

# RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS



2017



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# **RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS**

**2017**

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## Research Accomplishments and Recommendations-2017

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Dr. N. C. Patel

**VICE CHANCELLOR**  
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**ANAND - 388 110**

## **MESSAGE**

*Research is key to the national integrated framework of sustainable development goals. Agricultural research is at the heart of our efforts both to adapt to change and to transform the agriculture based livelihood of our farmers and other stake holders. Anand Agricultural University strives to provide enabling environment to the scientists so as to address the pertinent issues of agriculture and allied sectors through development of various technologies and advisories.*

*In context to above, I am happy to note that a booklet 'Research Accomplishments and Recommendations 2017' is being published, covering multidisciplinary technologies developed by the scientists of Anand Agricultural University for the benefit of farmers, scientists, extension workers, industrialists, NGO's and policy makers providing necessary scientific inputs to augment quality and quantity of agricultural production. I congratulate all the scientists and staff concerned with research activities in the University for their valuable contribution which will definitely help to improve the welfare of farmers in the state and nation.*

*I compliment Dr. K. B. Kathiria, Director of Research and his team for their sincere efforts in bringing out this valuable scientific publication covering the new technologies generated by the Anand Agricultural University. I am sure that this publication will be a very useful source of information to all those concerned with the agriculture and related sectors.*

**( N. C. Patel)**





**ANAND AGRICULTURAL UNIVERSITY**  
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**Director of Research  
and Dean PG Studies**

## ***FOREWORD***

*It is a matter of immense pleasure for me to put forward the 12th publication of 'Research Accomplishments and Recommendations 2017' containing compiled information on technologies developed and recommended by the scientists of Anand Agricultural University for the benefit of farming community, extension workers, entrepreneurs, veterinary / dairy professionals and other end users. I congratulate all the scientists who were directly or indirectly involved in developing the valuable technologies. I am confident that the output of our research efforts will not only boost up the output of agriculture and allied sectors but will also improve the quality of the produce and solve many problems and challenges faced by the state and the nation.*

*I express my sincere thanks to the Hon'ble Vice Chancellor, Dr. N. C. Patel for his guidance and useful inputs in improving the research outcome of Anand Agricultural University. I am thankful to all the conveners of AGRESCO sub-committees and Deans of various faculties for their support in the process of monitoring, scrutinizing and executing the research projects of the University by conducting AGRESCO meetings smoothly and meaningfully. The staff of the Directorate of Research deserves special appreciation for their untiring support enabling me to justify the mandate of my office.*

**(K. B. Kathiria)**





## ***PREFACE***

The research work carried out in different fields of agricultural sciences during the year 2016-17 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.

<b>Name of the sub-committee / faculty</b>	<b>No. of recommendations</b>	
	<b>For farmers/ entrepreneurs</b>	<b>For scientific community</b>
Crop Improvement	07	02
Crop Production	22	02
Plant Protection	09	24
Dairy Science and FPT & BE	21	06
Agri. Engineering & AIT	04	05
Animal Production	04	08
Animal Health	01	03
Social Science	-	09
<b>Total</b>	<b>68</b>	<b>59</b>

## RECOMMENDATIONS FOR FARMING COMMUNITY

### CROP IMPROVEMENT

#### PLANT BREEDING

##### 1. Crop : Bottle Gourd

Variety :Gujarat Anand Bottle Gourd Hybrid 1 (GABGH 1)



This hybrid of bottle gourd was developed through hétérosis breeding method having long vine growth habit. Fruits are cylindrical in shape with attractive light green colour, long peduncle with flat shape of apex at peduncle end. The hybrid gave 252.7q/ha yield as compared to check ABG 1 (190.7 q/ha) as well as check Pusa Naveen (175.3 q/ha). It recorded 32.5 (%), 44.1 (%), 38.6 (%) and 29.2 (%) higher yield over the checks viz., ABG 1, Pusa Naveen, NDBG 104 and NDBGH 4, respectively. It has low incidence of Mosaic and Downy mildew as compared to checks. GABGH

1 has higher chlorophyll content, moisture % and reducing sugar (%) as compared to all the checks. This hybrid is recommended for both *kharif* and summer seasons under irrigated conditions in middle Gujarat and for *kharif* season only in Saurashtra region

*(Research Scientist (Veg.), MVRS, AAU, Anand)*

## **2. Crop : Tomato**

### **Variety :Gujarat Anand Tomato 5 ( GAT 5)**



This variety of tomato GAT 5 has determinate plant type with dark green foliage, medium intensity of green colour on fruit before maturity; Fruits are circular in shape at longitudinally section and flat shape at blossom end. This variety exhibited 47.93, 46.71 and 92.96 per cent higher fruit yield over the check variety AT 3, DVRT 2 and JT 3, respectively. This variety had low incidence of the TLCV, leaf miner and fruit borer damage as compared to the check varieties. This variety contains higher total soluble solid (5.54 °Brix) and total soluble sugar (4.78%) as compared to the check varieties. This variety recommended for cultivation in middle Gujarat.

*(Research Scientist (Veg.), MVRS, AAU, Anand)*

### 3. Crop : Kuvarpathu

Variety:Gujarat Anand Kuvarpathu1 (GAK1)



The variety GAKP 1 yielded 106.40 t/ha fresh leaf which is 44.11 and 25.75% higher than checks Anand local and Kutch Selection, respectively. It yielded 62.79 t/ha mucilage which was 57.72 and 38.36% higher than checks Anand local and Kutch Selection, respectively. GAKP 1 produced 23.27 kg/ha Aloin-A which was 105.92 and 109.26 per cent higher over the checks Anand local and Kutch Selection, respectively. Low incidence of leaf spot disease. This variety is recommended for cultivation in Gujarat state.

*(Research Scientist, M & APRS, AAU, Anand)*

### 4. Crop : Soybean

Variety: NRC 37 (Ahilya 4)

This variety NRC 37 found superior for seed yield by 17.83 % over national check JS 335 as well as 35.66 and 47.29 % over local check GS 1 and GS 3, respectively in middle Gujarat. The seeds are attractive due to its shape and colour. It possesses



19.15 % oil. The variety NRC 37 is non-shattering in habit, white coloured flowers and hairy pods. This variety is recommended for cultivation in middle Gujarat

*(Research Scientist, TRTC, AAU, Devagadh Baria)*

## **5. Crop : Durum Wheat**

### **Variety: Gujarat Anand Durum Wheat 3 (GADW 3)**



This variety having attractive bold amber grains with test weight of 56-62 grams as compared to GW 1 (52-58 g). The variety GADW 3 produced on an average 1508 kg/ha grain under timely sown rainfed conditions which is 10.72% higher than GW 1 (1362 kg/ha). Moderately resistant to black and brown rust disease. The grains of GADW 3 having high  $\beta$ -Carotene (2.11 ppm) as compared to GW 1 (1.48 ppm). This variety is recommended for cultivation in *Bhal* and Coastal agro climatic Zone-VIII of Gujarat state.

*(Asstt.Res. Sci., ARS, AAU, Dhandhuka)*



## 6. Crop : Bidi Tobacco

Variety: Gujarat Anand Bidi Tobacco Hybrid 2 (GABTH 2)



This hybrid gave on an average (3948 kg/ha) 16.98 percent higher yield than existing hybrid MRGTH 1(3375 kg/ha) under irrigated conditions. It produce more number of leaves per plant with good spangling and puckering and comparable to MRGTH 1 in chemical constituents of leaf. This hybrid recommended for irrigated tobacco cultivated area of middle Gujarat

*(Research Scientist, BTRS, AAU, Anand)*

## CROP PRODUCTION

### CULTURAL PRACTICES

#### 1. Relay cropping of castor in legume crops

The farmers of middle Gujarat agro climatic zone are recommended to adopt soybean-castor relay cropping system for getting castor equivalent higher yield and net return. Soybean NRC 37 is to be sown 45 cm apart in first

fortnight of July and castor GCH 7 in second fortnight of August wherein, skip one row for sowing of castor after two rows of soybean.



***(Research Scientist, Regional Research Station, AAU, Anand)***

**2. To study the castor based intercropping system preceding *kharif* crop under middle Gujarat conditions**

The farmers of middle Gujarat agro climatic zone growing *rabi* castor (GCH 7) are recommended to grow three rows of chickpea (GG 1) for green pods at 30 cm spacing between two rows of castor sown at 150 cm spacing during 1<sup>st</sup> fortnight of October for getting castor equivalent higher yield and net return.

***(Research Scientist, Regional Research Station, AAU, Anand)***

**3. Effect of different date of planting and spacing on dry biomass yield of *Artemisia annua* Linn.)**

The farmers of middle Gujarat agro climatic zone cultivating artemisia in *rabi* season are recommended to transplant artemisia during 3<sup>rd</sup> week of November to 3<sup>rd</sup> week of December with the spacing of 60 x 60 cm for securing higher dry biomass yield and net return.

***(Research Scientist, M & APRS, AAU, Anand)***

4. Assessment of cropping sequences for bidi tobacco growing area of middle Gujarat agro climate zone

The farmers of middle Gujarat agro climatic zone are recommended to adopt prevailing *bidi* tobacco-pearl millet crop sequence for getting higher yield and net return.

***(Research Scientist, BTRS, AAU, Anand)***

5. Effect of intercropping pattern on soybean and maize yield in middle Gujarat conditions

The farmers of middle Gujarat agro climatic zone are recommended to grow soybean(NRC 37) and maize (GM 6) as intercrop in 3:2 row ratio with distance of 45 cm during *kharif* season for getting higher yield and net return.



Soybean and maize intercropping (3:2 row ratio)

***(Res. Sci. (Agron.), TRTC, AAU, Devgadhi Baria)***

6. To evaluate sowing time and varieties of chickpea for green pod yield in middle Gujarat agro climatic conditions

The farmers of middle Gujarat agro climatic zone growing chickpea for green pods are recommended to sow variety GG 2 during 4<sup>th</sup> week of September to 2<sup>nd</sup> week of October for getting higher yield of green pods and net return.

***(Senior Scientist & Head, KVK, AAU, Dahod)***



## 7. Influence of different spacing and plant growth regulators on growth and flower yield of spider lily under middle Gujarat Agro-climatic conditions

The farmers of middle Gujarat Agro climatic zone are recommended to grow spider lily at spacing of 60 x 60 cm with recommended dose of fertilizer (20 t FYM, 300 + 200 + 200 kg NPK/ha ) and 2 sprays of gibberellic acid @ 200 mg/ liter of water for getting higher yield and net return.

