Research Accomplishments and Recommendations

2019

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RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

2019

Editors
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MESSAGE

The visionary leaders of the nation realized the importance of modern science & technology and agricultural research as means to shore up the woefully inadequate food production in the country. 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 delighted to note that the AAU is going to publish "Research Accomplishments and Recommendations 2019" prepared by the Directorate of Research, AAU, Anand. I feel enormous pleasure to put forth the informative publication containing location specific and need based technologies developed by the scientists of different faculties for farming as well as scientific communities. I congratulate all the scientists for the precious research effort done by them, which will help not only to increase the agricultural production in the state but also to address various important issues.

I compliment former Director of Research, Dr. K.B. Kathiria and his team for their sincere efforts in bringing out this important scientific publication covering the new technologies generated by the AAU scientists. I am sure that this publication will be a very useful source of information to all those concerned for the welfare of agricultural and related sectors.

(R.V.Vyas)

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FOREWORD

It is a matter of immense pleasure for me to put forward the fourteenth edition of 'Research Accomplishments and Recommendations 2019' containing information on technologies developed and recommended by the scientists of Crop Improvement, Crop Production, Plant Protection, Social Science, Animal Health, Animal Production & Fisheries, Dairy Science & FPTBE and Agricultural Engineering & Agricultural Information Technology of Anand Agricultural University for the benefits of farming community, extension entrepreneurs, veterinary / dairy professionals and other end users. I congratulate all the scientists who are directly or indirectly involved in developing these useful technologies. I am sure that the higher production of agriculture and allied sectors will be achieved through very important but basic interventions like improved varieties, better crop nutrition and improved agronomic practices, which will ultimately improve the quality of the produce and solve many problems and challenges faced by the agricultural sector.

I am highly indebted to Dr. N. C. Patel, former Hon. Vice Chancellor of AAU for his guidance and useful inputs in improving the research outcome of Anand Agricultural University. Efforts made by my predecessor Dr. K. B. Kathiria deserve appreciation for his contribution in the compilation of this booklet. 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 respective AGRESCO sub-committee meetings efficiently and meaningfully. The technical staff of the Directorate of Research deserves special appreciation for compiling the information in time and documenting it in a nice way.

(R.V.Vyas)

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PREFACE

The research work carried out in different fields of agricultural sciences during the year 2018-19 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 and new technical programmes made by different committees are listed below.

Name of the sub-committee / faculty	No. of recommendations		No. of New Technical Programmes
	For farmers/ entrepreneurs	For scientific community	
Crop Improvement and Basic Science	07	01	09
Crop Production	14	03	19
Plant Protection	06	07	39
Dairy Science and FPT&BE	19	04	20
Agri. Engineering& AIT	-	01	12
Animal Production	07	06	15
Animal Health	01	04	12
Social Science	01	04	46
Total	**55**	**30**	**172**

RECOMMENDATIONS FOR FARMING COMMUNITY

CROP IMPROVEMENT

1. Crop : Castor

Variety : Gujarat Castor Hybrid 10 (GCH 10: Charutar Gold)

This castor hybrid GCH 10 (Charutar Gold) gave 3894 kg/ha seed yield which was 9.05% higher than check GCH 7 (3571 kg/ha) under irrigated condition of Gujarat. This hybrid found resistant to wilt under sick plot and artificially inoculated soils under pot method. Days to maturity of primary raceme is quite earlier (99 days) as compared to check GCH 7 (111 days). This indicates early maturity of proposed hybrid as compared to check GCH 7. The 100 seed weight of this newly developed hybrid is 35.35 g as compared to 31.79 g of check GCH 7. The oil content of proposed hybrid is 50.03 per cent which is higher than check GCH 7 (49.38%). The proposed hybrid is recommended for release under irrigated condition in Gujarat.

(Associate Research Scientist, ARS, AAU, Sansoli)

2. Crop : Maize

Variety : Gujarat Anand Pop Corn Hybrid 21 (GAPCH 21- Mahashweta)

The popcorn single cross hybrid GAPCH 21 (Mahashweta) is recommended for *rabi* cultivation in middle Gujarat. This hybrid gave average 3669 kg/ha kernel yield and recorded 53.96 per cent higher yield than check Amber popcorn. This hybrid having high popping (92%) and popping volume (213 ml/cm^3). It is medium maturing, orange flint kernels and high test weight (190 g). This hybrid is resistant against *Curvularia* Leaf spot and *Puccinia* rust as well as moderately resistant against stem borer.

(Research Scientist, MMRS, AAU, Godhra)

3. Crop : Maize

Variety: Gujarat Anand Sweet Corn Hybrid 11 (GASCH 11: Madhuram)

The sweet corn single cross hybrid GASCH 11 (Madhuram) is recommended for *rabi* cultivation in middle Gujarat. This hybrid gave green cob yield of 13273 kg/ha which is 46.82 per cent higher than check Win Orange Sweet Corn. This hybrid revealed superiority in quality parameters viz., total soluble solids (18.4^0 Brix), total soluble sugar (7.58%) and protein (4.96%) over check Win Orange Sweet Corn. The hybrid is resistant against *Turcicum* leaf blight and stem borer.

(Research Scientist, MMRS, AAU, Godhra)

4. Crop : Brinjal

Variety: Gujarat Anand Brinjal 6 (GAB 6: Anand Doli)

The Gujarat Anand Brinjal 6 variety gave 634.90 q/ha fruit yield which is 44.70, 38.82, 17.72, 26.28, 40.74 and 40.20 per cent higher over the checks GOB 1, GBL 1, GJB 2, GJLB 4, Doli 5 and Punjab Sadabahar, respectively in middle Gujarat condition. This variety has dark pink fruit skin colour with strong glossiness, club shaped fruit with medium size and cluster fruiting pattern. It has erect plant growth habit and dentate leaf margin. This genotype has less prevalence of little leaf disease reaction and lower or comparable number of jassids and whitefly as well as fruit borer damage as compared to the checks GJB 2, GJLB 4, Doli 5 and Punjab Sadabahar. This variety contains higher dry matter (14.32%), total phenol (0.087%) and protein (0.82%) as compared to the check varieties GJB 2, GJLB 4, Doli 5 and Punjab Sadabahar. This variety is recommended to release in middle Gujarat for *Kharif-Rabi* season under irrigated condition.

