./ha starting from 50 per cent head formation resulted in its residue below the limit of

quantitation of 0.05 µg/g in cabbage head if harvested from 5th day after the last spray. Therefore, PHI of 5 days could be suggested if quinalphos 25 EC is recommended on cabbage with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

7. Residue and persistence of ethion 50 EC in/on cauliflower

Two foliar sprays of ethion 50 EC in cauliflower at 10 days interval @ 500 g a.i./ha starting from 50 per cent curd formation resulted in its residue below the limit of quantitation of 0.05 µg/g in cauliflower curd if harvested from 15th day after the last spray. Therefore, PHI of 15 days could be suggested if ethion 50 EC is recommended on cauliflower with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

8. Residue and persistence of acephate 75 SP in/on cauliflower

Two foliar sprays of acephate 75 SP in cauliflower at 10 days interval @ 560 g a.i./ha starting from 50 per cent curd formation resulted in 0.12 µg/g residues even on the 15th day after the last application which being higher than the limit of quantitation of 0.05 µg/g, label claim of acephate 75 SP can be considered for cauliflower based on the risk assessment.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

9. Residue and persistence of carbendazim 50 WP in/on cauliflower

Two foliar sprays of carbendazim 50 WP in cauliflower at 10 days interval @ 250 g a.i./ha starting from 50 per cent curd formation resulted in 0.16 µg/g residues even on the 15th day of the last application which being higher than limit

of quantitation of 0.05 µg/g, label claim of carbendazim 50 WP can be considered for cauliflower based on the risk assessment.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

10. Residue and persistence of triazophos 40 EC in/on cauliflower

Two foliar sprays of triazophos 40 EC in cauliflower at 10 days interval @ 500 g a.i./ha starting from 50 per cent curd formation resulted in its residue below the limit of quantitation of 0.05 µg/g in cauliflower curd if harvested from 10th day after the last spray. Therefore, PHI of 10 days could be suggested if triazophos 40 EC is recommended in cauliflower with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

11. Residue and persistence of quinalphos 25 EC in/on cauliflower

Two foliar sprays of quinalphos 25 EC in cauliflower at 10 days interval @ 250 g a.i./ha starting from 50 per cent curd formation resulted in its residue below its MRL of 0.1 µg/g in cauliflower curd if harvested from 7th day after the last spray. Therefore, PHI of 7 days could be suggested.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

12. Residue and persistence of quinalphos 25 EC in/on chilli

Two foliar sprays of quinalphos 25 EC in chilli at 10 days interval @ 250 g a.i./ha starting from fruiting stage resulted in its residue below its MRL of 0.2 µg/g in green chilli fruits if harvested from 5th day after the last spray. Therefore, PHI of 5 days could be suggested.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

13. Residue and persistence of triazophos 40 EC in/on chilli

Two foliar sprays of triazophos 40 EC in chilli at 10 days interval @ 500 g a.i./ha starting from fruiting stage resulted in its residue below its limit of quantitation of 0.05 µg/g in green chilli fruits if harvested from 15th day after the last spray. Therefore, PHI of 15 days could be suggested if triazophos 40 EC is recommended in chilli with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

14. Residue and persistence of chlorpyriphos 20 EC in/on chilli

Two foliar sprays of chlorpyriphos 20 EC in chilli at 10 days interval @ 300 g a.i./ha starting from fruiting stage resulted in its residue below its limit of quantitation of 0.01 µg/g in green chilli fruits if harvested from 10th day after the last spray. Therefore, PHI of 10 days could be suggested if chlorpyriphos 20 EC is recommended on chilli with MRL of 0.01 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

15. Residue and persistence of carbendazim 50 WP in/on green chilli

Two foliar sprays of carbendazim 50 WP in chilli at 10 days interval @ 250 g a.i./ha starting from fruiting stage resulted in its residue below the MRL 2.0 µg/g (CODEX) in green chilli fruits on the 3rd day after the last application. Therefore, PHI of 3 days could be suggested if carbendazim 50 WP is recommended in chilli.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

16. Residue and persistence of fluopyram 200 + tebuconazole 200 - 400 SC in/on chilli

Three foliar sprays of fluopyram 200 + tebuconazole 200 - 400 SC in chilli at 10 days interval @ 100 + 100 g a.i./ha starting from fruiting stage resulted its residue below its limit of quantitation of 0.05 µg/g in green chilli fruits on the 20th day after the last application. Therefore, PHI of 20 days could be suggested if the fluopyram 200 + tebuconazole 200 - 400 SC combination is recommended in chilli with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