Apply spray of gibberellic acid at 45 and 60 days after planting of bulbs in first year and from second year onwards, spray at 45 and 60 days after cutting of leaves.

*(Principal, College of Horticulture, AAU, Anand)*

## 8. Evaluation of the possibility of inter-cropping system with banana cultivation in tribal area of Chhotaudepur region of middle Gujarat

The farmers of middle Gujarat Agro climatic zone are recommended to grow banana (cv. Grand Naine) at 1.8 × 1.8 m spacing and adopt intercropping with cauliflower or cabbage (30 × 30 cm) at the row ratio of 1:4 to get the additional yield and income without affecting the yield of banana.



*(Assistant Research Scientist, ARS, AAU, Jabugam)*

## NUTRIENT MANAGEMENT

### 9. Response of castor (*Ricinus communis* L.) to N, P and K under middle Gujarat condition

The farmers of middle Gujarat agro climatic zone are recommended to apply 100 kg N/ha (50 kg as basal and 50 kg at 45 DAS) and 25 kg  $P_2O_5$ /ha as basal in soils having phosphorous availability



medium to sufficient to castor grown in late *kharif* for getting higher yield and net return.

**(Professor & Head, Department of Agronomy, BACA, AAU, Anand)**

### 10. Response of wheat (*Triticum aestivum* L.) to N, P and K under middle Gujarat conditions

The farmers of middle Gujarat agro climatic zone growing wheat are recommended to apply 120 kg N/ha (60 kg as basal and 60 kg at tillering stage) and 30 kg  $P_2O_5$ /ha (soil having medium to high P status) as basal for getting higher yield and net return.



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

### 11. Response of N, P and bio-fertilizers on summer pearl millet (*Pennisetum glaucum* L.) under middle Gujarat conditions

The farmers of middle Gujarat agro climatic zone growing summer hybrid pearl millet are recommended to apply 140 kg N/ ha (70 kg as basal + 70 kg at 30 DAS) and 40 kg  $P_2O_5$ /ha as basal for securing higher yield and net return.



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

### 12. Effect of cow dung and anubhav bio degrader bacterial consortium (ABBC) on composting of banana pseudostem or maize fodder (waste) for preparation of vermicompost

The farmers of middle Gujarat agro climatic zone are recommended to prepare vermicompost from banana pseudostem or maize fodder using anubhav bio degrader bacterial consortium @ 1 Lit/t along with 5 % cow dung which gives high quality compost 15 days earlier than normal vermi composting method.

Method for preparation of vermicompost from banana pseudostem or waste maize fodder (100 kg)

1. Make small pieces (5-10 cm) of banana pseudostem or maize fodder (waste) and dry it under sunlight. Put the dried pieces of banana pseudostem or maize fodder (waste) in plastic bed (size 3.0x1.0x0.6 m).
2. Sprinkle water on pseudostem or maize fodder (waste) to get it wetted.

3. After one week, mix the anubhav bio degrader bacterial consortium 100 ml/10 l water & spread on materials kept in the bed. Similarly, spread the slurry prepared by mixing 5 kg cow dung in 10 l water. Release 400 g earthworms (*Eisenia fetida*) in 100 kg pieces of banana pseudostem or maize fodder (waste) in bed.
4. Cover the bed with old gunny bags till the compost is ready by sprinkling the water.
5. Sprinkling of water is discontinued when compost is ready. Vermicompost is collected after 8-10 days, thereafter sieve the material for use.

The vermicompost will be ready within 70 to 75 days.



**(Assistant Research Scientist, ARS, AAU, Jabugam)**

13. Effect of different organic manures and nitrogen levels on yield of vernonia (Kalijiri); *Vernonia anthelmintica* (L) Willd under middle Gujarat conditions

The farmers of middle Gujarat agro climatic zone growing

vernonia are recommended to apply FYM 10 t/ha along with 50 kg N/ha (25 kg as basal and 25 kg as top dressing at 45 DAS) and 25 kg  $P_2O_5$ /ha as basal for securing higher seed yield and net return



FYM 10 t/ha+ 50 kg N /ha

***(Research Scientist, M & APRS, AAU, Anand)***

**14. To revalidate the fertilizer recommendation of widely cultivated bidi tobacco varieties**

The farmers of middle Gujarat agro climatic zone growing *bidi* tobacco (GT 7 and A 119) are recommended to apply 140 kg N/ha whereas, 180 kg N/ha to MRGTH 1 for getting higher yield and net return.

***(Research Scientist, BTRS, AAU, Anand)***

**15. Performance of single cross hybrid maize in varying levels of nitrogen and phosphorus under rainfed conditions**

The farmers of middle Gujarat agro climatic zone growing rainfed maize hybrids GAYMH 1 and GAWMH 2 in Panchmahal district are recommended to fertilize the crop with 160 kg N and 20 kg  $P_2O_5$  per hectare, while in Dahod district, farmers are recommended to fertilize the crop with



160 kg N and 60 kg  $P_2O_5$  per hectare in soils having low  $P_2O_5$  for getting higher yield and net return. The nitrogen should be applied in four equal splits i.e., at basal, 4 leaves, 8 leaves and tasseling stage while  $P_2O_5$  as basal.

**(Research Scientist, MMRS, AAU, Godhra)**

#### 16. Effect of different levels of nitrogen and phosphorus on yield of castor under supplementary irrigation in *Bhal* region

The farmers of *Bhal* and coastal agro climatic zone growing semi *rabi* castor (GCH 7) under conserved soil moisture conditions are recommended to apply 37.5 kg N/ha and 50 kg  $P_2O_5$ /ha as basal and 37.5 kg N/ha in two equal splits after irrigation at 21 and 45 DAS for getting higher yield and net return.



(75 kg N ha<sup>-1</sup> + 50 kg  $P_2O_5$  ha<sup>-1</sup>)

**(Associate Research Scientist, ARS, AAU, Arnej)**

#### 17. Effect of chemical fertilizers and organic manures in high density planting system on growth, yield and quality of banana cv. Grand Naine

The farmers of middle Gujarat Agro climatic zone interested to grow banana (cv. Grand Naine) are recommended to plant at 1.2 x 1.2 x 2.0 m paired row system to get higher yield and net return.

To obtain consistent yield the organic manure as basal dose (10 kg FYM) and chemical fertilizers (300-100-200 g

NPK per plant) be given through drip in six equal splits at 90, 105, 120, 135, 150 and 165 days after planting. Apply irrigation through drip at alternate day @ 0.8 PEF (October to February 2 hours 30 minutes and March to June 5 hours) and system laid out with 2 drippers (4 lph capacity) for each plant.



***(Professor & Head, Department of Horticulture, BACA, AAU, Anand)***

#### **18. Assessment of Natural Organic Liquid (NOL) and inorganic nutrient supply system on yield and quality of banana cv. Grand Naine**

The farmers of middle Gujarat Agro climatic zone interested to grow banana (cv. Grand Naine) are advised to apply recommended dose of fertilizer (10 kg FYM and 300-100-200 g NPK per plant) and AAU PGPR (Plant Growth Promoting Rhizobacteria) bio NPK consortium @ 1 ml/plant near root zone after one month of planting.

OR

Recommended dose of fertilizer (10 kg FYM and 300-100-200 g NPK per plant) and AAU PGPR (Plant Growth Promoting Rhizobacteria) bio NPK consortium @ 1 ml/

plant after one month of planting along with drenching of NOL @ 500 l/ha near root zone of plant each at 30 and 45 days after planting for getting higher yield and net return.

#### NOL preparation

Materials required	Quantity of materials required for soil application
Water	500 lit
Cow dung	50 kg
Cow urine	25 lit
Jaggery / Molasses	5 kg
Butter milk	5 lit
Pulse flour	5 kg
Soil under banyan tree	2.5 kg
Period	7 days

Mix the above materials in barrel or tank and keep it for 7 days

- The above mixture should be stirred two times daily



RDF + FYM + Biofertilizer AAU PGPR bio NPK consortium  
 RDF + FYM + Biofertilizer AAU PGPR bio NPK consortium +  
 NOL Drenching @ 500 lit/ha at 30 and 45 DAP



## WATER MANAGEMENT

### 19. Effect of irrigation intervals on dry biomass yield of dodi (*Leptadenia reticulata* W. & A.)

The farmers of middle Gujarat agro climatic zone growing dodi crop in *kharif* are recommended to irrigate the crop at 0.8 IW/CPE ratio (12 irrigations each at interval of 20-25 days in winter and 12-15 days in summer) after first cutting i.e. 90 DATP for securing higher dry biomass yield and net return.

*(Research Scientist, M & APRS, AAU, Anand)*

### 20. Response of different nitrogen levels and time of application through fertigation on green cob yield of sweet corn (*Zea mays* L. Sachharata Strut) under middle Gujarat conditions

The farmers of middle Gujarat agro climatic zone growing sweet corn in *rabi* season are recommended to adopt drip irrigation at 0.8 PEF and fertilize the crop with 75% of RDN (90 kg/ha) in five equal splits (i.e. at basal, 20, 30, 40 and 50 DAS) through fertigation and 60 kg  $P_2O_5$  as basal for getting higher yield and net return.

#### System details:

1.	Lateral spacing	: 90 cm
2..	Dripper spacing	: 45 cm
3.	Dripper discharge	: 4 lph
4.	Operating pressure	: 1.2 kg/cm <sup>2</sup>
5.	Operating frequency	: Alternate day
6.	Operating time	: 55 minutes

*(Res. Sci. (Agron.), TRTC, AAU, Devgadhi Baria)*

## 21. Nitrogen management in summer sesame (*Sesamum indicum* L.) under drip irrigation system in *goradu* soil of middle Gujarat conditions

The farmers of middle Gujarat agro climatic zone growing summer sesame (Gujarat Sesame 2) are recommended to sow the crop adopting paired row (30-30 cm x 15 cm : 60 cm) in last week of February and adopt drip irrigation at 0.8 PEF and fertilize



with 40 kg N/ha i.e. 10 kg N/ha as basal and 30 kg N/ha in 5 equal splits at weekly interval starting from 25 DAS and 25 kg P as basal and liquid biofertilizer, *Azospirillum* and PSB, *Bacillus coagulans* @ 1 lit/ha for getting higher yield and net return.