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

5. Crop : Potato

Variety: Kufri Sadabahar

The potato variety Kufri Sadabahar (MS/93-1344) is developed by ICAR-Central Potato Research Institute, Shimla by clonal selection from the cross MS/81-145-638 x PF/F-1545. The variety Kufri Sadabahar depicted superior performance for total tuber yield (312.78 q/ha) in 75 days harvesting at Anand for early bulking and manifested 13.20, 10.86 and 7.79 per cent higher tuber yield over Kufri Badshah, Kufri Lauvkar and Kufri Pukhraj, respectively. While, in case of 90 days harvest at Anand, this variety gave tuber yield of 354.54 q/ha which is 17.51, 14.27 and 10.08 per cent higher over the checks Kufri Badshah, Kufri Lauvkar and Kufri Pukhraj, respectively. It has comparatively higher average tuber weight against all the checks. The tuber has oblong shape, smooth and white skin, predominantly apical shallow eyes and white flesh with mealy texture. Kufri Sadabahar has less prevalence of early blight, late blight, leaf curl and white fly as compared to all the checks. Kufri Sadabahar is already notified, hence endorsed for cultivation and harvesting at 75 days (immature) or 90 days (fully mature) after sowing during *rabi* season in middle Gujarat.

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

6. Crop : Garlic

Variety: Gujarat Garlic 7 (GG 7: Anand Kesari)

The garlic variety Gujarat Garlic 7 (GG 7: Anand Kesari), which is developed through clonal selection. It revealed bulb yield of 79.00 q/ha which is 16.00, 11.65, 15.13 and 14.00 per cent higher over the check varieties GG 4, GJG 5, GAG 6 and G 282, respectively in the Gujarat state. The variety has dark green leaves, strongly concave shape in cross section of leaf, medium density of leaves with erect foliage attitude, radial distribution of cloves, purple colour of dry external scales and purple scale colour of cloves. In quality attributes, the variety showed higher pyruvic acid (80.05 µmol/g), carotenoids (7.75 mg/100g), total soluble solids (21.82°Brix), reducing sugar (2.23%) and total antioxidant acitivity (0.118%) as compared to check varieties. The variety also reported low incidence of thrips as compared to check varieties. The garlic variety is recommended for *rabi* cultivation in the garlic growing areas of Gujarat.

(Research Scientist, HMRS, AAU, Dahod)

7. Crop : Cotton

Variety: Gujarat Anand Desi Cotton 3

(GADC 3 : Wagad Gaurav)

The Gujarat Anand Desi Cotton 3 variety gave higher seed cotton yield (2233 kg/ha) over check varieties G. Cot. 21, ADC 1 and GADC 2 by 34.02, 15.01 and 27.54%, respectively. It has recorded 44.8 per cent ginning out turn, 22.7 mm upper half mean length, 5.1 micronaire value and 22.5 g/tex tenacity (HVI mode). This variety is recommended for release in *desi* cotton area of North West Agro-climatic Zone - V as well as *Bhal* and Coastal Agro-climatic Zone-VIII of Gujarat.

(Associate Research Scientist, RCRS, AAU, Viramgam)

CROP PRODUCTION

CULTURAL PRACTICES

1. Effect of spacing and topping on yield of summer sesame (*Sesamum indicum* L.)

The farmers of middle Gujarat agro-climatic zone growing summer sesame are recommended to follow 45 cm spacing between two rows along with topping (removal of terminal bud) during 25 to 35 days after sowing for securing higher yield and net return.

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

2. Varietal performance of pearl millet under varying transplanting period in semi *rabi* season

The farmers of middle Gujarat agro-climatic zone are recommended to adopt semi *rabi* pearl millet by transplanting one month old seedlings of GHB 744 or GHB 732 during 20th to 30th September for getting higher grain and dry fodder yield as well as net return.

(Principal, COA, AAU, Jabugam)

3. Standardization of crop spacing and its effect on yield and fibre quality of desi cotton under rainfed condition

The farmers of North - West Agro-climatic Zone-V cultivating rainfed desi cotton are recommended to sow cotton variety G Cot 21 at 60 x 30 cm spacing to get higher seed cotton yield and net return

G Cot 21 at 60 x 30 cm spacing

(Associate Research Scientist, RCRS, AAU, Viramgam)

4. Effect of different plant spacing on growth and yield of capsicum under open ventilated polyhouse

The farmers of middle Gujarat growing capsicum under naturally ventilated polyhouse are advised to transplant capsicum at 45 × 30 cm spacing in raised beds for getting higher yield and net return. The beds should be prepared 40 cm apart with 90 cm base width, 75 cm top width and 45 cm height.

(Professor and Head, Department of Horticulture, BACA, AAU, Anand)

5. Performance of different varieties of potato under different spacing for middle Gujarat

The farmers of middle Gujarat growing potato are advised to grow Kufri Pukhraj variety at 45 x 20 cm spacing for getting higher yield and net realization.

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

NUTRIENT MANAGEMENT

6. Evaluation of efficacy of sulphur and zinc containing complex fertilizer for maximizing yield and quality through balanced nutrition of groundnut crop

The farmers of middle Gujarat Agro-climatic Zone growing summer groundnut having S and Zn deficient soil are recommended to apply recommended dose of 25 kg N and 50 kg P_2O_5/ha through S (5.6 kg/ha) and Zn (1.1 kg/ha) containing fertilizers for getting higher yield and better quality.

(Associate Res. Scientist, Micronutrient Research Scheme, AAU, Anand)

7. Evaluation of efficacy of sulphur and zinc containing complex fertilizer for maximizing yield and quality through balanced nutrition of mustard crop

The farmers of middle Gujarat Agro-climatic Zone growing mustard in S and Zn deficient soil are recommended to apply recommended dose of 50 kg N and 50 kg P_2O_5/ha through S (5.6 kg/ha) and Zn (1.1 kg/ha) containing fertilizers for getting higher yield and better quality. Further, an application of recommended dose of 50 kg N and 50 kg P_2O_5/ha along with either 10 t FYM/ha or 40 kg S and 5 kg Zn/ha is equally effective.

(Associate Res. Scientist, Micronutrient Research Scheme, AAU, Anand)

8. Effect of cutting management and fertility status levels on growth and seed yields of multicut forage sorghum [*Sorghum bicolor* (L.) Moench] var. CoFS-29

The farmers of middle Gujarat agro-climatic zone growing

multicut forage sorghum variety CoFS 29 for seed production purpose are recommended to apply 40 kg N/ha and 40 kg P_2O_5/ha as basal and 120 kg N/ha in three equal splits at 30 days after sowing, after first cut (50 DAS) and at 30 days after first cut for obtaining higher seed yield and net return.

(Research Scientist, Main Forage Research Station, AAU, Anand)

9. Effect of different levels of phosphorus, potassium and sulphur on growth, yield and quality of Bt Cotton Var.G.Cot.Hy.8 (BG II) under middle Gujarat conditions.

