

# **RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS**

**2011**



**DIRECTORATE OF RESEARCH  
ANAND AGRICULTURAL UNIVERSITY  
ANAND 388 110**

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## ***FOREWORD***

I feel extremely delighted to put forward the publication on “Research Accomplishments and Recommendations 2011” which contains technologies developed and recommended by scientists of all the faculties of Anand Agricultural University for farming as well as scientific communities.

The technologies developed and recommendations made by the scientists of this university are of high significance to the farming community as they will help them in cutting off the cost of cultivation and reaping higher profit in agricultural business. The publication will also serve a basic for contemplation of the scientist what they have done and what is yet to be done.

I take this opportunity to congratulate all the scientists, conveners of respective AGRESO sub committees and co-workers of Anand Agricultural University for their sincere efforts and hard work for generating new technologies in the field of agricultural sciences.

**(K. B. KATHIRIYA)**  
**DIRECTOR OF RESEARCH & DEAN**  
**FACULTY OF P.G.STUDIES**

## **PREFACE**

Nevertheless, agriculture as a human endeavour dates back to several millennia in past, yet even in this modern era, it is still important source of employment and livelihood for significant proportion of National population.

Instead of quantum, quality of research is important in present era of global completion. The repetition of the research within and between the faculties needs to be avoided to save the resources. Central Insecticidal board has made compulsory residual evaluation in pesticides recommendations and accordingly, a new technical programme required to be proposed.

The Research work carried out in different fields of agricultural science during the year 2010-11 has been very well discussed by different AGRESKO Sub-committees for bringing out useful and beneficial recommendations for farmers, scientific community, entrepreneurs and stake holders.

The recommendations made by different committees for adoption by the farmers in agriculture are listed below.

<b>Name of the Sub-committee</b>	<b>No. of recommendations</b>	
	<b>For farmers</b>	<b>For scientific community/ entrepreneurs</b>
<b>Crop Improvement</b>	<b>07</b>	<b>-</b>
<b>Plant Physiology</b>	<b>02</b>	<b>01</b>
<b>Crop Production</b>	<b>11</b>	<b>02</b>
<b>Plant Protection</b>	<b>37</b>	<b>02</b>
<b>Dairy Science, Agri. Engineering &amp; Food Processing</b>	<b>-</b>	<b>-</b>
<b>Animal Production</b>	<b>03</b>	<b>07</b>
<b>Animal Health</b>	<b>01</b>	<b>09</b>
<b>Social Science</b>	<b>-</b>	<b>02</b>

# Recommendations for farming community

## I CROP IMPROVEMENT

### [A] PLANT BREEDING

#### 1. Rice: Gujarat Anand Rice-2 (GAR-2)



The variety was developed from a cross Gurjari X IET-14714. The variety is of mid-early maturity group showing resistance to BLB, sheath rot, false smut and grain discoloration. It has yielded 4625 kg/ha which is 23.1 per cent higher over check GR-4. It has advantage in grain quality, easy threshability and can add to the export group of non scented quality. It also showed 24 % higher per day productivity than GR-4. This genotype is fertilizer responsive, non-lodging and possesses awnless long slender fine grains. In cooking and milling quality, its performance is better than the checks. It is recommended for cultivation in Middle Gujarat.

***(Research Scientist (Rice), Main Rice Research Station, AAU, Nawagam)***



## 2. Maize: High Quality Protein Maize-1 (HQPM-1)



This is a yellow seeded mid maturity group single cross hybrid with long cylindrical cobs. The hybrid exhibited grain yield of 4973 and 4426 kg/ha in *rabi* and *kharif* season, respectively. The yield is 42.8, 20.6 and 15.5 per cent higher yield over check varieties GM 3, Ganga Safed 2 and Shaktiman-1, respectively during *rabi* season. In *kharif* season, it showed 19.5 per cent yield advantage over the check GM-2. The hybrid was also tolerant to maydis leaf blight and stem borer under natural conditions besides tolerant to drought stress. Quality wise it possesses nearly double lysine and tryptophan content than normal maize. It is therefore endorsed for cultivation across the state in *kharif* and *rabi* seasons.

**(Research Scientist (Maize), Main Maize Research Station, AAU, Godhra)**

### 3. Okra: Gujarat Anand Okra-5 (AO-5)



This variety yielded 141 q/ha fruits yield that is 35.9 and 55.9 per cent higher than checks GO-2 and Pusa Sawani, respectively. The fruits of this variety have attractive shape, size and deep green colour fruits and fetches higher price in the market as compared to other released varieties. Under the YVMV hot spot condition, it has 7.86 % YVMV infection as compared to 76.27 and 83.82 % infection in GO 2 and Pusa Sawani checks, respectively. It is also recorded less per cent of fruit borer damage and low population of Jassids and white fly per leaf as compared to the checks. It is particularly suitable for YVMV prone belt of Gujarat during *kharif* season.

**(Research Scientist (Vegetable), Main Vegetable Research Station, AAU, Anand)**



#### 4. Chilli: Gujarat Anand Vegetable Chilli-112 (GAVC-112)



The variety was recommended for cultivation in Gujarat on account of its 18.7 and 24.5 per cent higher green fruit yield (127.05 q/ha) over GVC-101 and GVC-111, respectively. The fruits are elongated, straight, pungent and compact having light green colour. The variety also exhibited low incidence of anthracnose, thrips and fruit borer, as compared to check varieties. The fruit picking is easier than GVC-111 which reduces the labour cost.

***(Research Scientist (Vegetable), Main Vegetable Research Station, AAU, Anand)***



5. Chilli: Gujarat Anand Vegetable Chilli Hybrid-1 (GAVCH-1)



This is the first CMS based hybrid of Gujarat having green fruit yield of 237 q/ha which is 31.7, 35.0, 56.0 per cent higher over ARCH-228 (Hybrid), GVC-101 and GVC-111 checks, respectively. The hybrid also exhibited low incidence of anthracnose, thrips and fruit borer as compared to checks. The fruits of this hybrids possess elongated shape, light green colour semi wrinkled surface and pungency. The proposed chilli hybrid is recommended for the Gujarat state during *kharif* - *rabi* season under irrigated conditions.