### ***System details:***

1.	Lateral spacing	: 90 cm
2.	Dripper spacing	: 45 cm
3.	Dripper discharge	: 4 lph
4.	Operating pressure	: 1.2 kg/cm <sup>2</sup>
5.	Operating frequency	: Alternate day
6.	Operating time	: March-April 55 minutes and May 90 minutes

***(Associate Research Scientist, ARS, AAU, Thasra)***

## WEED MANAGEMENT

### 22. Assessment of premix broad spectrum herbicides for weed management in wheat

The farmers of middle Gujarat agro climatic zone growing wheat are recommended to apply premix broad spectrum herbicide clodinafop propargyl (15%) + metsulfuron methyl (1% WP) 64 g/ha or sulfosulfuron (75%) + metsulfuron methyl (5%) WG 32 g/ha (mix in 500 litres of water) as post emergence application (25-30 DAS) or carry out hand weeding at 20 and 40 days after sowing for effective management of complex weed flora and higher net return. No adverse effect of herbicides on succeeding crops was observed.



**Clodinafop + metsulfuron (Pre mix) (64 g/ha) PoE**

**Sulfosulfuron + metsulfuron (Pre mix) (32 g/ha) PoE**

***(Agronomist & PI, AICRP-Weed Management, AAU, Anand)***

## PLANT PROTECTION

### AGRICULTURAL ENTOMOLOGY

#### 1. Bio-efficacy of some insecticides against Bihar hairy caterpillar, *Spilosoma obliqua* Walker on cowpea, *Vigna unguiculata* (Linnaeus) Walpers

For effective and economical control of Bihar hairy caterpillar, *Spilosoma obliqua* Walker in cowpea, farmers of middle Gujarat are recommended to apply one spray of any one of the following insecticides at the initiation of the pest.

- 1) Thiodicarb 75 WP, 0.15% (20 g/10 litre of water)
- 2) Indoxacarb 15.8 EC, 0.0158% (10 ml/10 litre of water)
- 3) Emamectin benzoate 5 SG, 0.0025% (5 g/10 litre of water)

Recommendation for PHI as per CIB guidelines

Year	Crops	Pest	Pesticides with formulation	Dosage/ha				Appl. schedule	Waiting period/ PHI (Days)
				g. a.i.	Quantity of formulation (g/ml)	Conc. (%)	Dilution in water (litre)		
2017	Cowpea	Bihar Hairy Caterpillar	Thiodicarb 75% WP	750	1000	0.15	500	One spray at flowering stage	17
			Indoxacarb 15.8% EC	79	500	0.0158	500		12
			Emamectin benzoate 5% SG	12.50	250	0.0025	500		14

**(Professor and Head, Dept. of Ento., BACA, AAU, Anand)**

#### 2. Integrated management of termite in wheat

The farmers of middle Gujarat growing irrigated wheat are recommended to apply cake before sowing and sow the seeds air dried for 12 hours after treating with any one of the following insecticides diluted in 5 litre of water for the

management of termite.

1. Castor cake @ 1 ton/ha and fipronil 5 SC 500ml/100 kg seeds
2. Castor cake @ 1 ton/ha and chlorpyrifos 20 EC 400 ml/100 kg seeds
3. Neem cake @ 1 ton/ha and fipronil 5 SC 500 ml/100 kg seeds

***(Professor and Head, Dept. of Ento., BACA, AAU, Anand)***

### 3. Bio-efficacy of selected insecticides against pink bollworm in *Bt* cotton

The farmers of Gujarat growing *Bt* cotton are recommended to apply any one of the following insecticides alternatively, first spray at 75 days after sowing and second at 15 days of first spray for effective management of pink bollworm.

1. Indoxacarb 15.8 EC, 0.0079 % (5 ml/ 10 litre of water)
2. Emamectin benzoate 5 SG, 0.0025 % (5 g/10 litre of water)
3. Spinosad 45 SC, 0.014 % (3 ml/10 litre of water)

Year	Crop	Pest	Pesticides with formulation	Dosage/ha				Appl. schedule	Waiting period / PHI (Days)
				g. a.i.	Quantity of formulation (g/ml)	Conc. (%)	Dilution in water (litre)		
2017	Cotton	Pink bollworm	Indoxacarb 15.8 EC	39.5	500	0.0079	500	75 and 90 DAS	14
			Emamectin Benzoate 5 SG	12.5	500	0.0025			10
			Spinosad 45 SC	67.5	300	0.014			10

***(Professor and Head, Dept. of Ento., BACA, AAU, Anand)***

#### 4. Impact of sowing periods on incidence of pest complex in pigeon pea.

Farmers of middle Gujarat are advised to sow pigeon pea variety Anand Gujarat Tur 2 (AGT 2) from 25<sup>th</sup> June to 1<sup>st</sup> July (26<sup>th</sup> std week, onset of monsoon) to minimize the incidence of pod borers and thereby increase the seed yield.

**(Research Scientist, Pulse Res. Station, AAU, Vadodara)**

#### 5. Bio-efficacy of microbial insecticides against sucking pests in *Bt* cotton

The farmers of middle Gujarat growing *Bt* cotton are advised to spray *Lecanicillium lecanii*  $2 \times 10^8$  cfu/g (1% WP) @ 40 g /10 litre water) or *Beauveria bassiana*  $2 \times 10^8$  cfu/g (1% WP) @ 40 g /10 litre water) at fortnightly interval for three times starting from initiation of sucking pests for the effective biological control.

Year	Crop	Pest	Pesticides with formulation	Dosage				Application schedule	Waiting period/ PHI (days)	Remarks
				a.i/ ha	quantity of formulation /ha	Conc (%)	Dilution in water			
2016-17	<i>Bt</i> Cotton	Sucking pests (Aphid, jassid, white-fly, thrips)	<i>Lecanicillium lecanii</i> (1% WP) ( $2 \times 10^8$ cfu/g) or <i>Beauveria bassiana</i> (1% WP) ( $2 \times 10^8$ cfu/g)	---	1.8 kg	--	450 liter	Spray of <i>Lecanicillium lecanii</i> (1% WP) @ 40 g /10 litre water)/ <i>Beauveria bassiana</i> (1% WP) @ 40 g /10 litre water) at fortnightly interval for three times starting from initiation of sucking pests	---	---

**(Principal Research Scientist, AICRP on Biocontrol, AAU, Anand)**

## 6. Bio-efficacy of insecticides against stem borer (*Chilo partellus*) infesting maize

Farmers of the middle Gujarat growing *kharif* maize for grain purpose are advised to apply whorl application of carbofuran 3 G @ 10 kg/ha two times at 30 and 40 days after germination for the effective and economical management of stem borer.

Year	Crop	Pest	Pesticides with formulation	Dosage			Application schedule	Waiting period/ PHI (days)	Re-marks
				g a.i./ ha	quantity of formulation /ha	Dilution in water (10 lit.)			
2017	Maize ( <i>Kharif</i> )	Stem borer ( <i>Chilo partellus</i> )	Carbofuran 3G	300	10 kg		Two whorl application at 30 and 40 days after germination.	60 days	-

**(Assistant Research Scientist, MMRS, AAU, Godhra)**

## 7. Bio-efficacy of insecticides against girdle beetle *Oberea brevis* Swedenbord of soybean

Farmers of middle Gujarat growing soybean are recommended to treat the seeds with imidacloprid 600 FS @ 9 ml/ kg seeds and spray twice with chlorantraniliprole 18.5 SC, 0.006% (3 ml/ 10 litre of water) at 40 and 55 days after sowing for effective management of stem borer(girdle beetle).

Year	Crops	Pest	Pesticides with formulation	Dosage/ha				Appl. schedule	Waiting period /PHI (Days)	Re-mark
				g. a.i.	Quantity of formulation (g/ml)	Conc. (%)	Dilution in water (litre)			
2017	Soy-bean	Girdle beetle, <i>Oberea brevis</i> Swedenbord	Seed treatment with imidacloprid 600 FS @ 9 ml/ kg seeds and spray twice chlorantraniliprole 18.5 SC @ 0.006% (3 ml/ 10 litres of water)	5.4 g/kg seed & 30 g	150	0.006	500	At the time of sowing and 40 and 55 DAS	22	--

**(Scientist(Plant Protection), KVK, AAU, Dahod)**

## 8. Bio-efficacy of different insecticides against major lepidopteran pests of soybean

Farmers of middle Gujarat growing soybean are advised to apply two sprays (first at initiation of pest and second at 15 days after first spray) of chlorantraniliprole 18.5 SC, 0.006 % (3 ml/10 litre of water, 30 g.a.i./ha) or indoxacarb 15.8 EC, 0.0079 % (5 ml/ 10 litre of water, 39.5 g.a.i./ha) alternatively for effective control of lepidopteran pests viz; *Spilosoma obliqua* (Walker) and *Spodoptera litura* Fab.

Year	Crop	Pest	Pesticides with Formulations	Dosage/ha				Appl. schedule	Waiting period /PHI (Days)
				g.a.i.	Quantity of formulation g/l	Conc. (%)	Dilution in water (10 lit)		
2017	Soy-bean	Bihar hairy caterpillar, <i>Spilosoma obliqua</i> (Walker) and leaf eating caterpillar, <i>Spodoptera litura</i> Fab.	Chlorantraniliprole 18.5 SC	30	0.3	0.006	3 ml	First spray at initiation of pest and second at 15 days after first spray	22
			Indoxacarb 15.8 EC	39.50	0.5	0.0079	5 ml		

**(Assistant Professor(Ento), COA, AAU, Jabugam)**



## PLANT PATHOLOGY AND NEMATOLOGY

### 9. Impact of agro-shade net on damping-off disease in bidi tobacco nursery

Farmers of middle Gujarat growing bidi tobacco nursery are recommended to raise the nursery by covering the nursery beds either with green agro-shade net of 75% or 90% shade about 60 cm height from soil and spray drench with azoxystrobin 23 SC, 0.023% (10 ml/10 litre water/ 100 m<sup>2</sup>) as and when required to minimize damping-off disease and thereby getting more number of healthy seedlings

Year	Crop	Pest	Pesticide with formula-tion	Dosage				Application schedule	Waiting period/ PHI (days)
				g. a.i./ ha	Quantity of formula-tion/ ha	Conc (%)	Dilution in water (10 lit.)		
2017	Bidi Tobacco (Nursery)	Damping-off	Azoxystrobin 23 SC	230	1 lit.	0.023	10 ml	Spray drench at the initiation of the disease and as and when required thereafter.	.