The farmers of middle Gujarat Agro-climatic Zone growing Bt. cotton (G Cot Hy 8 BG II) are recommended to apply 20 kg P_2O_5/ha, 80 kg K_2O/ha and 20 kg S/ha besides RDN 240 kg N/ha for getting higher yield and net return.

(Asso. Research Scientist, TRTC, AAU, Devagadhbaria)

10. Effect of organic manures, bio-fertilizers, levels of nitrogen and phosphorus on soybean (*Glycine max* (L.) Merrill) and their residual effects on *rabi* maize

The farmers of middle Gujarat agro-climatic zone growing *rabi* maize (Gujarat Maize 3) after *kharif* soybean (NRC 37) are recommended to apply 10 t FYM/ha along with 45 kg N/ha and 60 kg P_2O_5/ha before sowing, besides seed treatment of biofertilizers (*Rhizobium japonicum* 5 mL/kg seed) + PSB (*Bacillus coagulans* 5 mL/kg seed). It is also recommended to apply 75% recommended dose of fertilizer (90 kg N/ha and 45 kg P_2O_5/ha) to the succeeding *rabi* maize crop for obtaining higher yield and net return.

(Asso. Research Scientist, TRTC, AAU, Devagadh Baria)

11. Effect of different levels of nitrogen, phosphorus and bio-fertilizer on yield of irrigated wheat (*Triticum aestivum* L.) in *Bhal* region

The farmers of *Bhal* and coastal agro-climatic zone growing wheat (GW 496) under restricted irrigation condition are recommended to apply 60 kg N/ha and 60 kg P_2O_5/ha as a basal and 60 kg N/ha in two equal splits at 30 and 45 DAS for obtaining higher grain yield and return.

(Asso. Research Scientist, ARS, AAU, Arnej)

12. Effect of nitrogen and phosphorus on growth, flowering and yield of gladiolus (*Gladiolus grandiflorus* L.) cv. "American Beauty" under middle Gujarat Agro-climatic conditions

The farmers of middle Gujarat growing gladiolus cv. "American beauty" are advised to apply 250 kg N /ha in three equal splits each at basal, 30 and 45 days after planting of corms along with 50 kg P_2O_5/ha as basal for getting longer spike of gladiolus and net return. Moreover, 10 t FYM/ha as basal and 100 kg K_2O/ha apply in two equal splits each at basal and 45 days after planting of corms.

(Principal, College of Horticulture, AAU, Anand)

WEED MANAGEMENT

13. Management of complex weed flora in garlic (*Allium sativum* L.)

The farmers of middle Gujarat Agro-climatic Zone growing garlic are recommended to apply paddy straw mulch 5 t/ha followed by hand weeding at 30 and 60 days after planting (DAP) for effective management of complex weed flora and higher net return.

Paddy straw mulch 5 t/ha *fb* hand weeding at 30 & 60 DAP

(Agronomist, AICRP-Weed Management, AAU, Anand)

14. Bio-efficacy of new molecules of herbicides for weed management in soybean [*Glycine max* (L.) Merrill]

The farmers of middle Gujarat Agro-climatic Zone growing soybean are recommended to adopt any of the following orders

Post-emergence (15-20 DAS) application of fluazifop-p-butyl 11.1% w/w + fomesafen 11.1% w/w SL 250 g a.i./ha (premix)

or

Post-emergence (15-20 DAS) application of propaquizafop-p-butyl 2.5% + imazethapyr 3.75% w/w ME 125 g a.i./ha (premix)

or

Post-emergence (15-20 DAS) application of imazethapyr 10% SL 100 g a.i./ha followed by IC + HW at 30 DAS

or

Pre-emergence (2-3 DAS) application of pendimethalin 30% EC 750 g a.i./ha followed by IC + HW at 30 DAS

or

Pre-emergence (2-3 DAS) application of diclosulam 84% WDG 25.2 g a.i./ha followed by IC + HW at 30 DAS

or

Pre-emergence (2-3 DAS) application of pendimethalin 30% + imazethapyr 2% EC 960 g a.i./ha (premix) followed by HW at 30 DAS for effective management of complex weed flora and higher net return without any herbicide residues in produce and soil. There was no adverse effect of herbicide applied in soybean on succeeding crops.

(Agronomist, AICRP-Weed Management, AAU, Anand)

PLANT PROTECTION

AGRICULTURAL ENTOMOLOGY

1. Evaluation of pre-harvest spray of insecticides for control of pulse beetle, *Calloso bruchus* spp. in green gram

Green gram seed producers of middle Gujarat Agro-climatic Zone are advised to spray indoxacarb 14.5 SC, 0.012 % (8 ml/10 L water) at pod maturity stage to check the infestation of pulse beetle during storage up to two months without adverse effect on seed germination.

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

2. Biorational management of cumin pests

Farmers of middle Gujarat Agro-climatic Zone are advised

to spray neem oil, 1% (100 ml/10 L water) or garlic extract, 5% at appearance of pest and secondspray at 10 days after first spray for effective control of aphid and thrips in cumin. For preparation of 5% garlic extract, 500 g garlic cloves to be crushed in required quantity of water followed by filtration and dilution in 10 litres of water.

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

3. Efficacy of insecticides against fall armyworm, *Spodoptera frugiperda* (J. E. Smith) infesting maize

Spinetoram 11.7 SC, 0.0117% (10 ml/10 l water) or emamectin benzoate 5 SG, 0.0025% (5 g/10 L water) or chlorantraniliprole 18.5 SC, 0.006% (3 ml/10 L water) or chlorantraniliprole 0.4% G (whorl application, 20 kg/ha), or poison bait consisting maize flour 25 kg + jaggery 5 kg + thiodicarb 75 WP 250 g/ha (for preparation of poison bait, dissolve 5 kg jaggery in 5litre of water and add in 25 kg rice bran/maize flour 10- 12 hrs in advance before its application, add 250 g thiodicarb in this bait and mix properly) or spray *Bacillus thurengiensis* 0.5 WP (108 cfu /g) @20 g/10 L of water or *Metarhizium (Nomuria) rileyii1*.15 WP (2 x 106 cfu/g) 40 g/10 L of water were found effective in checking the population and damage caused by *Spodoptera frugiperda* in maize.

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

4. Study on foraging activities of honeybees in Middle Gujarat on various crops

Farmers interested to start the bee keeping are advised to grow following various crops in different seasons to settle

bee colonies in their area.