17. Residue and persistence of carbendazim 50 WP in/ on capsicum grown in open field

Two foliar sprays of carbendazim 50 WP in capsicum grown in open field at 10 days interval @ 250 g a.i./ha starting from fruiting stage resulted in its residue 0.41 µg/g in the fruits even on the 20th day after the last application, which being higher than the limit of quantitation of 0.05 µg/g, label claim of carbendazim 50 WP can be considered for capsicum based on risk assessment.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

18. Residue and persistence of chlorpyriphos 20 EC in/on capsicum grown in open field

Two foliar sprays of chlorpyriphos 20 EC in capsicum grown in open field at 10 days interval @ 300 g a.i./ha starting from fruiting stage resulted in its residue below its MRL 2.0 µg/g (CODEX) in the fruits immediately after the last application. Therefore, PHI of 1 day could be suggested if chlorpyriphos 20 EC is recommended in capsicum grown in open field.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

19. Residue and persistence of quinalphos 25 EC in/on capsicum grown in polyhouse

Two foliar sprays of quinalphos 25 EC in capsicum grown in polyhouse at 10 days interval @ 250 g a.i./ha starting from fruiting stage resulted in its residue below its limit of quantitation of 0.05 µg/g in the fruits if harvested from 10th day after the last spray. Therefore, PHI of 10 days could be suggested if quinalphos 25 EC is recommended in capsicum grown in polyhouse with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

20. Residue and persistence of triazophos 40 EC in/ on capsicum grown in polyhouse

Two foliar sprays of triazophos 40 EC in capsicum grown in polyhouse at 10 days interval @ 500 g a.i./ha starting from fruiting stage resulted in its residue below its limit of quantitation of 0.05 µg/g in the fruits if harvested from 15th day after the last spray. Therefore, PHI of 15 days could be suggested if triazophos 40 EC is recommended in capsicum grown in polyhouse with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

21. Residue and persistence of chlorpyriphos 20 EC in/on capsicum grown in polyhouse

Two foliar sprays of chlorpyriphos 20 EC in capsicum grown in polyhouse at 10 days interval @ 300 g a.i./ha starting from fruiting stage resulted in its residue below its MRL of 2.0 µg/g (CODEX) in the fruits immediately after the last application. Therefore, PHI of 1 day could be suggested if chlorpyriphos 20 EC is recommended in capsicum grown in polyhouse.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

22. Residue and persistence of acephate 75 SP in/on capsicum grown in polyhouse

Two foliar sprays of acephate 75 SP in capsicum grown in polyhouse at 10 days interval @ 560 g a.i./ha starting from fruiting stage resulted in its residue 0.42 µg/g in the fruits even on the 15th day after the last application which being higher than limit of quantitation of 0.05 µg/g, label claim of acephate 75 SP can be considered for capsicum based on the risk assessment.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

23. Residue and persistence of carbendazim 50 WP in/on capsicum grown in polyhouse

Two foliar sprays of carbendazim 50 WP in capsicum grown in polyhouse at 10 days interval @ 250 g a.i./ha starting from fruiting stage resulted in its residue 0.25 µg/g in the fruits even on the 20th day after the last application which being higher than limit of quantitation of 0.05 µg/g, label claim of carbendazim 50 WP can be considered for capsicum based on the risk assessment.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

24. Residue and persistence of quinalphos 25 EC in/on tomato

Two foliar sprays of quinalphos 25 EC in tomato at 10 days interval @ 250 g a.i./ha starting from fruiting stage resulted in its residue below its limit of quantitation of 0.05 µg/g in tomato fruits if harvested from 7th day after the last spray. Therefore, PHI of 7 days could be suggested if quinalphos 25 EC is recommended in tomato with MRL of 0.05 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

25. Residue and persistence of carbendazim 50 WP in/on tomato

Two foliar sprays of carbendazim 50 WP in tomato at 10 days interval @ 250 g a.i./ha starting from fruiting stage resulted in its residue below the MRL 0.5 µg/g (CODEX) in the tomato fruits on the 15th day after the last application. Therefore, PHI of 15 days could be suggested if carbendazim 50 WP is recommended in tomato.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