*(Res. Sci. (Pl.Path.), BTRS, AAU, Anand )*

## 10. Bioefficacy of fungicides against powdery mildew of clusterbean

Farmers of middle Gujarat growing cluster bean in *kharif* season are recommended to spray Hexaconazole 5 SC, 0.005% (10 ml/ 10 lit. water) twice to manage powdery mildew. The first spray is to be applied at the time of initiation of the disease and second at 15 days of first spray.

*(Asstt. Res. Sci. (Ento.), ARS, AAU, Derol)*

## BASIC SCIENCES

### PLANT PHYSIOLOGY

#### 1. Seed priming and foliar spray of stress mitigating chemicals for ameliorating moisture stress in conserved moisture conditions in chickpea

The farmers of *Bhal* & Coastal Agro-climatic Zone –VIII growing rainfed chickpea are advised to soak seeds with Thiourea @ 500 ppm (0.5 g/l) per kg seed for one hour before sowing and apply two spray of thiourea @ 1000 ppm (1.0 g/l) at vegetative stage (30-35 DAS) and at pod filling stage (45-50 DAS) to get maximum seed yield and net return”.



*(Asstt. Res. Sci., ARS, AAU, Dhandhuka)*

## DAIRY SCIENCE / FPT&BE

### DAIRY SCIENCE

#### 1. Study on use of *mulberry* in development of natural ice cream

The entrepreneurs and food processors interested in manufacturing of natural *mulberry* ice cream are recommended to adopt the production technology developed by Anand Agricultural University, Anand. The technology involves incorporating *mulberry* pulp @ 8.0% by weight of ice cream mix, along with the addition of sago @ 1.0% and WPC-70 @ 0.5% as the natural source of stabilizer and emulsifier, respectively.

***(Head, Dept. of Dairy Technology, DSC, AAU, Anand)***

#### 2. Utilization of paneer whey in cultured butter milk

Dairy industry and entrepreneurs are recommended to use method developed by Anand Agricultural University for the preparation of probiotic cultured buttermilk with acceptable sensory qualities and enhanced biofunctional properties by blending dahi with fermented paneer whey in 60:40 ratio (w/w) using starter cultures *Lactobacillus helveticus* MTCC 5463 and *Lactococcus lactis* subsp. *diacetylactis* (NCDC 60) in 1:1 ratio at 1% rate of inoculum. The product stored in PET bottles has shelf life of 5 days at  $7 \pm 1^\circ\text{C}$ .

***(Head, Dept. of Dairy Chemistry, DSC, AAU, Anand)***

#### 3. Development of value added buttermilk, dahi and ice cream containing drumstick.

Dairy industry and entrepreneurs are recommended to use method developed by Anand Agricultural University

for manufacturing of buttermilk containing Moringa leaf powder as an ingredient. One serving size (300 g) per day of the product could be a good source of Vitamin A, calcium and iron providing 10, 18 and 11% DV vs. 3.6, 15 and 2.83% DV respectively present in buttermilk without addition of moringa. Moreover, the product contains considerable amount of Vitamin C (~9% DV). The acceptability of the product could be improved by addition of two blends of spices viz. Blend A (consisting of equal quantities of roasted cumin and ginger powder) and Blend B (consisting of mixture of dry mango and black pepper in the proportion of 80:20 w/w) @ 0.20 and 0.30 % (w/w) of buttermilk, respectively. The product had a shelf-life of 20 days at  $7 \pm 2^\circ\text{C}$  when packaged in Polyethylene terephthalate (PET) bottles.

***(Head, Dept. of Dairy Microbiology, DSC, AAU, Anand)***

#### **4. Evaluation of bacterial culture for treatment of dairy effluent**

Dairy industry and entrepreneurs are recommended to adopt method developed by Anand Agricultural University using aerobic bacterial culture *B. cereus* MTCC 25641 for the reduction of effluent treatment loads of commercial dairy plants. This culture is found effective in reduction of COD by about 90% in 7 days of aeration when added @ 2 % in pilot scale experimental plant.

***(Head, Dept. of Dairy Microbiology, DSC, AAU, Anand)***

#### **5. Development of oat based probiotic smoothie**

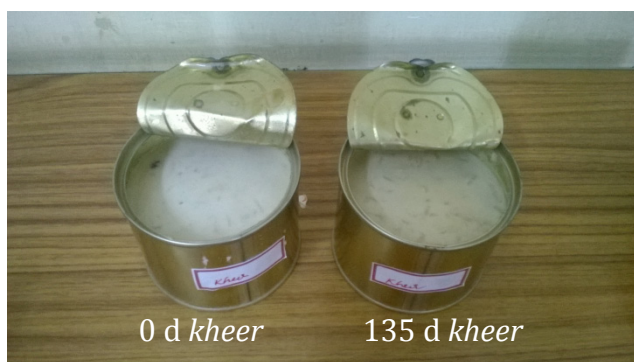
Dairy Industry and Entrepreneurs are recommended to adopt method developed by Anand Agricultural University for the preparation of probiotic smoothie using functional ingredients like oat bran (5%), SMP (9%), WPI (1%) with

addition of Sugar (7.5%) and mango pulp (12.0%). The product is made using *Streptococcus thermophilus* MTCC 5460 as starter and *Lactobacillus helveticus* MTCC 5463 as probiotic culture. Shelf life of the product is 24 days in polypropylene cups at  $4\pm 2^{\circ}\text{C}$ .

**(Head, Dept. of Dairy Microbiology, DSC, AAU, Anand)**

#### 6. Engineering interventions for commercial production of kheer

Dairy industry and entrepreneurs are recommended to adopt method developed by Anand Agricultural University for manufacture of thermally treated ( $118^{\circ}\text{C}$  for 15 min.) *Kheer*. It is made from standardized milk (4.5% fat & 8.5 % SNF) concentrated to 2 times concentration level using scraped surface heat exchanger (SSHE) and added with Basmati rice and sugar at the rate of 7 and 11.5%, respectively of concentrated milk. The product has a shelf life of 135 days at room temperature ( $35\pm 2^{\circ}\text{C}$ ). The technology developed for the manufacture of *Kheer* is recommended for its commercial exploitation.



**(Head, Dept. of Dairy Engineering, DSC, AAU, Anand)**

## 7. Process re-engineering for the manufacture of '*shrikhand*'

Dairy industry and entrepreneurs are recommended to adopt method developed by Anand Agricultural University for the manufacture of acceptable quality of *shrikhand* without removal of whey from Reconstituted Concentrated Skim Milk (RCSM) and cream. RCSM (35% Total solids) is inoculated with Sacco culture @ 1% of RCSM, and incubated at 40 °C until 2% acidity is developed. Then it is added with sugar @ 50% of dahi and 70% fat cream to get 6% fat in *shrikhand*. It is mixed well and thermized at 90 °C/10 min in SSHE and then added with 0.2% cardamom powder. *Shrikhand* was packed and stored at refrigeration temperature ( $7 \pm 2$  °C). The developed *shrikhand* has more yields and is cost effective compared to *shrikhand* manufactured by traditional method.



*(Head, Dept. of Dairy Engineering, DSC, AAU, Anand)*

## FOOD PROCESSING TECHNOLOGY

### 8. Production of high quality powder with maximum retention of essential oil using cryogenic grinding -“Cumin” & “Coriander”

Farmers, entrepreneurs and agro-processing units involved in grinding of spices are recommended to use the technology of cryogenic grinding developed by Anand Agricultural University, Anand for superior quality cumin and coriander powder with higher retention of volatile oil (84 & 93 % respectively) compared to conventional grinding.

*(Head, Dept. of Post Harvest Engg. & Tech, FPT & BE, AAU, Anand)*

### 9. Sterilization of Red Chilli using irradiation

The entrepreneurs and spice processors are recommended to adopt gamma irradiation protocol developed by Anand Agricultural University, Anand for fungal decontamination of chilli powder. The technology results in safe storage of packed and irradiated (7.5 kGy) ground chilli powder in ambient conditions for six months and more.

*(Head, Dept. of Food Engineering, FPT & BE, AAU, Anand)*

### 10. Development of vacuum dried *khaman*

The entrepreneurs interested in production of new product like dried *khaman* (ready-to-rehydrate) are recommended to adopt processing technology developed by Anand Agricultural University, Anand. The technology involves vacuum drying (600 mmHg, 80°C, 180 min) of *khaman* pieces. Final product packed in aluminium laminated pouches can be stored under ambient storage conditions (27±2°C) for 60 days. This can be easily rehydrated for consumption in 5

min using warm water ( $\sim 50^{\circ}\text{C}$ ) with addition of 68 g water to prepare 100g product.



**Dried Khaman**



**Fresh Khaman**

*(Head, Dept. of Food Engineering, FPT & BE, AAU, Anand)*

### 11. Ohmic heating of mango pulp

The entrepreneurs and fruit pulp processors interested in preservation of mango pulp are recommended to use ohmic heating processing technology developed by Anand Agricultural University, Anand. The processing parameters are voltage (160 V), temperature ( $80^{\circ}\text{C}$ ), with holding time of 4 min. The pulp retains better nutrients (7.1 Overall Acceptability), is stable and acceptable upto sixty seven days of storage in glass bottles, under refrigerated conditions at  $7\pm 2^{\circ}\text{C}$ . Energy requirement for ohmic heating of mango pulp was almost 3.5 times lesser than the conventional heating.

*(Head, Dept. of Food Engineering, FPT & BE, AAU, Anand)*

### 12. Effect of gamma irradiation on milling and cooking characteristics of pigeon pea

The entrepreneurs and dal millers interested in pulse processing are recommended to adopt gamma irradiation technology developed by Anand Agricultural University,



Anand for improving milling and cooking quality of pigeon pea. Irradiation (10 kGy) resulted in good milling characteristics, reduction in cooking time (~ 50%) and phytic acid content (~ 66%), and improving protein digestibility (80%).

***(Head, Dept. of Food Engineering, FPT & BE, AAU, Anand)***

### 13. Popping of sorghum grains using microwave energy

The entrepreneurs and food processors interested in production of ready to puff sorghum grains using microwave energy are recommended to use technology developed by Anand Agricultural University, Anand. The process involves use of Gujarat local (White) variety (17% moisture content, 1.33% salt, 10% oil). The technology enables production of puffed sorghum in domestic convective cum microwave oven (18 W/g, 160s). The pre-treated grains can be stored safely for 3 months and more in microwavable pouches.

***(Head, Dept. of Food Engineering, FPT & BE, AAU, Anand)***

### 14. Design and development of grader for aonla fruits

Farmers, entrepreneurs and food processors are recommended to use the size based grader for aonla fruits developed by Anand Agricultural University, Anand, for grading aonla fruits. The developed grader has high capacity (300 kg/h) efficient and economical (about 1/5<sup>th</sup> cost of manual) over manual grading the aonla fruits.