**(Research Scientist (Vegetable), Main Vegetable Research Station, AAU, Anand)**

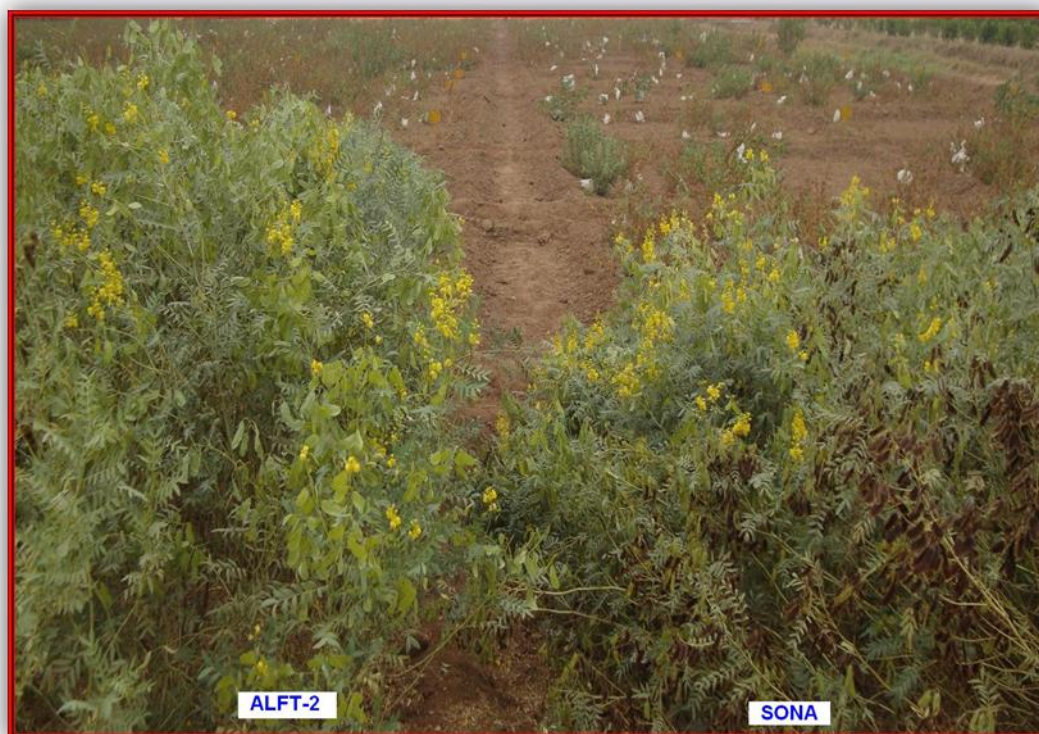
6. Forage crop: Gujarat Anand Anjan Grass-1 (GAAG-1)



The recommended genotype is a selection from natural population of Anjan Grass from *Kutchh* and it was tested in trial as ACS-26. It is a tall growing perennial grass. It revealed 44.9 and 51.9 per cent higher green fodder yield (214 q/ha) and dry matter yield (72 q/ha) than national check CAZRI-75, respectively. High leaf to stem ratio with low oxalates and nitrate contents and better palatability are other favourable characters of the variety. It is recommended for cultivation under rainfed pasture lands of Gujarat state. **(Research Scientist (Forage), Main Forage Research Station, AAU, Anand)**



## 7. Medicinal crop: Gujarat Anand Senna-1 (GAS 1)



This culture is isolated as a selection from germplasm. It is the first genotype recommended for release in the state. It recorded 1834 kg dry leaf yield which is 71.4 and 53.6 per cent higher than check varieties ASNTV and Sona, respectively. The sennoside content of the variety is also higher (1.58 %) as compared to 1.33 % and 1.18 % of ASNTV and Sona, respectively. The sowing time of this culture is onset of monsoon (June-July).

### [B] PLANT PHYSIOLOGY

#### 1. Defoliation in chilli

Farmers of Middle Gujarat, Agro climatic Zone–III planting chilli crop cv. Guj.Veg.Chilli-111 for vegetable fruit production purpose are advised to adopt 25 - 50% random defoliation at 30 DATP for getting higher fruit yield and net return.

*(Research Scientist (Pl. Phy.), Main Vegetable Research Station, Anand)*

## 2. Spraying of NAA on Bottle Gourd

Farmers of Middle Gujarat, Agro climatic Zone–III growing bottle gourd cv. Anand Bottle Gourd-1 for vegetable fruit production purpose are advised to spray NAA @ 50 mg/l at 3-4 leaf stage for getting higher fruit yield with the higher net realization.

*(Research Scientist (Pl. Phy.), Main Vegetable Research Station, Anand)*

## II CROP PRODUCTION

### [A] CULTURAL PRACTICES

#### 1. Effect of sowing methods and irrigation scheduling on new introducing crop *rajgira* (grain amaranthus)

The farmers of AES II of middle Gujarat agro-climatic zone growing *rajgira* crop are advised to adopt line sowing method at 45 x 10 cm spacing and apply five irrigations each of 5 cm depth at an interval of 20-30 days (IW/CPE: 0.6) after sowing to get higher yield and net profit.

*(Associate Research Scientist, Irrigated Crop Research Station, Thasra)*

### [B] CROPPING SEQUENCE

#### 2 Production potential of different cropping systems grown in rustica tobacco area of middle Gujarat

The rustica tobacco growing farmers of AES II of middle Gujarat agro climatic zone are advised to adopt paddy (*khariif*) – rustica tobacco (*rabi*) or paddy (*khariif*) – grain amaranthus (*rabi*) crop sequence to obtain higher net realization.

*(Research Scientist, BTRS, Anand)*

#### 3 Studies on cropping sequence system in *goradu* soil of middle Gujarat condition

The farmers of AES II of middle Gujarat agro-climatic zone growing *rajgira* in *rabi* are recommended to adopt *rajgira* based cropping system, growing either maize or pearl millet in *khariif* and okra in summer to get higher net profit.

*(Associate Research Scientist, Irrigated Crop Research Station, Thasra)*



## [C] NUTRIENT MANAGEMENT

### 4 Integrated nutrient management in mustard

The farmers of AES II of middle Gujarat agro-climatic zone growing mustard (G M-2) are advised to apply FYM @ 10 t/ha along with 50 kg N and 50 kg P<sub>2</sub>O<sub>5</sub>/ha in the form of urea and SSP, respectively, for getting higher yield and net income. Out of the total quantity of fertilizer, 25 kg N + 50 kg P<sub>2</sub>O<sub>5</sub> should be applied at the time of sowing and remaining quantity of nitrogen should be applied at 30-35 days after sowing.

*(Research Scientist, RRS, Anand)*

### 5 Integrated nutrient management in rustica tobacco GCT- 3

The farmers of AES II of middle Gujarat agro climatic zone growing rustica tobacco (GCT 3) are advised to apply 85% of recommended dose (200 kg N/ha) of fertilizer [170 kg N/ha (25% from A. S. + 75% from Urea)]. The bio-fertilizer *Azospirillum lipoferum* ASA-1 @ 5ml/litre of water should be applied by root dipping of seedlings for 15 minutes which saves 15% nitrogen without affecting quality, yield and net realization.

*(Research Scientist, BTRS, Anand)*

### 6 Effect of different organic manures and spacing on yield and quality of kalmegh panchang (*Andrographis paniculata* Wall).

Farmers of AES II of middle Gujarat agro climatic zone growing *Kalmegh* are advised to apply FYM @ 10 t /ha or castor cake @ 1.0 t /ha and sow at a spacing of 30 x 15 cm to obtain higher yield and net realization.

*(Research Scientist, M & AP, Anand)*

### 7 Integrated nutrient management in cotton

The farmers of AES II of middle Gujarat agro-climatic zone growing Bt. cotton are advised to apply vermicompost @ 2 t/ha and fertilize the crop with nitrogen @ 240 kg N /ha to get higher yield and net profit. Nitrogen should be applied in four equal splits at monthly interval starting from sowing.