Season	Crops
Kharif	*Shankhavali,* sesame, sunflower, golden rod, bajara, green gram, cowpea, maize, pigeon pea, *senna,* castor, *damaro*, cotton, water lily, *rudrakh,* basil and gallardia
Rabi	*Shankhavali,* fennel, mustard, lucerne, coriander, sunflower, maize, fenugreek, water lily, *damaro* and gallardia
Summer	Sesame, sunflower, *Shankhavali,,* green gram, bajara and maize

These crops should be grown periodically to provide pollen and nectar to bees.

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

5. Bio-efficacy of different insecticides against serpentine leaf miner, *Liriomyza trifolii* (Burgess) on watermelon

Farmers of middle Gujarat Agro-climatic Zone growing watermelon are advised to spray cyantraniliprole 10 OD, 0.01% (10 ml/10 L water) at 40 days after sowing and second spray at 15 days after first spray for effective management of serpentine leaf miner, *Liriomyza trifolii*. Interval between last spray and harvest should be minimum 5 days.

(Principal, CoA, AAU, Jabugam)

PLANT PATHOLOGYAND NEMATOLOGY

6. Efficacy of bio agents in the management of *Meloidogyne* species in bitter gourd

For effective management of root-knot nematode, *Meloidogyne* spp. infecting bitter gourd, farmers of middle

Gujarat Agro-climatic Zone are advised to apply 2.5 tons of vermicompost/ha enriched with *Purpureocillium lilacinum* @ 2.5 kg/ha before sowing.

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

BASIC SCIENCES **-NIL-**

DAIRY SCIENCE / FPT&BE

DAIRY SCIENCE

1. Technology development for Moraiyo (*Panicum miliare*) Kheer

A technology developed by Anand Agricultural University, Anand for manufacture of moraiyo kheer involves use of standardized milk (4.5 per cent fat, 8.5 per cent SNF), addition of 3.0 per cent of moraiyo and 6.0 per cent of sugar (w/w of milk), concentrating the milk 2 times and adding 0.05 per cent cardamom powder (w/w of kheer). This method is recommended for dairy/food industry and entrepreneurs. The moraiyo kheer has a shelf-life of 8 days when packed in pre-sterilized polypropylene cups and stored at 7±1°C.

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

2. Technology for manufacture of carrot *rabri*

A technology developed by Anand Agricultural University, Anand for manufacture of carrot *rabri* using full cream milk (6.0 per cent fat, 9.0 per cent SNF) added with 8.0 per cent carrot shreds, 7.5 per cent sugar and 0.1 per cent sodium alginate (w/w of milk) and concentrating milk 2 times is recommended for dairy/food industry and entrepreneurs. Carrot *rabri* prepared using this method contains 0.34 per cent crude fiber and 1.0 mg β-carotene/100g product. The carrot *rabri* had a shelf-life of 10 days when stored in polypropylene cups at 7±1°C.

Carrot *rabri*

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

3. Technology for manufacture of extended shelf-life dietetic *Basundi*

A technology to manufacture of extended shelf-life dietetic *Basundi* has been developed by Anand Agricultural University, Anand. The standardized process involves vacuum concentration of milk, replacing sucrose with intense sweetener, followed by in-bottle heat processing using rotary sterilizer at 110°C for 15 min. The heat processed *Basundi* has a shelf life of 90 days when stored at 37±2°C.

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

4. Application of Infrared spectroscopy in detection of foreign fats and oils in ghee

FT NIR spectroscopy based method coupled with chemometrics is developed by Anand Agricultural University, Anand for detection and identification of common foreign oils and fats mixed in ghee. The limit of detection is 2% for oils/fats, while the minimum limit of identification varies from 5 to 10% depending on type of oil/fat mixed in ghee. The developed method is simple, convenient and efficient analytical tool to solve the problems in detection of adulterations in ghee.

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

5. Development of probiotic smoothie enriched with finger millet (*Eleusine coracana*)

A method for preparing Finger millet (*Eleusine coracana*) smoothie enriched with probiotic has been standardized at Anand Agricultural University, Anand. The product is made using toned milk, malted ragi flour and fermented with Streptococcus thermophilus MTCC 5460 and probiotic Lactobacillus helveticus MTCC 5463 and subsequently incorporated with strawberry crush. The product has a shelf life of 20 days, when packaged in pre-sterilized PET bottles

and stored at 7±1ºC. The probiotic count in the product was more than 9 log cfu/g at the end of shelf life.

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

6. Development of Greek yoghurt type probiotic fermented milk

A method is developed by Anand Agricultural University, Anand for manufacturing Greek yoghurt type probiotic fermented product using indigenous cultures. The product can be made using standardized milk, fermentation by indigenous cultures (*Streptococcus thermophilus* MTCC 5460 + *Lactobacillus delbreuckii* subsp. bulgaricus NCIM 2358+ *Lactobacillus helveticus* MTCC 5463), straining of curd and addition of pickle masala. The product has a shelf life of 21 days in polypropylene cups when stored at 7±1oC. Probiotic count in the product at the end of shelf life was more than 9 log cfu/g.

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

7. Application of solar energy in unit operations for milk and milk product processing

Anand Agricultural University, Anand recommends Dairy entrepreneurs to utilise the solar power generated through solar photo voltaic (PV) panel system of 1KW capacity, to carryout various unit operations for milk processing like, chilling of milk, manufacture of khoa and manufacture of ice cream using equipment having less than 1KW power requirement. The power generated from the solar photo voltaic system helps for sustainable processing with reduction in cost of processing.

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

8. Design, development and performance evaluation of a solar thermal system assisted double pipe heat exchanger for heating of milk for preparation of paneer

Double pipe four pass heat exchanger equipped with helical coil in the annular space and assisted by Evacuated Tube Collector (ETC) solar thermal water heating system as heating source and PNG water heating system for backup heating is designed and developed at Anand Agricultural University, Anand is recommended for small scale dairy entrepreneur/industry for heating of milk for the preparation of the paneer. The energy saving for heating of milk was found in the range of 62.0 to 96.0 per cent with counter current flow pattern and 20 liters per minute hot water flow rate and 1 liter per minute chilled milk flow rate during January to April by this heat exchanger.

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

FOOD PROCESSING TECHNOLOGY

9. Production of premium quality powder with maximum retention of essential oil using cryogenic grinding of carom (ajwain) and black pepper

Entrepreneurs and agro-processing units involved in grinding of spices are advised to use the technology of cryogenic grinding developed by Anand Agricultural University for high quality ajwain and black pepper powder with higher retention of volatile oil content of 74.36 and 71.31 per cent respectively. For higher retention of volatile oil, the cryogenic grinding of ajwain seeds at temperature of -60°C, sieve size of 0.8 mm and feed rate of 8 kg/h and for

black pepper at temperature of -60°C, sieve size of 1.5 mm and feed rate of 10 kg/h is recommended. The processing cost of the optimized operating conditions for cryogenic grinding of ajwain and black pepper is `. 33.00 and `. 25.00 per kg respectively.