26. Residue and persistence of chlorpyriphos 20 EC in/on tomato

Two foliar sprays of chlorpyriphos 20 EC in tomato at 10 days interval @ 300 g a.i./ha starting from fruiting stage resulted in its residue below its limit of quantitation of 0.01 µg/g in tomato fruits if harvested from 7th day after the last spray. Therefore, PHI of 7 days could be suggested if chlorpyriphos 20 EC is recommended in tomato with MRL of 0.01 µg/g.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

27. Residue and persistence of imidacloprid 70 WG in/on tomato

Three foliar sprays of imidacloprid 70 WG in tomato at 7 days interval @ 35 g a.i./ha starting from fruiting stage resulted in its residue below its MRL of 1.0 µg/g in tomato fruits one hour after the last application. Therefore, PHI of 1 day could be suggested if imidacloprid 70 WG is recommended in tomato.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

28. Residue and persistence of fluopyram 400 SC in/on tomato

Soil drench of fluopyram 400 SC @ 250 g a.i./ha in tomato, twice at 15 days interval starting from fruiting stage revealed its residue below determination level in tomato fruits even up to 15 days after the last application. Therefore, PHI of 1 day could be suggested if fluopyram 400 SC is recommended in tomato.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

29. Residue and persistence of imidacloprid 17.8 SL in/on okra

Two foliar sprays of imidacloprid 17.8 SL in okra at 10 days interval @ 20 g a.i./ha starting from fruiting stage resulted in its residue below its MRL of 2.0 µg/g in okra fruits one hour after the last application. Therefore, PHI of 1 day could be suggested.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

30. Residue and persistence of imidacloprid 17.8 SL in/on brinjal

Two foliar sprays of imidacloprid 17.8 SL in brinjal at 10 days interval @ 20 g a.i./ha starting from fruiting stage resulted in its residue below its MRL 0.01 µg/g 1-day after the last application. Therefore, PHI of 1 day could be suggested if imidacloprid 17.8 SL is recommended in brinjal.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

31. Residue and persistence of spiromesifen 22.9 SC in/on brinjal

Two foliar sprays of spiromesifen 22.9 SC in brinjal at 10

days interval @ 96 g a.i./ha starting from fruiting stage resulted in its residue below limit of quantitation of 0.05 µg/g in brinjal fruits one day after the last application. Therefore, PHI of 1 day could be suggested.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

32. Residue and persistence of fluopyram 200 + tebuconazole 200 - 400 SC in/on onion

Three foliar sprays of fluopyram 200 + tebuconazole 200 – 400 SC in onion at 10-day interval @ 75 +75 g a.i./ha starting from bulb formation stage resulted in the residue below their limit of quantitation of 0.05 µg/g in onion bulbs on the 50th day (at harvest) after the last application. Therefore, the PHI of 50 days could be suggested for bulb onion if the fluopyram 200 + tebuconazole 200 – 400 SC combination is recommended in onion with 0.05 µg/g MRL. However, in spring onion as the residue levels are being higher than the limit of quantitation even on the 20th day, risk assessment can be carried out to fix the MRLs.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

33. Residue and persistence of flubendiamide 240 + thiacloprid 240 - 480 SC in/on red gram

Three foliar sprays of flubendiamide 240 + thiacloprid 240 - 480 SC in red gram at 10 days interval @ 48 + 48 g a.i./ha starting from pod formation stage resulted in the residues below their limit of quantitation of 0.05 µg/g in matured pods on the 41st day (harvest) after the last application. Therefore, PHI of 41 days could be suggested for matured pods/seeds if flubendiamide 240 + thiacloprid 240 - 480 SC combination is recommended in red gram with 0.05 µg/g MRL. However, in green pods, as the residue levels are being

higher than the limit of quantitation even on the 20th day, risk assessment can be carried out to fix the MRLs in green pods.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

34. Residue and persistence of trifloxystrobin 25 + tebuconazole 50 - 75 WG in / on cowpea

Two foliar sprays of trifloxystrobin 25 + tebuconazole 50 – 75 WG in cowpea at 10 days interval @ 87.5+175 g a.i./ha at pod formation stage resulted in the residues below their limit of quantitation of 0.05 µg/g in matured pod /seed on the 42nd day (harvest) after the last application. Therefore, PHI of 42 days could be suggested for matured pods if the trifloxystrobin 25 + tebuconazole 50 – 75 WG combination is recommended in cowpea with 0.05 µg/g MRL. However, in green cowpea pods, as the residue levels reached below determination limit of 0.05 µg/g on the 20th day, PHI of 20-days could be suggested for green pods.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