*(Associate Research Scientist, Irrigated Crop Research Station, Thasra)*

## 8 Response of soybean to N,P,K & S fertilization

The farmers of AES II of middle Gujarat agro-climatic zone growing soybean in *kharif* are advised to apply 45kg N/ha, 60kg P<sub>2</sub>O<sub>5</sub>/ha and 20 kg S/ha to get higher yield and net return.

**(Research Scientist, TRTC, Devgadbaria; Research Scientist (Micronutrients) and Prof., & Head, Soil Science, BACA, Anand)**

## [D] WATER MANAGEMENT

### 9 Irrigation methods and fertilizer levels on performance of cabbage

The farmers of AES II of middle Gujarat agro climatic zone are advised to adopt drip irrigation system in *rabi* cabbage (cv. Golden acre) planted in paired row system (45-75 X 45 cm) with fertigation of water soluble NPK -160:60:60 [N and P through Urea + Urea phosphate (17:44- N:P) and K through MOP] in five equal splits starting from 15 DATP at an interval of 10 days along with 25 t FYM/ ha to get maximum yield and net realization with 40% saving of water.

The system should be laid out by keeping 120 cm distances between two laterals with drippers (4 lph) at 45 cm distance. The system should be run at 1.2 kg/cm<sup>2</sup> for 43 minutes at alternate day.

**(Professor, IFFCO Chair, Soil Science, BACA, Anand)**

### 10 Testing of feasibility of drip irrigation with mulching in castor

The farmers of AES II of middle Gujarat agro-climatic zone are advised to adopt drip irrigation system for castor to get higher yield and net return with 31% saving in irrigation water (0.6 FPE). For drip irrigation, castor crop should be sown in paired row (60-180 x 60 cm). The system should be laid out one month after cessation of monsoon at a lateral distance of 2.4 m (in paired row) and dripper (4 LPH) spaced at 0.6 m. The system should be operated at 1.2 kg/cm<sup>2</sup> pressure for 1: 30 to 2: 1.5 hours an alternate day.

They are also advised to mulch their crop with paddy straw @5 t/ha just after installation of drip system for getting higher yield and net return.

**(Research Scientist, RRS, Anand)**

## 11 Response of clusterbean to irrigation, FYM and sulphur application

The farmers of AES II of middle Gujarat agro climatic zone growing clusterbean (variety GG 2) in late *kharif* are advised to fertilize their crop with 5 t FYM /ha coupled with 20 kg sulphur /ha in elemental form as basal and recommended dose of 20 kg N /ha + 40 kg P<sub>2</sub>O<sub>5</sub> /ha before sowing for securing higher yield and net return. The crop should be irrigated at branching and flowering stages, if rainfall is not received during these stages.

*(Research Scientist, ARS, DeroI)*

## III PLANT PROTECTION

### [A] AGRICULTURAL ENTOMOLOGY

#### 1 Persistence and residue studies of quinalphos 25 EC in/on cauliflower

Three foliar applications of quinalphos 25 EC @ 500 g a. i. ha<sup>-1</sup> at an interval of 15-days do not pose residue problem in cauliflower heads if harvested 10 days after the last spray and therefore, pre-harvest interval of 10 days is recommended.

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

#### 2 Residue studies of oxydemeton methyl 25 EC in/on cotton

Four foliar applications of oxydemeton methyl 25 EC @ 300 g a.i. ha<sup>-1</sup> at an interval of 15-days do not pose residue problem in cotton seed, lint and seed oil if harvested 68 days after the last spray and therefore, pre-harvest interval of 68 days is recommended.

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

#### 3 Residue studies of methyl parathion 50 EC/ 2 DP in/on cotton

Four foliar applications of methyl parathion 50 EC or 2 DP (dusting powder) @ 500 g a.i. ha<sup>-1</sup> at an interval of 15-days do not pose residue problem in cotton seed, lint and seed oil if harvested 68 days after the last spray and therefore, pre-harvest interval of 68 days is recommended.

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

**4      Residue studies of dichlorvos 76 EC in/on groundnut**

Two foliar applications of dichlorvos 76 EC @750 g a.i. ha<sup>-1</sup> in *kharif* groundnut at an interval of 15-days do not pose residue problem in kernel and oil if harvested 51 days after the last spray and therefore, pre-harvest interval of 51 days is recommended.

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

**5      Residue studies of quinalphos 1.5 DP / 25 EC in/on groundnut**

Two foliar applications of quinalphos 1.5 % DP @ 375 g a.i. ha<sup>-1</sup> or 25 EC @ 350 g a.i. ha<sup>-1</sup> at an interval of 15-days in *kharif* groundnut do not pose residue problem in kernel and oil if harvested 51 days after the last spray and therefore, pre-harvest interval of 51 days is recommended.

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

**6      Residue studies of quinalphos 25 EC in/on potato**

Three foliar applications of quinalphos 25 EC @ 0.5 kg a.i. ha<sup>-1</sup> at 15-day interval do not pose residue problem in potato tubers if harvested 34 days after the last spray and therefore, pre-harvest interval of 34 days is recommended.

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

**7      Residues and persistence studies of β-cyfluthrin 9% + imidacloprid 21% - 300 OD in/on brinjal**

Three foliar sprays of a combination product beta-cyfluthrin 9% + imidacloprid 21%-300 OD @ 18+42 g a.i.ha<sup>-1</sup> at 7-day interval do not pose residue problem in brinjal fruits if harvested 3 days after the last application and therefore, pre-harvest interval of 3 days is recommended.

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

**8      Residue studies of endosulfan 35 EC in/on groundnut**

Three foliar applications of endosulfan 35 EC @ 350 g a. i. ha<sup>-1</sup> at an interval of 15-days do not pose residue problem in *kharif* groundnut if harvested 53 days after the last spray and therefore, pre-harvest interval of 53 days is recommended.

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



**9 Residues and persistence studies of fipronil 18 % + imidacloprid 36 % - 540 SC in/on maize**

Seed coating of maize with fipronil 18 % + imidacloprid 36 % - 540 SC @ 2.7 + 5.4 g a. i. kg<sup>-1</sup> seed do not pose residue problem in tender leaves 20 days after the treatment and grains at harvest i.e. 81 days after the treatment and therefore pre-harvest interval of 81 days is recommended.

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

**10 Residues and dissipation of β-cyfluthrin 9 % + imidacloprid 21 % -300 OD in/on mango.**

Three foliar sprays of a combination product β- cyfluthrin 9 % + imidacloprid 21 % -300 OD @ 2.5 ml per 10 L water in mango at 10-days interval starting from fruit initiation do not pose residue problem in mango fruits if harvested one day after the last application and therefore, pre-harvest interval of one day is recommended.

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

**11 Residues and persistence studies of β- cyfluthrin 9% + imidacloprid 21% - 300 OD in/on okra**

Three foliar applications of a combination product, β-cyfluthrin 9% + imidacloprid 21% -300 OD @ 18 + 42 g a.i.ha<sup>-1</sup> at 7-days interval do not pose residue problem in okra fruits if harvested 3 days after the last application and therefore, pre-harvest interval of 3 days is recommended.