(Professor & Head, Dept. of PHET, FPT&BE, AAU, Anand)

10. To formulate and standardize the process of micronutrient rich powder for women

The entrepreneurs and food processors interested in manufacture of nutraceutical food products are advised to adopt the production technology of micronutrient rich malted food developed by Anand Agricultural University, Anand. The technology involves malting of mothbean and ragi grains for 48 h and 36 h respectively and sand roasting at 150˚C and 160˚C respectively for 60 seconds. The moth bean malt flour (22 per cent) and *ragi* malt flour (19.5 per cent) are mixed in skim milk (38.5 per cent) and barley malt extract (20 per cent) and cooked for 5 minutes. The mixture is then dried under vacuum and milled. This product provides 16.75 per cent protein, 5.7 mg/100g iron, 285.0 mg/100g calcium and 1.8 mg/100g zinc. The product can be stored for 6 months at ambient temperature.

(Professor & Head, Dept. of PHET, FPT&BE, AAU, Anand)

11. Extension of shelf life of bread using suitable ingredients

The entrepreneurs and bakery industry interested in manufacture of extended shelf life bread are advised to use the technology developed by Anand Agricultural University, Anand. It involves addition of 1.0 per cent xanthan gum,

1.0 per cent potato peel fiber and 7.0 per cent soy flour in the bread recipe and coating of the bread loaf at the rate of 4.35 mg natamycin/kg of bread. The bread duly packed in polyethylene package can be safely stored up to 7 days at ambient temperature.

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

12. Development of functional low calorie muffins

Bakery entrepreneurs interested in production of muffins are advised to use the technology developed by Anand Agricultural University, Anand. The technology involves incorporation of 15.0 per cent of erythritol and 7.5 per cent of orange peel powder in the formulation of muffins. The muffin packed in polypropylene bags had 21 days shelf life at ambient temperature. There is reduction in calorific value by 10.12 per cent as compared to traditional muffin.

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

13. Technology for development of Ready-to-Rehydrate type of rice and pulses (Sub-title: Technology for development of Ready-to-Rehydrate type of rice)

The entrepreneurs and food processors interested in manufacture of ready-to-rehydrate rice (RTRR) are advised to adopt the technology developed by Anand Agricultural

University, Anand. The technology involves various processing operations including soaking, cooking and dehydration under specific conditions. The final product is a pre-cooked and dried rice, which can be easily rehydrated within 6 min with addition of hot (90°C) water (1:2.5 w/v, RTRR:Water).

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

14. Super critical extraction of essential oil from Ajwain (Carom seed) and Black pepper

- Entrepreneurs and Agro-processing units involved in production of superior quality pepper essential oil are advised to use the supercritical fluid extraction technology developed by Anand Agricultural University, Anand. This technology involves use of carbon dioxide supercritical fluid extraction at controlled pressure of 245 bar and temperature of 47°C which yields 5.6 per cent pepper essential oil. The essential oil had 1.3 per cent piperine.
- Entrepreneurs and Agro-processing units involved in production of superior quality ajwain essential oil are advised to use the supercritical fluid extraction technology developed by Anand Agricultural University, Anand. This technology involves use of carbon dioxide supercritical fluid extraction at controlled pressure of 300 bar and temperature of 35°C which yielded 3.9 per cent ajwain essential oil. The essential oil had 60.8 per cent thymol.

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

15. Production technologies for value added products from pumpkin seeds

The entrepreneurs and food processors interested in manufacture of roasted salted pumpkin seed snacks are advised to adopt the production technology of roasting of pumpkin seed developed by Anand Agricultural University, Anand. The technology involves dehulling of whole pumpkin seed, conditioning to moisture content of 12.0 per cent using 20.0 per cent salt solution, roasting the pumpkin seed in halogen roaster at 190°C for 6 min. The product prepared was highly acceptable, possessing adequate hardness, fracturability and had reasonable keeping quality (up to 90 days).

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

16. Evaluation of combined effect of gamma irradiation and edible coating on shelf-life of sapota fruit (Sub-title: Evaluation of independent effect of gamma irradiation and edible coating on shelf-life of sapota fruit)

- Entrepreneurs interested in enhancement of shelf-life of sapota fruit cv. Kalipatti are advised to use the edible coating (blend of pectin, polyvinyl alcohol and glycerol) technology developed by Anand Agricultural University, Anand. The shelf life of coated sapota fruit was 11 days at ambient temperature, with minimal physiological weight loss (18.51 per cent) and retaining the firmness (0.16 N) of fruit.
- Entrepreneurs interested in enhancement of shelf-life of sapota fruit cv. Kalipatti are advised to use gamma irradiation (0.3 kGy) technology developed by Anand Agricultural University, Anand. The shelf life of irradiated sapota fruit was 10 days with minimal physiological weight loss (15.60 per cent) and retaining the firmness (0.19 N) of fruit.

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

17. Study on energy assessment in selected food processing plants

The units manufacturing food products are advised to carry out energy audit of their plants periodically to conserve electrical energy. Plant producing bakery (2800MT/year) and chocolates (12000MT/year) products showed average specific electrical energy consumption of 121 kWh/MT and 310 kWh/MT respectively. Energy conservation measures have shown potential in saving electrical energy by about 36.0 per cent.

(Professor & Head, Dept. of FE, FPT&BE, AAU, Anand)

18. Development of irradiation technology for agricultural, animal, dairy and food products. (Sub-title: Effect of gamma radiation on peanut storage and its oil quality)

Entrepreneurs and oilseed processers are advised to use gamma irradiation technology developed by Anand Agricultural University, Anand for microbial decontamination and insect disinfestation of peanut. The technology results in safe storage of packaged (polypropylene, 55 µm) and irradiated (2.5 kGy) peanut kernels in ambient condition for up to 6 months.

(Professor & Head, Dept. of FE, FPT&BE, AAU, Anand)

19. Development of antidiabetic and antioxidant rich cookies and health drink using Garden Cress Seed (*Lepidium Sativum* L.)

The bakery industry and entrepreneurs interested in production of cookies with higher antioxidant and antidiabetic activities are recommended to use the formulation developed by Anand Agricultural University, Anand. The formulation involves use of garden cress seed powder to replace 10.0 per cent of refined wheat flour. The resultant cookies had 112.0 and 147.0 per cent increase in antioxidant (FRAP, per cent inhibition) and antidiabetic (NGH, per cent inhibition) activities respectively over conventionally prepared cookies. The cookies packed in aluminum foil had ambient storage life of up to 2 months.