35. Residue and persistence of deltamethrin 2.5 EC in/on chickpea

Three foliar sprays of deltamethrin 2.5 EC in chickpea at 7 days interval @ 12.5 g a.i./ha starting from pod setting stage resulted in its residue below its limit of quantitation of 0.05 µg/g in matured pods/seeds on the 37th day (harvest) after the last application. Therefore, PHI of 37 days could be suggested if deltamethrin 2.5 EC is recommended in chickpea with 0.05 µg/g MRL in seed. However, for green pods, PHI of 7 days could be suggested.

(Residue Analyst, AINP on Pesticide Residues, AAU, Anand)

36. Bio-efficacy of newer insecticides against tomato leaf miner, *Liriomyza trifolii* (Burgess)

For effective and economical management of leaf miner in tomato, spray spinosad 45 SC, 0.0135 per cent (3 ml/ 10 litre water; 67.5 g a.i./ha) or abamectin 1.9 EC, 0.0006 per cent (3 ml/ 10 litre water; 2.85 g a.i./ha) alongwith 400 g jaggery, first at appearance of the pest and subsequent two sprays at 15 days interval.

(Asstt. Res. Sci. (Ento.), MVRS, AAU, Anand)

37. Evaluation of different miticides against paddy mites

One spray of spiromesifen 240 SC, 0.024 per cent (10 ml/10 litre of water, 120 g. a.i./ha) or propargite 57 EC, 0.057 per cent (10 ml/10 litre of water, 285 g. a.i./ha) or fenpyroximate 5 SC, 0.005 per cent (10 ml/10 litre of water, 25 g. a.i./ha) at the time of initiation of yellow leaf mite of paddy was found effective.

(Asstt. Res. Sci. (Ento.), MRRS, AAU, Nawagam)

38. Evaluation of synthetic insecticides for the control of *Spodoptera litura* Fabricious infesting bidi tobacco under nursery conditions

Application of emamectin benzoate 5 SG, 0.0025 per cent (5 g / 10 liter water; 7.5 g a.i./ha) in tobacco nursery was found effective against leaf eating caterpillar (*Spodoptera litura* Fabricious) infesting bidi tobacco seedlings at the initiation of infestation.

(Asstt. Res. Sci. (Ento.), BTRS, AAU, Anand)

PLANT PATHOLOGY AND NEMATOLOGY

39. Bio-efficacy of newer fungicides against maydis leaf blight, turcicum leaf blight and curvularia leaf spot diseases in maize

For the management of leaf blight (maydis and turcicum) and curvularia leaf spot diseases of maize during kharif and rabi seasons, the seed treatment with captan 75 WS @ 3 g/ kg seeds followed by two sprays of azoxystrobin 18.2% + difenconazole 11.4% (29.6 SC), 0.03% (9.2 ml/ 10 litre of water) at 30 and 45 days after germination was found effective.

(Asstt. Res. Sci. (Pl. Path.), MMRS, AAU, Godhra)

DAIRY SCIENCE

1. Comparative appraisal of physical, chemical, instrumental and sensory evaluation methods for monitoring oxidative deterioration of ghee

1. Among BIS, AOAC, AOCS, FOX and IDF methods for determination of peroxide value of ghee, the use of FOX method is recommended since it is best correlated with the flavour score of ghee.
2. Among Weight gain, Conjugated dienes content, Iodine value, FFA content, Kreis number and Peroxide value (by FOX method) for monitoring primary stage of oxidation in ghee, determination of peroxide value of ghee by FOX method is recommended since it is best correlated with the flavour score of ghee.
3. Among Thiobarbituric acid, ρ-Anisidine value, Totox value and Carbonyl value for monitoring secondary stage of oxidation in ghee, the method of Carbonyl value is

recommended since it is best correlated with the flavour score of ghee.