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

**12 Residues and persistence studies of spiromesifen 240 SC in/on okra**

Two foliar sprays of spiromesifen 240 SC @ 120 g a.i.ha<sup>-1</sup> in *kharif* okra at 10-days interval do not pose residue problem in okra fruits if harvested 3 days after the last application and therefore, pre-harvest interval of 3 days is recommended.

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

**13 Residue studies of spinosad 45 SC in/on pigeon pea**

Three foliar applications of spinosad 45 SC @ 73 g a.i. ha<sup>-1</sup> at 15-days interval do not pose residue problem in pigeon pea grains if harvested 26 days after the spray and therefore, pre-harvest interval of 26 days is recommended.

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

**14     Residue studies of endosulfan 35 EC in/on sugarcane**

Four foliar sprays of endosulfan 35 EC @ 350 g a.i.ha<sup>-1</sup> at 15-days interval do not pose residue problem in sugarcane juice if harvested 38 days after the last spray and therefore, pre-harvest interval of 38 days is recommended.

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

**15     Residues and persistence studies of spiromesifen -240 SC in/on tomato**

Two foliar sprays of spiromesifen 240 SC @ 150 g a.i. ha<sup>-1</sup> at 7-days interval do not pose residue problem in *rabi* tomato if the fruits are harvested 24 hours after the last spray and therefore, pre-harvest interval of one day is recommended.

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

**16     Residue and persistent study of flubendiamide (24%) + thiacloprid (24%) 480 SC in/on tomato**

Three foliar applications of a combination product, flubendiamide 24% + thiacloprid 24% -480 SC @ 48 + 48 g a.i. ha<sup>-1</sup> at 10-days interval do not pose residue problem in tomato, if fruits are harvested 3 days after the last spray and therefore, pre-harvest interval of 3 days is recommended.

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

**17     Residues and persistence studies of  $\beta$ -cyfluthrin 9%+ imidacloprid 21%-300 OD in/on tomato**

Three foliar applications of a combination product,  $\beta$ -cyfluthrin 9% + imidacloprid 21%-300 OD @ 18+42 g a.i. ha<sup>-1</sup> at 7-days interval do not pose residue problem in tomato fruits if harvested one day after the last spray and therefore, pre-harvest interval of one day is recommended.

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

**18     Residue studies of emamectin benzoate 5 SG in/on tomato**

Three sprays of emamectin benzoate 5 SG @ 11 g a.i.ha<sup>-1</sup> at 10–days interval do not pose residue problem in tomato fruits if harvested 3 days after the last application and therefore, pre-harvest interval of 3 days is recommended.

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

**19     Residue studies of emamectin benzoate 5 SG in/on okra**

Two sprays of emamectin benzoate 5 SG @ 11 g a.i.ha<sup>-1</sup> at 15-days interval do not pose residue problem in okra fruits if harvested one day after the last application and therefore, pre-harvest interval of one day is recommended.

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

**20     Residue and persistence studies of deltamethrin 10 EC in/on chilli**

Three foliar applications of deltamethrin 10 EC @ 17.5 g a.i. ha<sup>-1</sup> at 7-days interval do not pose residue problem in green chilli fruits if harvested one day after the last spray and therefore, pre-harvest interval of one day is recommended.

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

**21     Residues and persistence studies of fipronil 80 WG in/on chilli**

Two foliar applications of fipronil 80 WG @ 50 g a.i. ha<sup>-1</sup> at an interval of 10-days do not pose residue problem in green chilli fruits if harvested 10 days after the last spray and therefore, pre-harvest interval of 10 days is recommended.

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

**22     Residues and persistence studies of flubendiamide 24% + thiacloprid 24% -480 SC in/on chilli**

Three foliar sprays of a combination product flubendiamide 24% + thiacloprid 24% - 480 SC @ 60 g a.i. ha<sup>-1</sup> at 10-days interval do not pose residue problem in green chilli fruits if harvested one day after the last application and therefore, pre-harvest interval of one day is recommended.

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

**23     Residue studies of α-endosulfan 35 EC in/on cotton**

Four foliar applications of α-endosulfan 35 EC @ 700 g a.i. ha<sup>-1</sup> at an interval of 15-days do not result in its residues in lint, cotton oil and soil if harvested 90 days after the last spray and therefore, pre-harvest interval of 90 days is recommended.

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

## 24 Residues and persistence of flonicamid 50 WG in/on cotton

Four foliar sprays of flonicamid 50 WG @ 75 g a.i. ha<sup>-1</sup> at 15-days interval do not pose residue problem in cotton seed, lint, oil and cake at first picking i.e., 25 days after the last spray and therefore, pre-harvest interval of 25 days is recommended.

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

## 25 Influence of spray equipments on the bio-efficacy of NPV against *H. armigera* in pigeon pea

The framers of Middle Gujarat Agro-climatic Zone III growing pigeon pea are advised to spray their pigeon pea crop with HaNPV @ 250 LE/ha (1.5 x 10<sup>12</sup> POB /ha) using lever operated continuous Knapsack sprayer for effective and economical control of *Helicoverpa armigera*. The spray should be carried out three times during evening hours i. e. (1) at initiation of flower bud (2) flowering on 50% plants and (3) podding on 50% plants.

**(Assistant Research Scientist (Ento), ARS, Derol)**

## 26 Assessment of IPM modules for the control of *H. armigera* in chickpea

The farmers of Middle Gujarat Agro-climatic Zone III growing chickpea are advised to follow the following module for effective and economical management of gram pod borer, *Helicoverpa armigera*.

The first spray of Neem Seed Kernel Extract @ 5% at flowering on 50% plants, second spray of HaNPV @ 250 LE/ha (1.5 x 10<sup>12</sup> POB /ha) at pod formation on 50% plants and fenvalerate 20 EC @ 0.02% at 15 days after second spray.

**(Assistant Research Scientist (Ento), ARS, Derol)**

## [B] PLANT PATHOLOGY

### 1 Management of Alternaria blight, anthracnose and angular leaf spot diseases of Bt cotton

For effective and economical management of Alternaria blight, anthracnose and angular leaf spot diseases of Bt cotton; farmers of middle Gujarat are advised to soak the delinted seeds of cotton in streptomycin sulphate @ 0.025 % for 30 minutes followed by shade drying and treating with thiram @ 3 g/kg along with four alternate sprays of streptomycin sulphate



0.02 % + copper oxychloride 0.10% and ready mix formulation mancozeb 63 %+ carbendazim 12 %, 0.2 % **OR** only mancozeb 63 %+ carbendazim 12 %, 0.2 % starting at disease initiation and at 10 days interval.

**(Professor & Head, Department of Plant Pathology, BACA, Anand)**

## **2 Management of Alternaria blight of cumin**

For effective and economical management of *Alternaria* blight of cumin, farmers of middle Gujarat are advised to treat the seeds with thiram @ 5 g/kg seed followed by six sprays of propineb 70% WP, 0.2% **or** metiram 70 WG, 0.2% **or** propiconazole 25% EC, 0.1% starting from disease initiation and at 7 days interval.