***(Head, Dept. of Food Technology, FPT & BE, AAU, Anand)***

### 15. Development of ready to eat extruded food product from tomato pomace

The entrepreneurs and food processors interested in production of extruded food product from tomato pomace are recommended to use the technology developed by Anand Agricultural University, Anand. The extruder is to be operated at 140°C barrel temperature, 400 RPM screw speed, raw material moisture content of 16.44%. This technology involves use of dehydrated pomace @ 5% and its extrusion with the corn @ 80% and Bengal gram @15% resulting in extruded product rich in protein, fiber and lycopene.

***(Head, Dept. of Food Technology, FPT & BE, AAU, Anand)***

### 16. Production technology for superior quality malt flour from finger millet (Ragi)

The entrepreneurs and food processors interested in manufacturing of malt based products are recommended to adopt the production technology of finger millet malt developed by Anand Agricultural University, Anand. The technology involves soaking and germination of finger millet for 12 and 24 h, respectively, followed by drying at standard temperature and then milling. This process reduces the anti-nutritional factors like Phytic Acid and Trypsin Inhibitor Activity to 60.02 and 49.96%, respectively.

***(Head, Dept. of Food Technology, FPT & BE, AAU, Anand)***

### 17. Canning of mango slices

The entrepreneurs and mango fruit processors interested in production of canned mango slices are recommended to adopt processing technology developed by Anand

Agricultural University, Anand. Canned mango slices put in 20°Brix sugar syrup and thermally processed (retorted) at 100°C for 10 minutes results in good quality product. Processed mango slices can be stored at ambient storage conditions (30±2°C) for one year.

***(Head, Dept. of Food Technology, FPT & BE, AAU, Anand)***

## **18. Development of carotenoid fortified cookies**

The entrepreneurs and food processors interested in production of fortified cookies using carotenoid are recommended to use the technology developed by Anand Agricultural University, Anand. This technology involves use of carotenoid extract obtained by super critical fluid extraction from vacuum dried pumpkin powder. Addition at the rate of 350 mg of extract per 100g of refined wheat flour is recommended. The cookies thus obtained contained 42.17 mg of  $\beta$ -carotene per 100g of product with a shelf life of 60 days.

***(Head, Dept. of Food Technology, FPT & BE, AAU, Anand)***

## **19. Development of production technology for sesame spread**

The entrepreneurs and fat spread manufacturers interested in production of sesame spread are recommended to adopt processing technology developed by Anand Agricultural University, Anand. Sesame spread can be prepared by treatments includes, roasting (180 °C for 20 min) of de-hulled sesame, cooling, mixing of sesame seeds with sugar (7.3%), lecithin (1.2%), hydrogenated vegetable oil (5%) and salt (1.2%) and grinding the mix for 3 min at low speed to produce good quality sesame spread. Sesame spread can be stored at refrigerated conditions (7±2°C) for three months.

***(Head, Dept. of FQA, FPT & BE, AAU, Anand)***

## 20. Super critical extraction of essential oil from curry leaves

The entrepreneurs and food processors interested in production of essential oil from curry leaves are recommended to use supercritical extraction technology developed by Anand Agricultural University, Anand. This technology involves recovery of essential oil (1.3%) using drying, sieving and CO<sub>2</sub> supercritical fluid extraction at controlled pressure (125 bar) and temperature (45°C). The process results in superior quality essential oil compared to conventional extraction methods.

*(Head, Dept. of FQA, FPT & BE, AAU, Anand)*

## 21. Development of poultry dropping based biogas system for energy utilization in poultry farm

Poultry owners are recommended to adopt a technology developed by Anand Agricultural University, Anand for biogas production from poultry dropping. The biogas yield from poultry dropping was about 12.87% more than cattle dung for 2m<sup>3</sup>/day capacity biogas plant. The cost of biogas production from poultry dropping was calculated as Rs.31/m<sup>3</sup>/day. The produced biogas can be used to operate poultry brooders. By using the gas, 403.2 kWh electricity can be saved in three weeks duration for raising 1000 chicks as against electrically operated brooders.

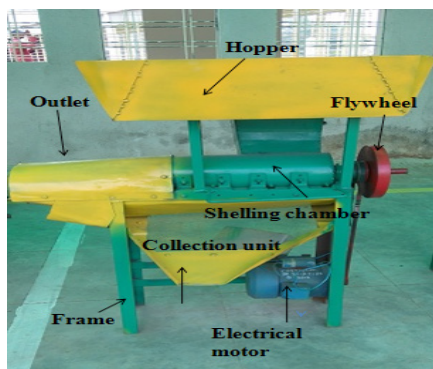
*(Head, Dept. of Bio energy, FPT & BE, AAU, Anand)*

## AGRICULTURAL ENGINEERING AND AIT

### AGRICULTURAL ENGINEERING

#### 1. Development of a low cost power operated maize sheller for small and marginal farmers

Electric power operated maize sheller developed by Anand Agricultural University is recommended for small and marginal farmer's use and commercial exploitation. The machine works satisfactorily for shelling 1000 kg maize cobs/h. The developed sheller reduce cost of shelling by 96.87 and 92.00 % over hand and pedal operated maize sheller respectively.



*(Head, FMP, CAET, AAU, Godhra)*

#### 2. Development of a low cost planting unit for conventional plough

A low cost planting unit for bullock drawn conventional plough developed by Anand Agricultural University for maize (seed size of 7 to 10 mm) sowing is recommended for small and marginal farmers' use and commercial exploitation as it saves about 38 & 93% time of sowing and 50 & 71% cost of sowing as compared to conventional plough with funnel

type seeding device and dibbling method, respectively.



*(Head, FMP, CAET, AAU, Godhra)*

### 3. Modifications in hand operated disc type maize sheller

A pedal operated disc type maize sheller developed by Anand Agricultural University is recommended for small and marginal farmers' use and commercial exploitation as its throughput capacity and shelling efficiency were observed as 67.9 kg/h and 99.44 respectively.



*(Principal, Poly. Agri. Engg., AAU, Dahod)*

## ANIMAL PRODUCTION

1. Formulation and evaluation of total mixed ration comprising of pigeon pea (*Cajanus cajan*) straw in adult sheep

Sheep owners are advised to maintain adult flock on total mixed ration comprising of equal quantity of *jowar* hay and pigeon pea straw.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

2. Formulation and evaluation of total mixed ration comprising of gram (*Cicer arietinum* L) straw in adult goats

Goats owners are advised to maintain adult flock on total mixed ration comprising of equal amount of *jowar* hay and gram straw.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

3. Studies on the effect of feeding bypass fat and yeast (*Saccharomyces cerevisiae*) supplemented total mixed ration to adult sheep during hot summer.

Sheep owners are advised to feed a combination of bypass fat and yeast (*Saccharomyces cerevisiae*) each at 2 % of feed intake to adult sheep during hot summer (April to June) in order to reduce the impact of heat stress.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

4. Methane mitigation in cattle using legume straw based total mixed ration with SSF biomass.

Farmers are recommended to feed total mixed ration with 30 % groundnut haulm (*gotar*), 30 % wheat straw and 40 % concentrate mixture, instead of total mixed ration with only 60 % wheat straw and 40 % concentrate mixture in order to reduce methane emission by 11% in adult cattle and buffalo.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*



## ANIMAL HEALTH

### 1. Effect of nutritional management of transition period on blood profile, puerperal events and postpartum fertility in buffaloes: a demonstration to tribal farmers

The buffalo owners in tribal areas of around taluka Santrampur, district Mahisagar are recommended to provide additional nutrients supplementation over routine feeding to their animals during transition period for 2 months each pre- and postpartum (1.5 kg compound concentrate, Type-I, BIS & 50 g chelated ASMM) with injectable slow releasing multi micro-minerals at around 2 months prepartum and again on the day of calving to reduce the peri parturient complications, and significantly improve postpartum fertility along with better economic return.

*(Prof. & Head, Department of Vet. Gynaecology & Obstetrics, Veterinary College, AAU, Anand)*

## RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY AND ENTREPRENEURS

### CROP IMPROVEMENT

#### 1. Screening of wild germplasm of okra for YVMV resistance

Among different species of okra including cultivated (*Abelmoschus esculentus*) and wild (*A. moschatus*, *A. moschatus* subsp. *tuberosus*, *A. manihot* var. *tetraphyllus*, *A. tuberculatus*, *A. angulosus* var. *grandiflorus* and *A. ficulneus*), two accessions of *A. moschatus* sub sps. *tuberosus* (IC 470750 and IC 413569) found resistant to YVMV (Yellow Vein Mosaic Virus) disease. These accessions may be used in pre-breeding programme to introgress the desirable genes for YVMV resistance into the cultivated okra.

*(Res. Sci., Distant Hybridization, Dept. of Agril. Biotech., AAU, Anand)*

### CROP PRODUCTION

#### 1. Influence of weed management practices on growth and seed yield of oat (*Avena sativa* L.)

Application of pendimethalin 0.90 kg/ha as pre emergence followed by hand weeding at 40 days after sowing of oat found effective for weed management with higher seed yield and net return.

*(Associate Res. Scientist, MFRS, AAU, Anand)*

#### 2. Soil test based fertilizer prescriptions through inductive cum targeted yield model for rice

The ready reckoner is developed on STCR basis for *kharif* rice grown in middle Gujarat conditions for fertilizers alone or fertilizers with FYM 5 t/ha. The ready reckoners prepared on the basis of below mentioned targeted yield equations and

soil test values for getting targeted yield.

- i) Sole use of chemical fertilizers

$$FN = 51.37 T - 1.04 SN$$

$$FP_2O_5 = 27.71 T - 3.24 SP$$

$$FK_2O = 62.93 T - 0.98 SK$$

- ii) Conjoint use of chemical fertilizers and FYM 5 t/ha

$$FN = 29.09 T - 0.62 SN - 0.10 FYM N$$

$$FP_2O_5 = 26.45 T - 4.08 SP - 0.48 FYM P$$

$$FK_2O = 38.93 T - 0.79 SK - 0.17 FYM K$$

## PLANT PROTECTION

### AGRICULTURAL ENTOMOLOGY

1. Bio-efficacy of different insecticides against mealy bug infesting custard apple

Two sprays of profenophos 50 % EC 0.05% (10 ml/10 lit of water) starting from appearance of the pest proved effective in the management of mealybug in custard apple.