(Prof. & Head, Department of DC, DSC, AAU, Anand)

2. Preparation of ghee from camel milk and evaluation of its shelf life

The ghee prepared from camel milk has Reichert Meissl (RM) value of 9.91 and Butyrorefractometer Reading (BR) at 40°C of 44.52. These parameters do not fulfill the present requirements specified by FSSAI and AGMARK for ghee. Therefore, while formulating FSSAI and/or AGMARK specifications for ghee prepared from camel milk, the RM value and BR reading at 40°C reported in the present study will be useful.

(Prof. & Head, Department of DC, DSC, AAU, Anand)

3. Evaluation of selected spices/herbs for their suitability to enhance the shelf life of paneer

Among the common culinary spices/herbs (ajwain, asafoetida, black pepper, cardamom, cinnamon, clove, coriander, cumin, fenugreek, garlic, ginger, mint, onion and turmeric), cardamom was found to be most effective to improve the shelf life of paneer. The addition of crushed cardamom seeds in milk @ 0.6% of the expected yield of paneer improves the shelf life of paneer up to 21 days at 7 ± 1°C.

(Prof. & Head, Department of DC, DSC, AAU, Anand)

4. Characterization of Khoa prepared from camel milk and evaluation of its suitability for preparation of selected sweets

The flavor of *gulabjamun* prepared from camel milk khoa blended with refined wheat flour (10%), *suji* (12%),

baking powder (0.25%) and water can be improved using cardamom, when added both in dough (20 ml extract of 7.5% crushed cardamom seed in water) and in sugar syrup (63°Brix) (3 g crushed cardamom seeds in 1 lit of sugar syrup).

(Prof. & Head, Department of DC, DSC, AAU, Anand)

5. Study on distribution pattern of nitrogenous components in milk

In pooled cow milk samples collected from Anand district, the average values of total nitrogen (TN), casein nitrogen (CN), whey protein nitrogen (WPN) and non-protein nitrogen (NPN) were 0.5102, 0.3903, 0.0793 and 0.0411%; in buffalo milk 0.6230, 0.4922, 0.0879 and 0.0429% while in mixed milk 0.5588, 0.4360, 0.0810 and 0.0418% respectively. Distribution of total nitrogen amongst CN, WPN and NPN was 76.50, 15.53 and 8.06% in cow milk; 79.00, 14.11 and 6.89% in buffalo milk; while it was 78.02, 14.50 and 7.48% in mixed milk respectively.

(Prof. & Head, Department of DC, DSC, AAU, Anand)

6. Metagenomic and Clinical investigation of synbiotic fermented dairy product containing probiotic *Lactobacillus helveticus* MTCC 5463 in geriatric volunteers

A honey supplemented probiotic fermented milk containing *Lactobacillus helveticus* MTCC 5463 is recommended for consumption by geriatrics as it is found to have immune boosting functional property in geriatrics and positively modulates the gut microflora.

The metagenomic study revealed that the faecal samples were dominated by Firmicutes (50%), Actinobacteria (20%) and Proteobacteria (10%) and feeding honey supplemented probiotic fermented milk resulted in 7% increase in Firmicutes, 1.5 % rise in Actinobacteria and 1.9% increase in Proteobacteria.

(Prof. & Head, Department of DM, DSC, AU, Anand)

FOOD PROCESSING TECHNOLOGY AND BIO-ENERGY

7. Screening of novel thermotolerant yeast with improved process economics for bioethanol production

Ethanogenic and thermotolerant AAU cultures ETGS1 and ETDLT1 are identified as strains of *Saccharomyces cerevisiae* and *Kluyveromyces marxianus*, respectively. These strains have shown potential for bioconversion of starch and lactose containing substrates into ethanol. Scientists interested in the process development for bioconversion of starch or lactose into ethanol can use these strains.

(Prof. & Head, Department of FQA, FPT & BE, AAU, Anand)

8. Screening, Identification and Characterization of Lactic Acid Bacteria with probiotic potential and phytic activity

Lactic acid bacterial strains *Pediococcus acidilactici* ID-01 and *Pediococcus lolii* ID-02 were isolated and identified having probiotic potential and phytate degrading ability. Scientists interested in phytate processing are advised to use these AAU strains.

(Prof. & Head, Department of FQA, FPT & BE, AAU, Anand)

AIT

9. e-Student Corner with Attendance and Result module for UG courses

e-Student corner web system developed by Anand Agricultural University is recommended for attendance, results and fees collection. The system is useful to Course Teachers, Academic in-charges, Principals, Registrar and Administrative Officers to carry out various academic activities of AAU and recommended for use in Anand Agricultural University.