**(Professor & Head, Department of Plant Pathology, BACA, Anand)**

## **3 Management of bacterial blight of cluster bean for seed purpose**

For effective and economical management of bacterial blight for seed production of cluster bean; farmers of middle Gujarat are advised to treat the seeds by soaking for one hour in solution of streptomycin sulphate 90% + tetracycline hydrochloride 10% (Streptocycline), 0.025% followed by three sprays of streptomycin sulphate 90% + tetracycline hydrochloride 10% (Streptocycline), 0.01% **OR** three alternate sprays of streptomycin sulphate 90% + tetracycline hydrochloride 10% (Streptocycline), 0.01%, followed by spray of copper oxychloride, 0.2% and streptomycin sulphate 90% + tetracycline hydrochloride 10% (Streptocycline), 0.01% starting from 35 days of sowing and at 10 days interval.

**(Professor & Head, Department of Plant Pathology, BACA, Anand)**

## **4 Persistence and residue studies of mancozeb 75 WP in/on cauliflower**

Three foliar applications of mancozeb 75 WP @ 1500 g a.i. ha<sup>-1</sup> in cauliflower at an interval of 7 days do not pose residue problem in cauliflower head if harvested 7 days after the spray. Therefore, pre-harvest interval of 7 days is recommended.

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

**5 Residue studies of mancozeb 75 WP in/on ginger**

Six foliar applications of mancozeb 75 WP @ 450 g a.i. ha<sup>-1</sup> in ginger at an interval of 15 days do not pose residue problem in rhizomes if harvested 74 days after the last spray. Therefore, pre-harvest interval of 74 days is recommended.

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

**6 Residue studies of mancozeb 75 WP in/on groundnut**

Two foliar applications of mancozeb 75 WP @ 1125 g a.i. ha<sup>-1</sup> in groundnut at 15-days interval do not pose residue problem in kernel and oil if harvested 51 days after the spray. Therefore, pre-harvest interval of 51 days is recommended.

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

**7 Persistence and residue studies of mancozeb 75 WP in/on onion**

Three foliar applications of mancozeb 75 WP @ 1500 g a.i. ha<sup>-1</sup> in onion at an interval of 10-days do not pose residue problem in immature bulb with green leaves or matured onion if harvested 10 days after the spray. Therefore, pre-harvest interval of 10 days is recommended.

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

**8 Residue studies of mancozeb 75 WG / 75 WP in/on potato**

Three foliar applications of mancozeb 75 WG/ 75 WP @ 750/ 1500 g a.i. ha<sup>-1</sup>, respectively in potato at 10 days interval do not pose residue problem in tuber if harvested 34 days after the last spray. Therefore, pre-harvest interval of 34 days is recommended.

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

**9 Residue studies of zineb 75 WP in/on turmeric**

Six foliar applications of zineb 75 WP @ 1500 g a.i. ha<sup>-1</sup> in turmeric at an interval of 15 days do not pose residue problem in rhizome if harvested 33 days after the last spray. Therefore, pre-harvest interval of 33 days is recommended.

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

**10    Residue and persistence of fluopicolide 6.25 % + propamocarb hydrochloride 62.5 % - 68.75 SC in tomato**

Three foliar sprays of a combi product, fluopicolide 6.25% + propamocarb hydrochloride 62.5% - 68.75 SC @ 93.75 + 937.5 g a.i.ha<sup>-1</sup> in tomato at 7 days interval do not pose residue problem if the fruits are harvested one day after the last spray. Therefore, pre-harvest interval of one day is recommended.

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

**11    Bio-efficacy of newer fungicides against turicum leaf blight (TLB) disease in *rabi* maize**

Farmers of the middle Gujarat growing *rabi* maize are advised to treat the maize seeds with captan (@ 3 g /kg seed) at the time of sowing followed by four sprays of ready mix fungicide carbendazim 12 % + mancozeb 63 % @ 0.2%, first spray at 40 DAS and remaining three sprays at 15 days interval from the first spray for effective and economical management of turicum leaf blight (TLB) disease.

***(Assistant Research Scientist (Patho), Main Maize Research Station, Godhra)***

Sr.No.	Crop	Pesticide	Pest/Disease	Application	a.i. per ha	Formulation per 10 l water	Treatment	Pre- harvest interval (Days)
1	Cauliflower	Mancozeb 75WP	Leaf spot	Foliar spray	1500 g	40 g	Three sprays at 15- day interval starting from head formation stage.	7
2	Cauliflower	Quinalphos 25EC	Diamond back moth	Foliar spray	500 g	40 ml	Three sprays at 15- day interval starting from head formation stage.	10
3	Cotton	Oxydemeton methyl 25EC	Sucking pests	Foliar spray	300 g	24 ml	Four sprays at 15-day interval starting from vegetative stage.	68
4	Cotton	Parathion methyl 50EC / 2DP	Boll worms	Foliar spray	500 g	20 ml (EC) 25 kg/ha (DP)	Four sprays at 15-day interval starting from vegetative stage.	68
5	Ginger	Mancozeb 75WP	Leaf spot	Foliar spray	450 g	20 g	Six sprays at 15-day interval starting from vegetative stage.	74
6	Groundnut	Dichlorvos 76EC	Leaf eating caterpillar	Foliar spray	750 g	18-20 ml	Two sprays at 15-day interval starting from pod formation stage.	51
7	Groundnut	Mancozeb 75WP	Leaf spot	Foliar spray	1125 g	30 ml	Two sprays at 15-day interval starting from pod formation stage.	51
8	Groundnut	Quinalphos 1.5DP / 25EC	Leaf eating caterpillar	Foliar spray	375 g (DP) 350 g (EC)	25 kg/ha (DP) 30 ml (EC)	Two sprays at 15-day interval starting from pod formation stage.	51 (30 As per CIB Guideline)
9	Onion	Mancozeb 75WP	Purple blotch	Foliar spray	1500 g	40 g	Two sprays at 10-day interval starting from bulb formation stage.	10
10	Potato	Mancozeb 75WP / WG	Early blight Late blight	Foliar spray	750 g	20 g	Three sprays at 10- day interval starting from vegetative stage.	34