*(Asstt. Prof. (Ento.), COH, AAU, Anand)*

2. Bio-efficacy of insecticidal molecules against cucumber leaf miner, *Liriomyza trifolii* (Burgess)

Seed treatment either with thiamethoxam 30 FS or imidacloprid 600 FS @ 10 ml/kg seed followed by two foliar sprays of thiamethoxam 25 WG (0.01%; 4 g/10 lit water; 50 g.a.i/ha) first at 30 days after sowing and second at 15 days after first spray for effective control of cucumber leaf miner, *Liriomyza trifolii*.

*(Asstt.Prof.(Ento.), S.M.C. Polytechnic in Agriculture, AAU, Anand)*

### 3. Bio-efficacy of different insecticides against stem borer infesting durum wheat

For effective management of stem borer in *durum* wheat, apply foliar spray of chlorantraniliprole 18.5 SC 0.006 % (3 ml/ 10 liters of water) at 50<sup>th</sup> days of sowing. OR seed treatment of chlorpyrifos 20 EC, 4 ml in 50 ml water/ kg seeds (0.8 g a.i./kg seeds) + foliar spray of chlorantraniliprole 0.006% (3 ml/ 10 liters of water) at 50<sup>th</sup> days of sowing.

***(Scientist (Pl. Protection), KVK, AAU, Arnej)***

### 4. Residues and persistence of triazophos 40 EC in/on cucumber

Two foliar sprays of triazophos 40 EC in cucumber at 10-day interval @ 300 g a.i./ha at fruiting stage resulted in its residue below the limit of quantitation of 0.05 µg/g in cucumber fruits if harvested from 10<sup>th</sup> day after the last application. Therefore, PHI of 10-day could be suggested if triazophos 40 EC is recommended in cucumber with MRL of 0.05 µg/g.

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

### 5. Residues and persistence of chlorpyrifos 20 EC in/on cucumber

Two foliar sprays of chlorpyrifos 20 EC in cucumber at 10-day interval @ 300 g a.i./ha at fruiting stage resulted in its residue below the MRL 0.2 µg/g (by FSSAI) in cucumber fruits if harvested from 7<sup>th</sup> day after the last application. Therefore, PHI of 7-day could be suggested if chlorpyrifos 20 EC is recommended in cucumber.

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

#### 6. Residues and persistence of quinalphos 25 EC in/on cucumber

Two foliar sprays of quinalphos 25 EC in cucumber at 10-day interval @ 300 g a.i./ha at fruiting stage resulted in its residue below the limit of quantitation of 0.05 µg/g in cucumber fruits if harvested from 7<sup>th</sup> day after the last application. Therefore, PHI of 7-day could be suggested if quinalphos 25 EC is recommended in cucumber with MRL of 0.05 µg/g.

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

#### 7. Residues and persistence of ethion 50 EC in/on cucumber

Two foliar sprays of ethion 50 EC in cucumber at 10-day interval @ 500 g a.i./ha at fruiting stage resulted in its residue below the MRL 1.0 µg/g (by FSSAI) in cucumber fruits if harvested from 1<sup>st</sup> day after the last application. Therefore, PHI of 1-day could be suggested if ethion 50 EC is recommended in cucumber.

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

#### 8. Residues and persistence of carbendazim 50 WP in/on cucumber

Two foliar sprays of carbendazim 50 WP in cucumber at 10-day interval @ 150 g a.i./ha at fruiting stage resulted in its residue below the MRL 0.5 µg/g (FSSAI) in cucumber fruits if harvested from 1<sup>st</sup> day after the last application. Therefore, PHI of 1-day could be suggested if carbendazim 50 WP is recommended in cucumber

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

#### 9. Residues and persistence of profenophos 50 EC in/on cucumber

Two foliar sprays of profenophos 50 EC in cucumber at 10-day interval @ 500 g a.i./ha at fruiting stage resulted in its residue below the limit of quantitation of 0.05 µg/g in cucumber fruits if harvested from 10<sup>th</sup> day after the last application. Therefore, PHI of 10-day could be suggested if profenophos 50 EC is recommended in cucumber with MRL of 0.05 µg/g.

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

#### 10. Residues and persistence of cypermethrin 25 EC in/on cucumber

Two foliar sprays of cypermethrin 25 EC in cucumber at 10-day interval @ 50 g a.i./ha at fruiting stage resulted in its residue below the MRL 0.07 µg/g (by CODEX) in cucumber fruits if harvested from 3<sup>rd</sup> day after the last application. Therefore, PHI of 3-day could be suggested if cypermethrin 25 EC is recommended in cucumber.

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

#### 11. Residues and persistence of spiromesifen 22.9 SC in/on chilli

Two foliar sprays of spiromesifen 22.9 SC in chilli at 10-day interval @ 96 g a.i./ha at fruiting stage resulted in its residue below the MRL (0.50 µg/g by EU/UK & 0.45 µg/g by US) in chilli fruits if harvested from 15<sup>th</sup> day after the last application. Therefore, PHI of 15-day could be suggested if spiromesifen 22.9 SC is recommended in chilli.

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

## 12. Residues and persistence of lambda-cyhalothrin 5 EC in/on chilli

Two foliar sprays of lambda-cyhalothrin 5 EC in chilli at 10-day interval @ 15 g a.i./ha at fruiting stage resulted in its residue below the MRL (0.10 µg/g by EU/UK, 0.2 µg/g by US & 1.0 µg/g by Japan) in chilli fruits if harvested from 1<sup>st</sup> day after the last application. Therefore, PHI of 1-day could be suggested if lambda-cyhalothrin 5 EC is recommended in chilli.

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

## 13. Residues and persistence of bifenthrin 10 EC in/on chilli

Two foliar sprays of bifenthrin 10 EC in chilli at 10-day interval @ 50 g a.i./ha at fruiting stage resulted in its residue below the MRL (0.50 µg/g by CODEX) in chilli fruits if harvested from 1<sup>st</sup> day after the last application. Therefore, PHI of 1-day could be suggested if bifenthrin 10 EC is recommended in chilli.

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

## 14. Residues and persistence of triazophos 40 EC in/on bitter gourd

Two foliar sprays of triazophos 40 EC in bitter gourd at 10-day interval @ 300 g a.i./ha at fruiting stage resulted in its residue below the limit of quantitation of 0.05 µg/g in bitter gourd fruits if harvested from 7<sup>th</sup> day after the last application. Therefore, PHI of 7-day could be suggested if triazophos 40 EC is recommended in bitter gourd with MRL of 0.05 µg/g.

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



### 15. Residues and persistence of profenophos 50 EC in/on bitter gourd

Two foliar sprays of profenophos 50 EC in bitter gourd at 10-day interval @ 500 g a.i./ha at fruiting stage resulted in its residue below the limit of quantitation of 0.05 µg/g in bitter gourd fruits if harvested from 7<sup>th</sup> day after the last application. Therefore, PHI of 7-day could be suggested if profenophos 50 EC is recommended in bitter gourd with MRL of 0.05 µg/g.

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

### 16. Residues and persistence of ethion 50 EC in/on bitter gourd

Two foliar sprays of ethion 50 EC in bitter gourd at 10-day interval @ 500 g a.i./ha at fruiting stage resulted in its residue below the MRL 1.0 µg/g (by FSSAI) in bitter gourd fruits if harvested immediately after the last application. Therefore, PHI of 1-day could be suggested if ethion 50 EC is recommended in bitter gourd.

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

### 17. Residues and persistence of cypermethrin 25 EC in/on bitter gourd

Two foliar sprays of cypermethrin 25 EC in bitter gourd at 10-day interval @ 50 g a.i./ha at fruiting stage resulted in its residue below the MRL (0.20 µg/g by EU & 2.0 µg/g by Japan ) in bitter gourd immediately after the last application. Therefore, PHI of 1-day could be suggested if cypermethrin 25 EC is recommended in bitter gourd.

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

## 18. Residues and persistence of quinalphos 25 EC in/on bitter gourd

Two foliar sprays of quinalphos 25 EC in bitter gourd at 10-day interval @ 250 g a.i./ha at fruiting stage resulted in its residue below the limit of quantitation of 0.05 µg/g in bitter gourd fruits if harvested from 3<sup>rd</sup> day after the last application. Therefore, PHI of 3-day could be suggested if quinalphos 25 EC is recommended in bitter gourd with MRL of 0.05 µg/g.

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

## 19. Residues and persistence of chlorpyrifos 20 EC in/on bitter gourd

Two foliar sprays of chlorpyrifos 20 EC in bitter gourd at 10-day interval @ 300 g a.i./ha at fruiting stage resulted in its residue below the MRL of 0.20 µg/g (by FSSAI) in bitter gourd from 3<sup>rd</sup> day after the last application. Therefore, PHI of 3-day could be suggested if chlorpyrifos 20 EC is recommended in bitter gourd.

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

## 20. Residue and persistence of carbendazim 50 WP in/on bitter gourd

Two foliar sprays of carbendazim 50 WP in bitter gourd at 10-day interval @ 150 g a.i./ha at fruiting stage resulted in its residue below the MRL of 0.50 µg/g (by FSSAI) in bitter gourd from 3<sup>rd</sup> day after the last application. Therefore, PHI of 3-day could be suggested if carbendazim 50 WP is recommended in bitter gourd.

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

## 21. Residues and persistence of imidacloprid 17.8 SL in/on bitter gourd

Two foliar sprays of imidacloprid 17.8 SL in bitter gourd at 10-day interval @ 20 g a.i./ha at fruiting stage resulted in its residue below the MRL (1.0 µg/g by EU, 0.40 µg/g by Japan and 0.50 µg/g by US) in bitter gourd immediately after the last application. Therefore, PHI of 1-day could be suggested if imidacloprid 17.8 SL is recommended in bitter gourd.