(Director IT, AAU, Anand)

10. Web User Interface Assisted Document Management System

Web user interface assisted document management system developed by Anand Agricultural University automates the workflow process. It is applied for digitization of documents and recommended for use in Anand Agricultural University.

(Director IT, AAU, Anand)

11. Development of web based Procurement Management System

Web based procurement management system developed by Anand Agricultural University is useful to purchase goods. System generates comparative statement, *kharid patrak* etc. and recommended for use in Anand Agricultural University.

(Director IT, AAU, Anand)

12. Development of web based Online Tour Program

Web based online tour program developed by Anand Agricultural University is useful to place online tour

proposals for university staff members with provision for approval from authorities. It also generates print out of tour diary, TA-DA reports, and previous tour reports and recommended for use in Anand Agricultural University.

(Director IT, AAU, Anand)

13. Development of web based Online Bill Processing System

Web based online bill processing system developed by Anand Agricultural University automates many financial functions like budget entry, grant allocation, checking bill, passing bill and necessary reports for management. It is recommended for use in Anand Agricultural University.

(Director IT, AAU, Anand)

14. Development of Web Based PG Module of Student Corner for Anand Agricultural University

Web based PG Module of Student Corner developed by Anand Agricultural University is useful to store and manipulate PG students' information like basic details, course, degree, major and minor subject, major guide, seminar and synopsis approval date, thesis title, thesis date and notification. It is also useful for managing students progress in their studies and recommended for use in Anand Agricultural University.

(Director IT, AAU, Anand)

ANIMAL PRODUCTION

1. Effect of climatic factors on daily milk production of dairy cows

Minimum temperature, morning relative humidity and wind speed are responsible for 66 % of total climatic variations

in milk yield of dairy cows. Minimum temperature and morning relative humidity are negatively correlated, while wind speed has positive impact on milk yield.

(Res. Sci., Livestock Research Station, AAU, Anand)

2. *In vitro* evaluation of Fenugreek (*Trigonella foenumgraecum*) for its influence on substrate degradation and methanogenesis

Supplementation of Fenugreek seeds at 2% level in the total mixed ration for adult goats significantly ($P<0.01$) improved *in vitro* digestibility of dry matter and organic matter with reduction in methane emission.

(Res. Sci., ANRS, Vet. College, AAU, Anand)

3. Effect of incorporation of dried date palm (*Phoenix dactylifera* L. [Arecaceae]) leaves in total mixed ration for adult sheep and goats

Total mixed ration without or with air dried or green date palm leaves replacing jowar hay at 40% DM equivalent basis, has no adverse effect on voluntary feed intake, body weights and cost of feeding in adult Surti goats and Marwari sheep.

(Res. Sci., ANRS, Vet. College, AAU, Anand)

4. Effect of incorporation of dried date palm (*Phoenix dactylifera* L. [Arecaceae] leaves in total mixed ration for adult sheep and goats

Total mixed ration without or with air dried or green date palm leaves replacing jowar hay at 40% DM equivalent basis on feeding adult Surti goats or Marwari sheep do not influence rumen fermentation patterns and digestibility coefficient for dry matter, organic matter, proximate

constituents, neutral detergent fibres and acid detergent fibres.

(Res. Sci., ANRS, Vet. College, AAU, Anand)

5. To study the effects of feeding different quality maize on production performance and egg quality parameters of White Leghorn birds

Significantly higher content of lysine (0.427%), tryptophan (0.216 %), anthocyanin (0.874 mcg %) and total anti-oxidant activity (13.876 mg/100 g) are observed in eggs of White Leghorn layer birds fed layer mash containing purple colour maize in comparison with white maize (Gujarat Maize-3), yellow maize (Gujarat Anand Yellow Maize Hybrid-1) and High Quality Protein Maize-1 (HQPM-1) .

(Res. Sci.,Poultry Complex, Vet. College, AAU, Anand)

ANIMAL HEALTH

6. Study on effect of biherbal drug of *Bryophyllum calycinum* and *Tribulus terrestris* on urolithiasis

The biherbal methanolic extract of *Bryophyllum calycinum* (Panfuti) and *Tribulus terrestris* (Gokharu) (1:1) at the dose rate of 400 mg/kg body weight, orally, once in a day, for four weeks has antiurolithiatic effect on ethylene glycol induced urolithiasis in Wistar rat.