11	Potato	Quinalphos 25EC	Tuber moth	Foliar spray	500 g	20 ml	Three sprays at 15-day interval starting from vegetative stage.	34
12	Turmeric	Zineb 75WP	Leaf spot	Foliar spray	1500 g	40 g	Six sprays at 15-day interval starting from vegetative stage.	33
13	Black gram	Quizalofop ethyl 5EC	Monocot weeds	Foliar spray	50 g	20 ml	One spray within 30 days of sowing	47
14	Brinjal	Beta cyfluthrin 9 % + Imidacloprid 21 % - 300 OD	Shoot and Fruit Borer	Foliar spray	18 + 42 g (60 g)	4 - 5 ml	Three sprays at 7-day interval starting from fruiting stage.	3
15	Chilli	Deltamethrin 10 EC	Fruit borer	Foliar spray	17.5 g	4 ml	Three sprays at 7-day interval starting from fruiting stage.	1
16	Chilli	Fipronil 80 WG	Sucking pests	Foliar spray	50 g	1.3 g	Two sprays at 10-day interval starting from fruiting stage.	10
17	Chilli	Flubendiamide 24 % Thiocloprid 24 % - 480 SC	Fruit borer	Foliar spray	60 + 60 g (120g)	5 ml	Three sprays at 10-day interval starting from fruiting stage.	1
18**	Cotton	Alpha Endosulphan 35 EC	Bollworm complex	Foliar spray	700 g	20 ml	Four sprays at 15-day interval starting from reproductive stage.	90
19	Cotton	Flonicamid 50 WG	Sucking pests	Foliar spray	75 g	3 g	Four sprays at 15-20 days interval starting from vegetative stage.	25
20**	Groundnut	Endosulfan 35 EC	Spodoptera	Foliar spray	350 g	10 ml	Three sprays at 15-day interval starting from vegetative stage.	53
21	Maize	Fipronil 18 % + Imidacloprid 36 % - 540 SC	Termite and stem borer	Seed treatment	2.7 + 5.4 g	15 g	Seed treatment	20 (Leaves) 80 (Grains)
22	Mango	Beta cyfluthrin 9 % + Imidacloprid 21 % - 300 OD	Hoppers and sucking pests	Foliar spray	0.0075 %	2.5 ml	Three sprays at 10-day interval starting from fruiting stage.	1
23	Okra	Beta cyfluthrin 9 % Imidacloprid 21 %	Sucking pest and Spotted	Foliar spray	18 + 42 g	4 - 5 ml	Three sprays at 7-day interval starting from	3

		- 300 OD	bollworm		(60 g)		fruiting stage.	
24	Okra	Spiromesifen 240 SC	Mites and whitefly	Foliar spray	120 g	10 ml	Two sprays at 10-day interval starting from fruiting stage.	3
25	Onion	Quizalofop ethyl 5EC	Monocot weeds	Foliar spray	50 g	20 ml	One spray within 30 days of transplanting	3
26	Pigeonpea	Spinosad 45 SC	Pod borers	Foliar spray	73 g	2-3 ml	Three sprays at 15-day interval starting from pod setting stage.	26
27**	Sugarcane	Endosulfan 35 EC	Shoot borer	Foliar spray	350 g	20 ml	Four sprays at 15-day interval starting from vegetative stage.	38
28	Tomato	Spiromesifen 240 SC	Mites and Whitefly	Foliar spray	150 g	12 - 13 ml	Two sprays at 7-day interval starting from fruiting stage.	1
29	Tomato	Flubendiamide 24 % + Thiacloprid 24 % - 480 SC	Fruit borer and mites	Foliar spray	48+48 g (96 g)	4 - 5 ml	Three sprays at 10-day interval starting from fruiting stage.	3
30	Tomato	Fluopicolide 6.25 % + Propamocarb 62.5 % - 68.75SC	Late blight	Foliar spray	93.75 +937.5 g (1031.25 g)	30 ml	Three sprays at 7-day interval starting from fruiting stage.	1
31	Tomato	Beta cyfluthrin 9 % + Imidacloprid 21 % - 300 OD	Fruit borer	Foliar spray	18 + 42 g (60 g)	4 - 5 ml	Three sprays at 10-day interval starting from fruiting stage.	1
32	Tomato	Emamectin benzoate 5 SG	Fruit borer and sucking pests	Foliar spray	11 g	4 - 5 ml	Three sprays at 10-day interval starting from fruiting stage.	3
33	Okra	Emamectin benzoate 5 SG	Spotted bollworm	Foliar spray	11 g	4 - 5 ml	Two sprays at 15-day interval starting from fruiting stage.	1

**Note :** \*\* Banned for use in India vide Supreme Court Order

## IV DAIRY SCIENCE, AGRIL. ENGINEERING AND FOOD PROCESSING TECHNOLOGY

### [A] DAIRY SCIENCE

#### 1. Fermentation of double toned milk

Carbonated fermented milk containing more than 30 million live lactobacilli/ml can be prepared by fermentation of double toned milk using *Streptococcus thermophilus* MTCC 5460 and probiotic culture *Lactobacillus helveticus* MTCC 5463 with shelf-life of 28 days at  $5\pm 2^{\circ}\text{C}$ .

*(Dairy Microbiology Dept, SMC College of Dairy Science, Anand)*

#### 2. Synbiotic lassi

Synbiotic lassi could be prepared by fermentation of toned milk with *Streptococcus thermophilus* MTCC 5460 and a probiotic culture *Lactobacillus helveticus* MTCC 5463 with incorporation of processed honey. The product provide optimum dose of probiotic lactobacilli and is organoleptically acceptable till 21 days at  $5\pm 2^{\circ}\text{C}$ .

*(Dairy Microbiology Dept, SMC College of Dairy Science, Anand)*

#### 3. Low fat ice cream

Low fat ice cream with acceptability similar to a regular ice cream can be prepared using whey protein concentrate and maltodextrin as fat replacers and bulk fillers, respectively. The product has additional advantage of more than three times lower fat, 25% higher protein content and about 40% reduction in cost as compared to normal ice cream.

*(Dairy Technology Dept, SMC College of Dairy Science, Anand)*

#### 4. Treatment of dairy effluent

A hybrid reactor having combined features of Upflow Anaerobic Sludge Blanket (UASB) and anaerobic fixed film reactor with polypropylene or ceramic saddles as packing media is recommended for treatment of dairy effluent, which gives about 85% reduction in chemical oxygen demand (COD) in 2-3 days hydraulic retention time (HRT) with added advantage of biogas production.

*(Dairy Engineering Dept, SMC College of Dairy Science, Anand)*

## **[B] FOOD PROCESSING TECHNOLOGY**

### **1. Evaporatively cooled transportation system**

The evaporatively cooled transportation system developed by College of Food Processing Technology and Bio- Energy, Anand Agricultural University, Anand is recommended for safe and cool transportation of fruits/vegetables to preserve freshness with less physiological loss in weight and longer shelf-life. The system can be easily fitted on existing body of any goods transporting vehicle and removed when not required.

*(College of FPT & BE, Anand)*

### **2. Shelf life of aonla fruits**

The farmers and orchard owners are recommended to precool aonla fruits by dipping in chilled water maintained at 8 °C for 9 minutes and then stored at 4 °C and 85-90 % RH. This will extend the shelf life of aonla fruits by additional 30%.

*(College of FPT & BE, Anand)*

### **3. Ready-to-serve unripe mango beverage**

The entrepreneurs and food processors interested in production of superior quality ready-to-serve unripe mango beverage, panna are recommended to use the “Production technology for RTS (ready-to-serve) unripe mango beverage” developed by College of Food Processing Technology & Bio- Energy, Anand Agricultural University, Anand. The technology involves processing of unripe (green) and matures mango fruit using pressure cooking, pulping, straining and addition of appropriate level of water, sugar and salt, thermal treatment, addition of preservative and filling in bottles. The product is to be stored at 4°C for higher shelf life.