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

## PLANT PATHOLOGY AND NEMATOLOGY

## 22. Incidence and severity of frog eye spot disease on bidi tobacco in relation to agro-meteorological parameters

1. The weather parameters RDAY, MINT and VP1 were responsible for FES in tobacco nursery.

The logistic regression model developed for FES in nursery is as under.

$$\text{FES}_{\text{code}}(1, 0) = \log \left( \frac{P_i}{1} - P_i \right) \quad \text{FES}_{\text{code}}(1, 0) = \log \left( \frac{P_i}{1} - P_i \right) = - \\ 27.0169 + 0.7352 * \text{RDAY} + 3.0285 * \text{MINT} - \\ 2.0776 ** \text{VP1}$$

2. The weather parameters BSS, MAXT, MINT and TOTRF were responsible for FES in tobacco field.

The logistic regression model developed for FES in field is as under.

$$\text{FES}_{\text{code}}(1, 0) = \log \left( \frac{P_i}{1} - P_i \right) \quad \text{FES}_{\text{code}}(1, 0) = \log \left( \frac{P_i}{1} - P_i \right) \\ = 9.2280 + 0.5272 ** \text{BSS} - 0.5321 ** \text{MAXT} + 0.3275 ** \text{MINT} \\ - 0.00305 ** \text{TOTRF}$$

*(Res. Sci. (Pl. Path.), BTRS, AAU, Anand)*

### 23. Screening of blackgram germplasm against yellow mosaic disease

VUG-14-1 genotype of blackgram found resistant against yellow mosaic disease under high disease pressure in field conditions.

*(Asstt. Res. Sci. (Ento.), Agril. Res. Station, AAU, Derol)*

### 24. Bio-efficacy of fungicides against powdery mildew of clusterbean

Spray Hexaconazole 5 SC, 0.005% (10 ml/ 10 lit. water) twice to manage powdery mildew in *kharif* clusterbean. Apply first spray at the time of initiation of the disease and second at 15 days of first spray.

*(Asstt. Res. Sci. (Ento.), Agril. Res. Station, AAU, Derol)*

## BASIC SCIENCE

### 1. Effect of benzyladenine (BA) on water deficit stress in rice seedlings

It is informed to scientific community that for alleviating adverse effect of water deficit stress, rice seeds be treated with 100 ppm benzyladenine for 8 hrs. to maintain adequate level of osmolytes such as total soluble sugars, phenols and proline with low membrane injury upto 20 days old seedlings.

*(Professor & Head, Department of Biochemistry,  
BACA, AAU, Anand)*

## DAIRY SCIENCE

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

- The prediction based on regression model comprising peroxide value by FOX method, carbonyl value and flavor score obtained by sensory evaluation of ghee on storage at  $80\pm 2^{\circ}\text{C}$  as variables is promising for predicting shelf life of ghee at ambient temperature ( $35\pm 2^{\circ}\text{C}$ ).
- The use of Rancimat is not promising to predict the shelf life of ghee on storage at ambient temperature ( $35\pm 2^{\circ}\text{C}$ ).

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

### 2. Screening of qualitative tests for detection of adulterants in milk

Inter-adulterant interference in detection of adulterants in milk by selected qualitative tests

- Mixing of urea at 0.8 % or more in milk interferes in detection of detergents by Methylene blue test given by FSSAI (2015).
- Mixing of formalin at 0.4 % or more in milk interferes in detection of detergents by Methylene blue test given by FSSAI (2015).
- Mixing of sodium hydroxide at 0.08 % or more in milk interferes in detection of detergents by Methylene blue test given by FSSAI (2015).
- Mixing of formalin at 1.0% or more in milk interferes in detection of ammonium sulphate by Phenol test given by FSSAI (2015).
- Mixing of sodium hydroxide at 0.04 % or more in milk

interferes in detection of Glucose by Barfoed method given by FSSAI (2015).

- Mixing of formalin at 0.1 % or more in milk interferes in detection of Sucrose by Seliwanoff test given by Srivastava (2010).
- Mixing of sodium hydroxide at 0.01 % or more in milk interferes in detection of Maltodextrin by Iodine test given by Sharma et al. (2012).
- Mixing of urea at 0.4% or more in milk interferes in detection of starch by Iodine test given by BIS (1960).
- Mixing of ammonium sulphate at 0.1 % or more in milk interferes in detection of starch by Iodine test given by BIS (1960).
- Mixing of sodium hydroxide at 0.01 % or more in milk interferes in detection of starch by Iodine test given by BIS (1960).
- Mixing of sodium hydroxide at 0.01 % or more in milk interferes in detection of sulphate by Barium chloride given by FSSAI (2015).
- Mixing of sucrose at 0.4 % or more in milk interferes in detection of formaldehyde by Leach test given by BIS (1961).

**Note:**

While applying the afore mentioned qualitative tests, interference as caused by the coexisting respective adulterant should be taken into account for interpretation of the respective qualitative tests. Such interference by the coexisting adulterants suggests the need for suitable modification or for further research on alternate tests.

## Effect of Processing on detection of adulterants in milk by selected qualitative tests

- Pasteurization and sterilization of milk affects detection of detergents in milk by methylene blue test given by FSSAI (2015).
- Pasteurization, boiling and sterilization affects detection of Urea by DMAB test given by FSSAI (2015).
- Chilling, pasteurization, boiling and sterilization affects detection of glucose in milk by Barfoed test given by FSSAI (2015).
- Sterilization affects detection of sucrose in milk by Seliwanoff test given by Srivastava (2010).
- Sterilization affects detection of formaldehyde in milk by Leach test given by BIS (1961).
- Chilling, pasteurization, boiling and sterilization affects detection of Hydrogen peroxide in milk by  $\rho$ -Phenylenediamine test given by Draaiyeret *al.* (2009).
- Sterilization affects detection of Neutralizers by Rosolic acid test given by (DGHS, 2005).

*(Department of DC, DSC, AAU, Anand)*

### 3. Application of infrared spectroscopy in detection of foreign fats and oils in ghee

- FT-MIR spectroscopy in reflectance mode using HATR and FT-NIR spectroscopy in transmittance mode are suitable for evaluation of physical and chemical parameters of ghee.
- FT MIR ( $4000-650\text{ cm}^{-1}$ ) spectra of ghee have 14 peaks and position of peaks (wavenumbers) are at 3005, 2922, 2853, 1744, 1466, 1418, 1377, 1236, 1161, 1114, 1098, 966, 870



and  $721\text{ cm}^{-1}$ .

- FT NIR ( $10000\text{--}4000\text{ cm}^{-1}$ ) of ghee have 9 peaks and position of peaks (wavenumbers) are at 8258, 7185, 7076, 5790, 5677, 5262, 5180, 4976 and  $4700\text{ cm}^{-1}$ . The intensity of absorbance is higher in case of cow ghee compared to buffalo ghee.

*(Department of DC, DSC, AAU, Anand)*

## **FOOD PROCESSING TECHNOLOGY**

4. Experimental determination of rate of respiration and heat load of important commodities of the region.

Persons interested in designing cold/low temperature storage facilities for fruits/vegetables such as green chilli, guava, brinjal, mango, custard apple, cluster beans and cucumber are recommended to use the data on respiration rate and heat of respiration for the above commodities for various temperatures and RH's, generated by Anand Agricultural University, Anand.

*(Dept. of Post Harvest Engg & Tech, FPT & BE, AAU, Anand)*

5. Prevalence and study of antibiotic resistant pattern of Salmonella in raw milk in Anand town

Analysis of raw milk samples collected around Anand region reveals prevalence of Salmonella in 8.57%. These Salmonella strains found to be sensitive to antibiotics and pasteurization temperature.

*(Department of FQA, FPT & BE, AAU, Anand)*

6. The study on *in vitro* antioxidant and antidiabetic activity of garden cress seed (*Lepidium sativum*)

Antioxidant activity of garden cress seed was determined

by DPPH, ABTS, FRAP and TPC found 22.63 (% inh), 13.78 (% inh), 48.07 (RP%) and 788.46 (mg %), respectively. In *vitro* antidiabetic activity studied using non enzymatic glycosylation of haemoglobin assay and  $\alpha$ -amylase inhibition power found 70.20 (% inh) and 66.53 (% inh), respectively.

*(Principal, PFSHE, AAU, Anand)*

## AIT

### 1. Web based application for analysis of Completely Randomized Design, Latin Square Design, and Split Plot Design

Web based application developed by Anand Agricultural University is useful to analyze the data of the experiments using designs like Completely Randomized Design, Randomized Block Design, Latin Square Design, Split plot design and Strip Plot design and also for illustration purposes as well as for the researchers with interest in experimental designs.

*(Director IT, AAU, Anand)*

### 2. Development of Web based Annual Budget Management System

Web based online Annual Budget Management System developed by Anand Agricultural University automates annual budgeting and funding process of State Agricultural Universities. It is recommended to use at State Agricultural Universities Council and SAUs of Gujarat.

*(Director IT, AAU, Anand)*

### 3. Web based application for Dead Stock and IT Asset information Management

Web based Dead Stock and IT Asset information Management System developed by Anand Agricultural University is useful to store, retrieve and track dead stock items and IT assets details. It is recommended to use by the IT users of the concerned unit/sub-unit of the SAUs of Gujarat.

*(Director IT, AAU, Anand)*

### 4. Online Information Management for Extension Education Centers of AAU

Web based online Information Management for Extension Education Centers system developed by Anand Agricultural University is used to store and manipulate the training data, FLD information, budget information, extension activities, results of OFT and success stories of the unit/sub-unit of SAUs and can generate necessary reports for management. It is recommended to use by all the respective unit/sub-unit of SAUs of Gujarat who are involved in extension activities.

*(Director IT, AAU, Anand)*

### 5. Parameterization of probability models for suh derivation using geomorphological model of a catchment response

The NGO's, planners and irrigation specialists are advised to adopt two parameter weibull distribution over two parameter gamma distribution coupled with geomorphological model of catchment response for development of synthetic unit hydrograph and the flood hydrographs from ungauged catchments of Panam river basin system.

*(Principal, Poly. Agri. Engg., AAU, Dahod)*

## ANIMAL PRODUCTION

### 1. Development of area-specific mineral mixture formulations for Mahisagar district

Based on prioritization of limiting minerals in Mahisagar district, the area specific mineral mixture has been formulated to make up for the deficiency when dairy animals are fed @ 30g/head/day in addition to the current feeding practices.

Sr. No.	Mineral Element	Per Cent Requirement
1	Calcium	20.00
2	Phosphorus	12.01
3	Magnesium	4.61
4	Sulphur	1.00
5	Copper	0.17
6	Zinc	1.77
7	Manganese	0.51
8	Iron	0.40
9	Cobalt	0.01
10	Iodine	0.03

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

### 2. Formulation and evaluation of total mixed ration comprising of pigeon pea (*Cajanus cajan*) straw in adult sheep

The pigeon pea straw can replace 50 % *jowar* hay in total mixed ration (with roughage to concentrate ratio 70:30) for adult sheep without any adverse effect on body weight, rumen parameters and digestibility of nutrients.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

3. Formulation and evaluation of total mixed ration comprising of gram (*Cicer arietinum* L) straw in adult goats

The gram straw can replace 50 % *jowar* hay in total mixed ration (with roughage to concentrate ratio 70:30) for adult goats without any adverse effect on body weight, rumen parameters and digestibility of nutrients.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

4. Studies on the effect of feeding bypass fat and yeast (*Saccharomyces cerevisiae*) supplemented total mixed ration to adult sheep during hot summer.