(Prof. and Head, Dept. of Vet. Pharmacology & Toxicology, Vet. College, AAU, Anand)

7. Effect of Inclusion of Antioxidants - Cysteine and Taurine - in TFYG Extender on Refrigeration (5°C) and Cryopreservation (-196°C) of Buffalo Semen

Taurine @ 4 mg/ml or cysteine @ 1 mg/ml in standard Tris

Fructose Yolk Glycerol (TFYG) extender is recommended to the semen banks as a routine antioxidant additive for improved cryopreservation and/or refrigeration preservation of buffalo semen as it significantly ($p<0.01$) enhanced sperm progressive motility, viability, and membrane integrity with reduced sperm/acrosome abnormalities.

(Prof. and Head, Dept. of Gynaecology and Obstetrics, Veterinary College, AAU, Anand)

8. Seasonal Influence on Efficacy of Estrus Induction and Synchronization Protocols in Anoestrus cows and Buffaloes

Three estrus/ovulation synchronization protocols, viz., Ovysynch, Heatsynch and Triu-B used in true anoestrus crossbred cows during winter and summer seasons resulted in per cent estrus induction (corresponding values during winter and summer seasons - 100.00, 100.00, 100.00; 88.88, 92.30 and 90.90, respectively) and conception rates (58.33, 41.66, 50.00; 44.44, 46.15 and 45.45, respectively). In anoestrus buffaloes, during winter and summer seasons, the corresponding per cent estrus induction and conception rates were 83.33, 91.66, 83.33; 73.33, 84.21, 83.33; and 58.33, 50.55, 50.00; 26.66, 21.05 and 33.33, respectively. Hence, the three protocols can be used round the year in cows, whereas in buffaloes, Ovysynch protocol to be used only during winter season.

(Prof. and Head, Dept. of Gynaecology and Obstetrics, Veterinary College, AAU, Anand)

SOCIAL SCIENCE

1. Yard stick of CV% for accepting the results of Safed musali (*Chlorophytum borivilianum*) crop experiments

The yard stick of CV% for accepting the results of Safed musali (*Chlorophytum borivilianum*) crop experiments is 21 per cent for yield character.

(Prof. & Head, Department of Ag. Statistics, BACA, AAU, Anand)

2. Yard stick of CV% for accepting the results of Ashwagandha (*Withania somnifera*) crop experiments

The yard stick of CV% for accepting the results of Ashwagandha (*Withania somnifera*) crop experiments is 22 per cent for yield character.

(Prof. & Head, Department of Ag. Statistics, BACA, AAU, Anand)

3. Yard stick of CV% for accepting the results of Isabgul (*Psyllium*) crop experiments

The yard stick of CV% for accepting the results of Isabgul (*Psyllium*) crop experiments is 23 per cent for yield character.

(Prof. & Head, Department of Ag. Statistics, BACA, AAU, Anand)

4. National level scale to measure attitude of extension functionaries towards Agricultural Technology Management Agency (ATMA)

The following national level scale to measure attitude of extension functionaries towards ATMA is recommended.

No	Statements	Responses & Scoring				
		SA	A	UN	DA	SDA
1	I think that ATMA is the perfect platform to coordinate agricultural research and extension activities at district level.	5	4	3	2	1
2	I think that ATMA is impractical way to develop rural India.	1	2	3	4	5
3	I believe ATMA is in real sense bottom-up approach to develop rural India.	5	4	3	2	1
4	I believe that ATMA means too many cooks spoil the broth.	1	2	3	4	5
5	I feel that ATMA is an ideal instrument for the development of district.	5	4	3	2	1
6	I feel that ATMA creates conflicts among neighboring farmers.	1	2	3	4	5
7	ATMA in real sense is a decentralized model of development.	5	4	3	2	1
8	I feel that ATMA is more theoretical and less practical.	1	2	3	4	5
9	I believe that ATMA is the best agency to encourage Farmer's Interest Groups.	5	4	3	2	1
10	I feel that ATMA is an effective attempt joining all the stakeholders to develop district.	5	4	3	2	1
SA: Strongly Agree, **A**: Agree, **UN**: Undecided, **DA**: Disagree, **SDA**: Strongly Disagree						

(Prof. & Head, Dept. of Ext. Edu., BACA, AAU, Anand)

5. Scale to measure attitude of farmers toward use of mineral mixture for cattle

The following scale to measure attitude of farmers towards use of mineral mixture for cattle is recommended.