*(College of FPT & BE, Anand)*

### **4. Pumpkin powder**

The entrepreneurs and food processors interested in production of pumpkin powder are advised to use the “Production technology of pumpkin powder” developed by Anand Agricultural University, Anand, which results in a superior quality, carotene and mineral rich, self stable pumpkin powder for

various food uses. The technology involves blanching and sulphiting of approximate size of pumpkin pulp cube followed by drying under specified conditions and packaging the powder in light/oxygen barrier type packs.

***(College of FPT & BE, Anand)***

#### **5. High fiber bun**

A satisfactory high fiber bun can be prepared by replacing Refined Wheat Flour with maximum 6% Pigeon Pea Husk using formula, treatment and procedure standardized by Anand Agricultural University.

***(Polytechnic in Food Science and Home Economics, Anand)***

## **V ANIMAL PRODUCTION**

#### **1. Concentrate mixture for buffaloes**

In Kheda district, buffaloes yielding 5-7, 7-9 and 9-12 kg milk/day receive on an average daily 4.1, 4.2, and 5.3 kg concentrate mixture, respectively. In order to fulfill their nutrient requirement, the farmers are advised to feed additional 1.0 and 1.5 kg compound concentrate mixture during winter to buffaloes yielding daily 5-7, and 7-9 kg and 1.5 kg round the year to buffaloes that yield daily 9-12 kg milk.

***(Research Scientist, Animal Nutrition Research Station, Anand)***

#### **2. Concentrate mixture for bullocks**

In Kheda district, the bullocks receive on an average daily less than 200 g concentrate mixture during winter and summer seasons. In order to fulfill their nutrient requirement for maintenance, the farmers are advised to feed additional 800g compound concentrate mixture or 4.0 kg leguminous fodder.

***(Research Scientist, Animal Nutrition Research Station, Anand)***

#### **3. Total mixed ration**

Total mixed ration comprising of 50 % mature pasture grass and 50 % compound concentrate mixture with bypass protein source resulted in 22 % more body weight gain in crossbred calves without any increase in feed cost.

***(Research Scientist, Animal Nutrition Research Station, Anand)***



## VI ANIMAL HEALTH

### 1 Hoof care

Stall fed milch animals maintained on pakka floor are prone to hoof disorders with reduction in milk production (32%), hence regular hoof care is advocated.

*(Professor & Head, Dept. of Surgery & Radiology, Vet. College, Anand)*

## Recommendations for scientific community and entrepreneurs

## I CROP IMPROVEMENT

### PLANT PHYSIOLOGY

#### 1. Tobacco seed & oil yield

Application of 40 kg S/ha in the form of ammonium sulphate or bentonite significantly improved the tobacco seed yield & oil yield.

*(Associate Research Scientist, BTRS, Anand)*

## II CROP PRODUCTION

### WEED MANAGEMENT

#### 1 Residues and persistence studies of quizalofop ethyl 5 EC in blackgram

Control of grassy weeds in blackgram following post-emergence foliar application of quizalofop ethyl 5 EC @ 50 g a.i./ ha (20 ml formulation per 10 lit. water) as post emergence 29 days after sowing, do not pose residue problem in blackgram grains at harvest. Therefore, the PHI of 47 days is recommended.

*(Research Scientist, Pesticide Residue scheme, Anand)*

#### 2 Residue and persistence studies of quizalofop ethyl – 5 EC in onion

Control of grassy weeds in onion following a single spray of quizalofop ethyl 5 EC as post-emergence @ 50 g a.i./ha (20 ml formulation per 10 lit. water) 22 days after transplanting do not pose residue problem in onion plants, if harvested 3 day after the application. Therefore, PHI of 3 days for green onion recommended. Onion bulbs at harvest were also safe from residue point of view.

*(Research Scientist, Pesticide Residue scheme, Anand)*

### III PLANT PROTECTION

#### ENTOMOLOGY

##### 1 Influence of crop habitat diversity on biodiversity of natural enemies in pigeon pea pests

Pigeon pea crop intercropped with sunflower in the ratio of 9:1 with maize as border crop enhanced the population of predatory insects such as chrysopids and coccinellids which ultimately suppress the incidence of *Helicoverpa armigera* (Hubner) Hardwick on pigeon pea.

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

##### 2 Screening of promising accessions for resistance against shoot fly

Sorghum accessions PB-215, PB-257, IS-3260, IS-7053, IS-7650, IS-23262 and SS-96-784 were found to be resistant or moderately resistant against shoot fly. These accessions can be used in breeding programme for developing resistant varieties against shoot fly.

***(Asstt. Research Scientist (Ento), Main Forage Research Station, Anand)***

### IV ANIMAL PRODUCTION

##### 1 Estrus synchronization protocol

Estrus synchronization protocol involving i/vg insertion of CIDR for 7 days in combination with estradiol valerate i/m 1.0 mg on first day followed by i/m injection of PGF2 $\alpha$  500  $\mu$ g on sixth day and estradiol valerate 0.75 mg 24 hrs later while removing CIDR with double inseminations performed at 48 and 72 hrs after PGF2 $\alpha$  injection resulted in 100 % ovulatory estrus induction and more than 50 % conception at induced estrus in postpartum anestrus cows and buffaloes and is cost effective as compared to Ovsynch or Ovsynch + CIDR protocol (CR 33.33 & 50.00%), hence CIDR is advocated.

***(Research Scientists, LRS & RBRU and Prof., Dept. of Gynaecology, Anand)***

##### 2 Use of USG

The transrectal ultrasound scanning using 5 MHz linear transducer on day 26 and 40 post-AI in Kankrej cows revealed sensitivity up to 85.71 and 93.75 %, specificity 75.00 and 100.00 %, and diagnostic accuracy up to 80.77 and 96.15 %, respectively, for early pregnancy. Hence, the use of USG at day

40 post-AI is advocated for early pregnancy diagnosis in cattle with its advantages of instant result and detecting fetal viability over plain rectal palpation.

***(Research Scientist, Livestock Research Station, Anand)***

### **3 Bypass protein**

Supplementation of 1.25 kg bypass protein concentrate mixture replacing 1kg home-made concentrate mixture in the ration of buffaloes yielding 7.0-9.0 kg milk had similar blood biochemical profile, viz., serum total protein, albumin, globulin, blood glucose, total cholesterol, triglycerides, urea, creatinine, calcium and phosphorus and activities of aspartate aminotransferase and alanine aminotransferase.

***(Research Scientist, Animal Nutrition Research Station, Anand)***

### **4 Bypass fat**

During early lactation, buffaloes yielding daily 8-12 kg milk, when supplemented with bypass fat @ 20 g/kg milk yield had similar blood biochemical profile, viz., serum total protein, albumin, globulin, blood glucose, total cholesterol, triglycerides, urea, uric acid, creatinine, calcium and phosphorus and activities of aspartate aminotransferase and alanine aminotransferase.