(PI & HOD, Polytechnic in Food Science & Nutrition, AAU, Anand)

AGRICULTURAL ENGINEERING AND AIT

AGRICULTURAL ENGINEERING --NIL--

AGRICULTURAL INFORMATION TECHNOLOGY ---NIL---

ANIMAL PRODUCTION AND FISHERIES

1. **Effect of tannin as phytonutrient on growth performance and health of Surti kids**

   The goat keepers are advised to feed total mixed ration containing 18% babul pods to growing Surti male kids during 7-12 months of age to improve body weight gain and feed conversion efficiency with 23.7% reduction in feed cost per kg gain.

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

2. **Effect of tannin as phytonutrient on growth performance and health of Surti kids**

   The goat keepers are advised to feed total mixed ration containing 18% babul pods to growing Surti male kids during 7-12 months of age to improve general health and reduce parasitic load.

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

3. **Methane mitigation in calves through dietary interventions and its effect of performance of animals**

   Feeding of Total Mix Ration containing 15% Babul pods with roughage to concentrate ratio 50:50 increases growth rate by 17.68% and decreases daily methane emission by 16.22% in crossbred calves.

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

4. Methane mitigation in calves through dietary interventions and its effect of performance of animals

Feeding of Total Mix Ration (25% pigeon pea straw, 25% wheat straw and 50% concentrates) increases growth rate by 32.59 % and decreases daily methane emission by 10.53% in crossbred calves.

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

5. Performance of Indigenous Goats and Sheep of Gujarat State under different watering frequencies

The sheep and goat keepers of water scarcity areas of middle Gujarat maintaining animals under intensive production system are advised to give *ad lib* water to their animals at an interval of less than 12 hrs in order to increase feed and nutrients intake.

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

6. Development of area-specific mineral mixture formulations for Chhotaudepur district

Based on the prioritization of limiting minerals in Chhotaudepur district, the following area specific mineral mixture is formulated to make up the deficiency when fed @ 30g/head/day to cattle & buffalo in addition to the current feeding practices.

Sr. No.	Mineral element	Requirement (%)
1	Calcium	20.000
2	Phosphorus	12.00
3	Magnesium	5.00
4	Sulphur	1.80-3.00
5	Copper	0.10
6	Zinc	1.41

7	Manganese	0.12
8	Iron	0.40
9	Cobalt	0.012
10	Iodine	0.026

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

7. Study on performance of Holstein Friesian x Kankrej (HF X K) crossbred cows under intensive production system

The HF x K (50%) crossbred cows performed better under intensive production system. However, production and reproduction performance declined in *inter se* as compared to half bred HF x K (50%).

(Professor & Head, Dept. of LPM, Vet. College, AAU, Anand)

ANIMAL HEALTH

8. Effect of Peripartum Nutritional (multi-minerals and bypass fat) Supplementation on Uterine Involution, Postpartum Fertility and Reproductive Peridata in Jaffarabadi Buffaloes

Jaffarabadi buffalo owners are recommended to provide additional nutrients supplementation over routine feeding during transitional period from 45 days prepartum till 60 days postpartum (50 g chelated Area Specific Mineral Mixture and 150-200 g bypass fat daily) to improve the postpartum fertility and reduce calving interval for better economic return.

(Professor and Head, Department of Vet. Gynaec. and Obst. Vet. College, AAU, Anand)

SOCIAL SCIENCE

9. Impact assessment of drip irrigation technology in banana in middle Gujarat

In middle Gujarat, drip cultivated banana is about 38 per cent more profitable than traditional grown banana by receiving 19 per cent higher production. The banana productivity could be increased by about 20 per cent if the farmers switch over from traditional method to drip method with the same level of resource use.

(Professor and Head, Department of Agri. Economics, BACA, AAU, Anand)

RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY

BASIC SCIENCE

1. Development of tissue culture protocol for mass multiplication of seedless Lemon

Micro-propagation protocol for seedless lemon variety Konkan Lemon involves in vitro multiplication of cultures obtained on Murashige and Skoog (1962) (MS) medium supplemented with BA (0.2 mgl-1), Kn (1.0 mgl-1) and IBA (0.5 mgl-1) with the highest number of multiple shoots (4.20) which was found to be consistent for four sub-culturing on same medium. In vitro rooting was found maximum in MS medium supplied with auxins IBA (1.0 mgl-1) and NAA (0.2 mgl-1) inducing highest rooting (100 %) and number of roots (2.69). Primary hardening was achieved when Cocopeat alone used as substrate leading to least mortality (3.12 %) and better growth characteristics.

(Assistant Research Scientist, Tissue culture AAU, Anand)

CROP PRODUCTION

1. To find out critical limit of Ni for soil

The critical limit of DTPA extractable nickel in soil is 0.50 mg/kg.

(Asso. Res. Sci., Micronutrient Research Scheme, AAU, Anand)

2. Management of complex weed flora in garlic (*Allium sativum* L.)

For effective and economical management of complex weed flora in garlic, it is recommended to adopt any one of the below mentioned weed management practices.

Pre-emergence (2-3 DAP) application of oxyfluorfen 23.5% EC 240 g a.i./ha fb paddy straw mulch 5 t/ha fb hand weeding at 60 DAP

or

Early post-emergence (8-10 DAP) application of pendimethalin 30% EC 500 g a.i./ha + oxyfluorfen 23.5% EC 120 g a.i./ha (tank mix) fb paddy straw mulch 5 t/ha

or

Pre-emergence (2-3 DAP) application of pendimethalin 30% EC 500 g a.i./ha + oxyfluorfen 23.5% EC 120 g a.i./ha (tank mix) fb paddy straw mulch 5 t/ha

or

Pre-emergence (2-3 DAP) application of pendimethalin 30% EC 500 g a.i./ha fb paddy straw mulch 5 t/ha fb hand weeding at 60 DAP.

No residues of the applied herbicide were found in the garlic

bulb. There was no adverse effect of herbicide applied in garlic on succeeding crops.

(Agronomist, AICRP-Weed Management, AAU, Anand)

3. Effect of secondary and micro nutrients on growth, yield and quality of tobacco

Tobacco crop is not responding to application of secondary and micronutrients on the loamy sand soil having medium to sufficient status of these nutrients.

(Research Scientist, Bidi Tobacco Research Station, AAU, Anand)

PLANT PROTECTION

AGRICULTURAL ENTOMOLOGY

1. Establishment of processing factor for different pesticides in chilli fruits

Foliar application of acephate, chlorpyriphos, carbendazim, azoxystrobin and ethion in chilli at red chilli fruiting stage at double the recommended dose resulted in built up of residues in red chilli powder to the tune of 1.11, 3.45, 2.88, 1.46 and 3.26 times, respectively compared to fresh red chilli fruits. As no MRLs of these pesticides are available for red chilli powder, respective processing factors can be adopted in extrapolating MRLs from green chilli fruits to red chilli powder.