Sheep during hot summer when supplemented with a combination of bypass fat and yeast (*Saccharomyces cerevisiae*) each at 2% of feed intake caused significant reduction in rectal temperature and respiration rate and thus reduced the impact of heat stress.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

5. Methane mitigation in buffalo on legume straw based total mixed ration

Inclusion of groundnut haulm (*gotar*) @ 30% replacing wheat straw in total mixed ration (pelleted) with roughage to concentrate ratio 60:40 increases rumen microbial protein synthesis by 8.95% as compared to total mixed ration without groundnut haulm in Surti buffalo.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

6. Methane mitigation in buffalo on legume straw based total mixed ration

Inclusion of groundnut haulm (*gotar*) in mash and pelleted form @ 30% replacing wheat straw in total mixed ration

with roughage to concentrate ratio 60:40 reduces methane emission (g/kg DDMI) by 8.7 and 18.93 % and also digestible energy loss through methane by 5 and 12.92% in mash and pelleted form, respectively, as compared to total mixed ration without groundnut haulm in Surti buffalo.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

**7. Methane mitigation in cattle using legume straw based total mixed ration with SSF Biomass.**

Inclusion of groundnut haulm (*gotar*) @ 30 % replacing wheat straw in total mixed ration with roughage to concentrate ratio 60:40 increases rumen microbial protein synthesis by 13.26 % as compared to total mixed ration without groundnut haulm in cattle.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

**8. Methane mitigation in cattle using legume straw based total mixed ration with SSF Biomass.**

Inclusion of groundnut haulm (*gotar*) @ 30 % replacing wheat straw in total mixed ration with roughage to concentrate ratio 60:40 reduces methane emission (g/kg DDMI) by 15.13 % and digestible energy loss through methane by 10.80 % in cattle. Inclusion of Solid State Fermentation biomass 5% in the same ration further reduces methane emission by 10.60 % and digestible energy loss through methane by 4.26 %.

*(Research Scientist, ANRS, Vet. College, AAU, Anand)*

## ANIMAL HEALTH

1. Studies on prevalence, haemato-biochemical alterations and diagnostic aspects of trypanosoma evansi using blood smear examination and polymerase chain reaction (pcr) in cattle and buffaloes.

Polymerase chain reaction based diagnosis of Trypanosoma evansi is more effective than routine blood smear examination which has showed 30.23 % sensitivity in relation to PCR in cattle and buffaloes.

*(Prof. & Head, Department of Veterinary Parasitology,  
Veterinary College, AAU, Anand)*

2. Effect of nutritional management of transition period on blood profile, puerperal events and postpartum fertility in buffaloes: a demonstration to tribal farmers

Buffaloes during transition period in tribal area of taluka Santrampur district Mahisagar when supplemented with additional nutrients over routine feeding for 2 months each pre- and postpartum (1.5 kg compound concentrate, type I, BIS & 50 g chelated ASMM) along with injectable micro-minerals (Se 25 mg, Zn 200 mg, Cu 75 mg, Mn 50 mg) at around 2 months pre partum and again on the day of calving optimized the plasma metabolites, minerals and hormonal profiles, and reduced the incidence of peri parturient complications, enhanced uterine involution and significantly improved postpartum fertility with reduced infertility and calving interval. Injection of micro-minerals alone found more economical over concentrate alone or a combination of concentrate and micro-minerals in optimally fed animals.

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



### 3. Ultrasonography of udder and teat in dairy animals

Ultrasonography of bovine udder and teats using 7.5 MHz linear transducer with water bath method provides optimum visualization of the teat canal, rosette of Furstenberg, teat cistern, teat wall and blood vessels, whereas 10 MHz linear transducer with direct gel technique provides excellent visualization of udder parenchyma, gland cistern, vessels and supramammary lymph nodes.

*(Prof. & Head, Department of Veterinary Surgery and Radiology, Veterinary College, AAU, Anand)*

## SOCIAL SCIENCE

### 1. Development of yardstick of CV % for Arnej center (*Bhal* and Coastal Zone) crops field experiments

The yard stick of CV% for accepting the results of Arnej center (*Bhal* and Coastal Zone) crops experiments is 20 per cent for yield character.

*(Professor & Head, Department of Statistics, BACA, AAU, Anand)*

### 2. Development of yardstick of CV % for Dhandhuka center (*Bhal* and Coastal Zone)crops field experiments

The yard stick of CV% for accepting the results of Dhandhuka center (*Bhal* and Coastal Zone) crop experiments is 14 per cent for yield character.

*(Professor & Head, Department of Statistics, BACA, AAU, Anand)*

### 3. Development of yardstick of CV % for *Bhal* and Coastal Zone crops field experiments

The yard stick of CV % for accepting the results of *Bhal* and

Coastal Zone crops experiments is 18 per cent for yield character.

*(Professor & Head, Department of Statistics, BACA, AAU, Anand)*

**4. Development of yardstick of CV % for gram (Bhal and Coastal Zone) crop field experiments**

The yard stick of CV% for accepting the results of gram (Bhal and Coastal Zone) crop experiments is 19 per cent for yield character.

*(Professor & Head, Department of Statistics, BACA, AAU, Anand)*

**5. Development of yardstick of CV % for wheat (Bhal and Coastal Zone) crop field experiments**

The yard stick of CV% for accepting the results of wheat (Bhal and Coastal Zone) crop experiments is 15 per cent for yield character.

*(Professor & Head, Department of Statistics, BACA, AAU, Anand)*

**6. Development of yardstick of CV % for cotton (Bhal and Coastal Zone) crop field experiments**

The yard stick of CV % for accepting the results of cotton (Bhal and Coastal Zone) crop experiments is 21 per cent for yield character.

*(Professor & Head, Department of Statistics, BACA, AAU, Anand)*

**7. Development of yardstick of CV % for safflower (Bhal and Coastal Zone) crop field experiments**

The yard stick of CV% for accepting the results of safflower

(Bhal and Coastal Zone) crop experiments is 24 per cent for yield character.

*(Professor & Head, Department of Statistics, BACA, AAU, Anand)*

## 8. Development and standardization of scale to measure the attitude of farmers towards Farmers Interest Group

Development and standardization of scale to measure attitude of farmers towards Farmers Interest Group (FIG)

No	Statements	SA	A	UD	DA	SDA
1	I think that Farmers Interest Group (FIG) provides opportunity to solve those issues which are difficult to solve individually (+)	5	4	3	2	1
2	I think that FIG creates conflict among the farmers.(-)	1	2	3	4	5
3	I feel that FIG helps in acquiring costly inputs which are difficult to manage single-handedly (+)	5	4	3	2	1
4	I believe that FIG means too many cooks spoil the broth (-)	1	2	3	4	5
5	I think FIG is ideal platform to bridge extension personnel with farmers. (+)	5	4	3	2	1
6	I think that FIG creates conflict between resource poor and rich farmers (-).	1	2	3	4	5
7	I like to be a member of FIG (+).	5	4	3	2	1
8	I believe that FIG creates misunderstanding within the farmers (-)	1	2	3	4	5

9	I believe that input buying capacity of farmer improves joining FIG (+)	5	4	3	2	1
10	I believe that FIG provides forum in sharing advantageous issues (+)	5	4	3	2	1
11	I feel that FIG is a prospective system to empower farmers. (+)	5	4	3	2	1
12	I feel that FIG is a potential tool for women empowerment. (+)	5	4	3	2	1

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

### **9. Development and standardization of scale to measure attitude of extension personnel towards training programmes organized by EEI, Anand**

No	Statements	SA	A	UD	DA	SDA
1	I believe that training programmes organized by EEI help to improve work performance of extension personnel. (+)	5	4	3	2	1
2	I believe that medium of instruction in training programmes organized by EEI is not suitable to level of understanding of extension personnel. (-)	1	2	3	4	5
3	Training programmes organized by EEI result in improving practical skills of extension personnel. (+)	5	4	3	2	1
4	I believe that module of training programmes organized by EEI are more information oriented than performance oriented. (-)	1	2	3	4	5
5	I feel that training programmes organized by EEI help in inculcating extension leadership amongst the extension personnel. (+)	5	4	3	2	1
6	I hold opposite views for the methods of training adopted in training programmes organized by EEI. (-)	1	2	3	4	5

7	I believe that course contents of training programmes organized by EEI are outdated for extension personnel. (-)	1	2	3	4	5
8	I feel that training programmes organized by EEI create motivating environment for extension personnel. (+)	5	4	3	2	1
9	I feel that training programmes organized by EEI are incapable to introduce recent extension skill amongst extension personnel. (-)	1	2	3	4	5
10	I believe that trainers working at EEI to train extension personal are incompetent. (-)	1	2	3	4	5
11	I believe that training equipments used in training programmes organized by EEI are discouraging. (-)	1	2	3	4	5
12	I feel that the scope of career development is limited in training programmes organized by EEI. (-)	1	2	3	4	5
13	I think in general approaches adopted at EEI for training are learner centered. (+)	5	4	3	2	1
14	I think that training programmes organized by EEI result in overall improvement of extension productivity. (+)	5	4	3	2	1

***(Director, EEI, AAU, Anand)***



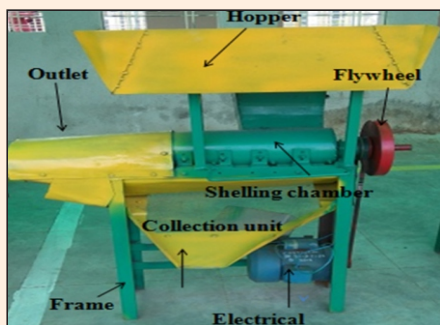
**Kheer**



**Shrikhand without removal of Whey  
from RSCM**



**Dried Khaman**



**Maize Sheller**



**Low Cost Planting unit of Conventional Plough**



**Hand Operated Disc Type Maize Sheller**



**Aonla Grading Machine**





**Gujarat Anand Tomato 5 ( GAT 5)**



**Gujarat Anand Bottle Gourd Hybrid 1 (GABGH 1)**



**Gujarat Anand Kuvarpathu1 (GAK1)**