***(Research Scientist, Animal Nutrition Research Station, Anand)***

### **5 Nutritional requirement to crossbred calves**

Growing crossbred calves subjected to nutritional inadequacy to the extent of 25% of ICAR standard for 120 days compensated the bodyweight gain during subsequent 60 days, when fed 25% more than the actual requirement with 10% reduction in feed cost per kg live weight gain and without any adverse effect on rumen fermentation, digestibility of nutrients and blood biochemical profile, viz., serum total protein, albumin, globulin, blood glucose, total cholesterol, triglycerides, urea, uric acid, creatinine, calcium, phosphorus, magnesium, and activities of aspartate aminotransferase and alanine aminotransferase except triglycerides level that was higher during feed restriction.

***(Research Scientist, Animal Nutrition Research Station, Anand)***

## 6 Concentrate mixture of bullocks

The inclusion of live yeast (*Saccharomyces cerevisiae*) @ 5-10 g/day in concentrate mixture of bullocks have improved digestibility of ether extract and nitrogen free extract by 9 and 6 %, respectively.

**(Research Scientist, Animal Nutrition Research Station, Anand)**

## 7 Detoxified jatropha or neem seed cake

The replacement of soyabean meal protein with detoxified jatropha or neem seed cake up to 75% level in the diet of growing kids had no any adverse effect on feed intake, growth performance, nutrient utilization, feed conversion and blood biochemical profile, viz., haemoglobin, glucose, total protein, albumin, globulin, cholesterol, triglycerides, blood urea nitrogen, calcium, phosphorus and activities of alanine- aminotransferase and aspartate aminotransferase.

**(Research Scientist, Animal Nutrition Research Station, Anand)**

# V ANIMAL HEALTH

## 1 Cefepime administered

Pharmacokinetics of Cefepime administered intramuscularly in cow calves (5 mg/kg body weight), sheep and goat (20 mg/kg body weight) get altered in febrile state (induced by *E. coli* lipopolysaccharide, 0.2 µg/kg body weight, intravenous). Repeated intramuscular administration of Cefepime in calves, sheep and goat every 12 hr for five days is safe based on haematological and serum biochemical evaluation.

**(Professor & Head, Dept. of Pharmacology, Anand)**

## 2 Oral administration of Piperine

Oral administration of Piperine (an alkaloid of *Piper nigrum* / *Piper longum*, 15 mg/kg body weight) and Trikatu (polyherbal ayurvedic preparation containing an equal ratio of *Piper longum*, *Piper nigrum* and *Zingiber officinale*, 2 g/kg body weight) increases bioavailability of Gatifloxacin in poultry and sheep by 11 per cent.

**(Professor & Head, Dept. of Pharmacology, Anand)**

### 3 In House designed primer

In House designed primer

F-5' AGCCGAGCTGAATGAGAAACA 3'

R-5' AACCCCACCGAACATATACAC 3'

can be used for specific detection of *Gastrothylax indicus* by PCR.

**(Professor & Head, Dept. of Parasitology, Veterinary College, Anand)**

### 4 Variant strain of Canine parvovirus-2

New variant strain of Canine parvovirus-2 i.e. CPV-2c detected in different canine population of the world is also circulating in the dogs of middle Gujarat region.

**(Professor & Head, Dept. of Microbiology, Veterinary College, Anand)**

### 5 Endoscopic teat surgery

The wet lab model using cadaver teats is useful for hands on training in endoscopic teat surgery. During theloscopy and theloressectoscopy teats filled with air and water, respectively provides better visualization.

**(Professor, Dept. of Surgery & Radiology, Veterinary College, Anand)**

### 6 Ultrasonography of forestomach

For ultrasonography of forestomach in goats, 7.5 MHz convex probe is suitable, while 15-18 MHz linear probe is ideal for rumeno-reticular groove, longitudinal, transverse and coronary omaso-abomasal grooves, rumen papillae and reticular wall.

**(Professor, Dept. of Surgery & Radiology, Veterinary College, Anand)**

### 7 Conservative technique for amputation of preputial prolapse

In bulls, the conservative technique for amputation of preputial prolapse by resecting inverted 'V' shaped triangular portion minimizes postoperative stricture formation, and hence advantageous over circumcision technique for functional recovery.

**(Professor, Dept. of Surgery & Radiology, Veterinary College, Anand)**

### 8 Ilizarov technique



Ilizarov technique for immobilization of tibial fractures in dogs nullifies the disadvantages of intramedullary pinning by preventing axial rotation, torsional and bending forces and thus giving additional stability to the fractured bone for earlier restoration of normal limb functions.

*(Professor, Dept. of Surgery & Radiology, Veterinary College, Anand)*

## 9 Tie-in configuration technique

Tie-in configuration technique for immobilization of femoral fractures in dogs nullifies the disadvantages of intramedullary pinning by preventing proximal migration of the pin and by resisting axial compressive as well as rotational fracture forces and also provides added stability to the fractured bone for earlier restoration of normal limb functions.

*(Professor, Dept. of Surgery & Radiology, Veterinary College, Anand)*

## VI SOCIAL SCIENCE

### 1. Scale to measure attitude towards application of distance education in agriculture and allied fields

Following scale is recommended for scientific community to measure attitude towards application of distance education in agriculture and allied fields. The statements are as follow. The reliability of 1<sup>st</sup> and 2<sup>nd</sup> year was 0.78 and 0.74 respectively.

Sr.	Statements for Final Scale
1.(+)	I feel that DEAAF is need of hours to fill gap between actual need of able human recourses for agril. Development and their availability.
2.(+)	I believe that there is need to implement DEAAF programme because of its flexibility.
3.(-)	I don't think offering master and doctorate programme on agriculture through DE is possible.
4.(-)	I dislike DEAAF because it does not follow formal way of learning.
5.(+)	I like to learn through DEAAF as it provides opportunity to learn at any time.
6.(+)	I feel that DEAAF creates educational opportunity to those who want to learn while earning.
7.(+)	I feel that DEAAF is relevant to the ever increasing higher agricultural educational needs of India.
8.(+)	I believe that DEAAF has the potential to bring out innovation.

*(Assist. Prof., Polytechnic in FS&HE, Anand)*

## 2. Scale to measure attitude of farmers towards soil health card programme

Following scale is recommended for scientific community to measure attitude of farmers towards soil health card programme. The statements are as follow. The reliability of 1<sup>st</sup> and 2<sup>nd</sup> year was 0.78 and 0.83 respectively.

Sr.	Statements for Final Scale
1.(+)	I believe that Soil Health Card (SHC) programme is blessing for the farmers.
2.(+)	I realize that SHC is useful to know the physical properties of the soil to ensure the soil productivity.
3.(+)	I trust that SHC is useful to save input cost for the farmers.
4.(+)	I believe that SHC is useful scheme for farmers.
5.(-)	I feel that SHC programme is not useful for illiterate farmers.
6.(+)	I feel that SHC is useful scheme to understand fertility status of the soil.
7.(+)	I recognize that SHC is worthy for balanced use of chemical fertilizers.
8.(+)	I recognize that SHC is useful to adopt Integrated Nutrient Management practices in the crops.

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