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

2. Bio-efficacy of insecticides against pest complex in greengram

Seed treatment in greengram with imidacloprid 48 FS, 5

ml/kg and spray of flubendiamide 48 SC, 0.01% (2 ml/10 L water) at 50% flowering stage can effectively manage thrips, spotted pod borer and pod borer.

(Unit Officer, RRS, AAU, Anand)

3. Screening of greengram genotypes against insect pests and diseases under natural conditions

Out of 17 greengram genotypes screened, VMG-67 was found resistant against insect pests viz., whitefly, aphid, jassid, thrips, spotted pod borer (Marucavitrata) and yellow mosaic disease and gave higher grain yield under field conditions. The scientists working in breeding programme are advised to utilise genotype VMG-67 for resistance breeding programme.

(Res. Sci. (Pulse), PRS, AAU, Model Farm, Vadodara & Assoc. Res. Sci., ARS, AAU, Derol)

4. Screening of blackgram genotypes against insect pests and diseases

Out of 20 blackgram genotypes screened, VUG-07 was found resistant against insect pests viz., whitefly, aphid, jassid, thrips and spotted pod borer, Marucavitrata and gave higher grain yield under field condition. The scientists working in breeding programme are advised to utilise genotype VUG-07 for resistance breeding programme.

(Res. Sci. (Pulse), PRS, AAU, Model Farm, Vadodara & Assoc. Res. Sci., ARS, AAU, Derol)

5. Bio-efficacy of different insecticides against serpentine leaf miner, *Liriomyza trifolii* (Burgess) on watermelon

Two sprays, first at 40 days after sowing and second at 15 days after first spray of deltamethrin 2.8 EC, 0.0028% (10

ml/10 l water) or flonicamid 50 WG, 0.015% (3 g/10 l water) found effective against serpentine leaf miner, *Liriomyza trifolii* infesting watermelon.

(Principal, CoA, AAU, Jabugam)

PLANT PATHOLOGY

6. Detection of seed borne nature of Mungbean Yellow Mosaic Virus (MYMV) in urdbean and Bean Common Mosaic virus (BCMV) in mungbean

Mungbean yellow mosaic virus was not detected as seed borne in urdbean, while bean common mosaic virus detected as seed borne in mungbean.

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

7. Management of early blight of potato

For the effective management of early blight disease of potato, dry seed (cut tubers) treatment with 5 kg talc powder followed by 1 kg mancozeb 75 WP for 100 kg potato seed tuber before 12 hrs. of planting followed by three foliar sprays viz., first spray of propiconazole 25 EC, 0.025% at disease initiation, second of azoxystrobin 23 SC, 0.023% and third of propiconazole 25 EC, 0.025% at 15 days interval were found effective.

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

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

DAIRY SCIENCE

1. Purification and characterization of ACE-inhibitory peptides derived from fermented Camel milk

A protocol is developed by Anand Agricultural University, Anand for the production of antihypertensive peptides i.e. GPPYQPLVPR, CISSSTPPYDLNRFK, VCNYVSWIK and MDTIEPVSVACIS from camel milk by fermenting it using selected Lactobacillus cultures (*L. acidophilus* NCDC015, *L. fermentum* LBF, *L. rhamnosus* NS4 and *L. delbreuckii* sub sp. *bulgaricus* 09) added at 2.0 per cent and incubating at 37ºC for 12h.

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

FOOD PROCESSING TECHNOLOGY

2. Study on decontamination of pesticides in selected Spices, vegetable and fruits using γ-irradiation, UV radiation and Ozonation Techniques

(Sub Title: Degradation of pesticide in red chili powder using gamma irradiation)

Gamma irradiation of red chilly did not showany effect onthe degradation of pesticides such as for chlorpyriphos, ethion, triazophos, trifloxystrobin, azoxystrobin, cypermethrin, acetamiprid, carbendazim, imidacloprid, thiacloprid, chlorantraniliprol, fipronil, fipronil-sulfone, profenophos and flubendamide.

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

3. Bio-chemical characterization of *Moringa oleifera* leaves and pods

- Biochemical characterization of tender moringa leaves was evaluated in two seasons i.e. Nov. –May and June – October. The biochemical characterization of tender moringa pod was evaluated in Nov. -May.
- GCMS analysis of moringa leaves led to identification of four compounds viz., phytol acetate, 2,4-Di-tert-butylphenol, 1-Tetradecanol and Neophytadiene
- GCMSQTOF analysis of moringa pods showed presence of fifteen compounds viz., 2,4-Di-tert-butylphenol; 1-Undecanol; 1-Hexadecanol; 1-Hexadecanol; bis-4,4'-(1-methylethylidene) Phenol; Nonacos-1-ene; 2-Dodecylcyclohexanone; Glycidyl palmitate; (Z)-9,17-Octadecadienal; N-heptafluorobutyryl-1,2,3,4-Tetrahydro-1-naphthylamine; L-Norvaline, N-decyloxycarbonyl-, undecylester;Dodecanoicacid,2,4,6-trimethyl-,methylester; Glycidyl palmitate; Octadecanoic acid 2,3-dihydroxypropyl ester; Glycidyl oleate and Glycidyl palmitate
- LCMSQTOF analysis of moringa pods showed presence of thirty five compounds viz., (S)-Angelicain; trans-Zeatin; N-stearoyl tryptophan; Citpressine I; Trp-Ala-Pro; Trp-Ser-Pro; His-HoPhe-OH; His-Ser-OH; His-TyrMe-OH; Lactococcin; 4-Fluoro-L-threonine; Cinncassiol D4; Lys-Trp-OH; Avenanthramide 1s; PE-Cer(d14:1(4E)/21:0); 2-glyceryl-PGE2; Caohuoside D; Ambofuracin; Caohuoside D; Evasterioside D; TyrMe-Phe-OH; 15-Acetoxyscirpene-3,4-diol 4-O-a-D-glucopyranoside; D-Glucosaminide; (+)-Syringaresinol O-beta-D-glucoside; Trypanothione disulfide; Tyr-Gly-OH; Theobromine; Ile Asn-Phe;

4(Hydroxymethyl) benzenediazonium(1+); (+)-Mayurone; Asp-Asp-His; and 2E,6E-Octadienal

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

4. Evaluation of purity of silver foil used on sweets in rural area

- 50 silver foil coated sweet samples from unorganized sector were analyzed for silver and aluminum content. None of the samples contained pure silver.
- Analysis of few samples for presence of heavy metals and other elements revealed that cadmium, cobalt, chromium, lead, nickel, iron, copper, manganese, phosphorus and zinc were present in samples as undesirable elements.