No	Statements	Responses and Scoring				
		SA	A	UD	DA	SDA
1	I trust adopting mineral mixture for milch animals.	5	4	3	2	1
2	I believe that there is more propaganda about the use of mineral mixture as animal feed than truth.	1	2	3	4	5
3	I think that mineral mixture helps to feed crucial minerals to milch animals.	5	4	3	2	1
4	I believe that use of mineral mixture helps boosting milk yield in animals.	5	4	3	2	1
5	I think use of mineral mixture helps in making animal bones stronger.	5	4	3	2	1
6	I would like to advise my children to use mineral mixture for milch animals.	5	4	3	2	1
7	Use of mineral mixture ensures higher fertility rate in milch animals.	5	4	3	2	1
8	Use of mineral mixture reduces animal stress.	5	4	3	2	1
9	I think that progressive livestock owner is one who uses mineral mixture for animal feed.	5	4	3	2	1

10	I believe that health of milch animals can be improved faster using mineral mixture.	5	4	3	2	1
11	I believe that vigour of milch animal can be increased using mineral mixture..	5	4	3	2	1
12	I think using mineral mixture for milch animals is feasible only to rich farmers.	5	4	3	2	1
SA= Strongly Agree , A=Agree, UD=Undecided, DA=Disagree, SDA=Strongly Disagree						

(Prof. & Head, Dept. of Ext. Edu., BACA, AAU, Anand)

6. Scale to measure attitude of farmers towards dehorning in cattle

The following Scale to measure attitude of farmers towards dehorning in cattle is recommended.

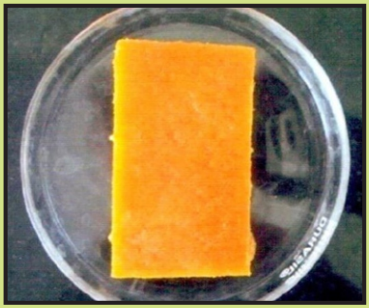
No	Statements	Responses and Scoring				
		SA	A	UD	DA	SDA
1	The dehorning in cattle is advantages method.	5	4	3	2	1
2	I dislike purchasing dehorned milch animals for my farm.	1	2	3	4	5
3	The dehorning is the healthier approach to improve animal health.	5	4	3	2	1
4	I think that dehorning in animals is unreliable practice.	1	2	3	4	5
5	I feel that adoption of recommended dehorning practices in animals involves risk but worth taking.	5	4	3	2	1
6	I think that dehorning reduces productivity of milch animals.	1	2	3	4	5
7	Dehorning helps in reducing risk of injury to other animals.	5	4	3	2	1
8	I think adoption of dehorning in animals is adoptable only by rich farmers.	1	2	3	4	5

9	Dehorning helps in decreasing danger of injury to cattle keepers.	5	4	3	2	1	
10	I believe dehorning helps animals in behaving advantageously.	5	4	3	2	1	
11	I think that progressive animal keeper is one who believes in dehorning practices in their milch animals.	5	4	3	2	1	
12	I would dislike advising my children to adopt dehorning in milch animals.	1	2	3	4	5	
SA= Strongly Agree , A=Agree, UD=Undecided, DA=Disagree, SDA=Strongly Disagree							

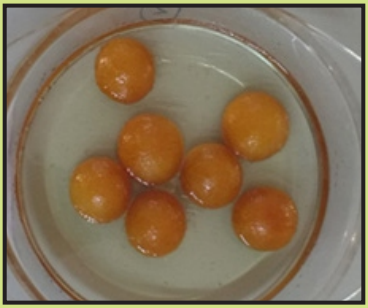
(Prof. & Head, Dept. of Ext, Edu., BACA, AAU, Anand)


યુનિવર્સિટી ભવન
ANAND AGRICULTURAL UNIVERSITY, ANAND

Basil Ice Cream



Protein fortified Pumpkin bar



Camel Milk Gulabjamun

Iron-rich biscuits

AAU

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Multi Tillage Tool

Potato Planter

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