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

AGRICULTURAL ENGINEERING ---NIL---

AGRICULTURAL INFORMATION TECHNOLOGY

1. Student Information Management System (SIMS) for School of Bakery

A web-app "SIMS" is recommended for short term course of Bakery offered by Polytechnic in Food Science and Home Economics, AAU, ANAND to record details of admission, fees, attendance and result. It generates reports like Attendance, Fee Receipt, Deposit, Stipend, Result, Mark sheet and Certificate.

(Principal, College of AIT, AAU, Anand)

ANIMAL PRODUCTION

1. Effect of SSF biomass supplementation of growth performance of crossbred calves

Supplementation of Solid State Fermentation Biomass (SSF)

@ 3% in the wheat straw based TMR (50% roughage: 50% concentrate) significantly improves growth rate by 23.68%, reduces daily methane emission by 7.08%, dietary energy loss through methane by 13.72 % and increases microbial proteins synthesis by 29.03% in crossbred calves.

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

2. Effect of tannin as phytonutrient on growth performance and health of Surti kids

Surti male kids during growing stage of 7-12 months of age, when fed total mixed ration containing 3.06% tannin (18% babul pods) resulted in significant increase in average daily gain by 27.7%, feed efficiency in terms of DM, CP, DCP and TDN by 18.35, 18.12, 17.78 and 19.71 %, respectively.

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

3. Effect of tannin as phytonutrient on growth performance and health of Surti kids

Surti male kids during growing stage of 7-12 months of age fed with total mixed ration containing 3.06% tannin (18% babul pods) resulted in lower nematode (Trichostrongylid group and Trichuris Spp.) ova count, oocysts of coccidia and plasma A:G ratio by 73.69, 43.68 and 31 percents, respectively, and increased plasma total protein, globulin, Catalase activity and SOD activity by 15.33, 38.14, 16.34 and 300 percents, respectively reflecting healthy status of kids.

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

4. Methane mitigation in calves through dietary interventions and its effect of performance of animals

Feeding of Total Mixed Ration containing 15% Babul pods

with roughage to concentrate ratio 50:50 increases growth rate by 17.68%, rumen microbial protein synthesis by 42.28 %, while decreases methane emission (g/kg DDMI) by 10.10 % and reduces dietary energy loss through methane as % of MEI (Mcal/d) by 10.55%. The loss of dietary energy saved through methane mitigation was utilized by the calves for weight gain.

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

5. Methane mitigation in calves through dietary interventions and its effect of performance of animals

Feeding of Total Mixed Ration containing 25% pigeon pea straw, 25% wheat straw and 50% concentrate to crossbred calves increases growth rate by 32.59 %, rumen microbial protein synthesis by 37.44 %, while decreases methane emission (g/kg DDMI) by 16.12 % and reduces dietary energy loss through methane as % of MEI (Mcal/d) by 16.46 %. The loss of dietary energy saved through methane mitigation was utilized by the calves for weight gain.

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

6. Effect of supplementing Fenugreek (*Trigonella foenum-graecum*) seeds in the ration of crossbred cows on nutrient utilization and milk production

Supplementation of fenugreek seeds @ 1 % in the ration of lactating crossbred cows increases the digestibility of crude protein, crude fibre and feed efficiency with respect to DCP intake by 14.54% with reduction in number of services per conception.

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

ANIMAL HEALTH

1. Effect of Piperine Pre-treatment on Pharmacokinetics of Gemifloxacin in Layer Birds

Simultaneous single oral administration of piperine and gemifloxacin (each at 10 mg/kg) enhances oral bioavailability of gemifloxacin (F: 25.79%) as compared to gemifloxacin given alone (F: 15.50%) in layer birds.

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

2. Studies on renoprotective effect of aqueous and alcoholic biherbal Extracts of *Vigna unguiculata* and *Hordeum vulgare* in Wistar Rats

The herbal alcoholic extract of Horse gram and Barley (1:1(at the dose rate of 300mg/kg body weight orally once in a day for five weeks has nephroprotective effect on 0.75% v/v ethylene glycol and 2 % w/v ammonium chloride induced urolithiasis in wistar rats.

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

3. Effect of Peripartum Nutritional (multi-minerals and bypass fat) Supplementation on Uterine Involution, Postpartum Fertility and Reproductive Peridata in Jaffarabadi Buffaloes

Jaffarabadi buffaloes supplemented with area specific chelated mineral mixture (50 g/h/d) and bypass fat (150-200 g/h/d) over routine farm feeding during from 45

days prepartum till 60 days postpartum, together with intramuscular injection of micro-minerals, 5 ml (Se 25 mg, Zn 200 mg, Cu 75 mg and Mn 50 mg) around 45 days prepartum and again on the day of calving optimized the plasma metabolites, minerals and hormonal profile, and reduced the period of placental expulsion time, enhance uterine involution and service period/ calving interval with improved postpartum fertility status

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

4. Evaluation of Reproductive Metabiota in Various Patho-Physiological Conditions in Dairy Animals

Metagenomically, the genital microbiota first ever explored in HF crossbred cows of different reproductive status revealed dynamic and a rich bacterial diversity comprising 21 Phyla, 543 Genera and 1720 Species. The most abundant phyla were Firmicutes, Bacteroidetes Fusobacteria and Actinobacteria and genera Peptoniphilus Porphyromonas, Arcanobacterium, and Bacteroides in higher frequency in cyclic and endometritic cows than the pregnant and acyclic ones. Pseudomonas was higher in acyclic cattle. Plasma progesterone favoured Phylum Acidobacteria (r= 0.83) and Genus Clostridium and Corynebacterium (r=0.79, 0.74), while estrogen Phylum Nitrospirae in the vaginal micobiota of crossbreds.

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

SOCIAL SCIENCE

1. Study on variability and development of yardstick for reliability of the experimental results of sugarcane crop

The yard stick of CV% for accepting the results of agronomy experiments for sugarcane crop conducted in south Gujarat region is 12 per cent for yield character.

(Professor and Head, Department of Agri. Statistics, BACA, AAU, Anand)

2. Study on variability and development of yardstick for reliability of the experimental results of sugarcane crop

The yard stick of CV% for accepting the results of plant breeding experiments for sugarcane crop conducted in south Gujarat region is 10 per cent for yield character.

(Professor and Head, Department of Agri. Statistics, BACA, AAU, Anand)

3. Prediction of monthly rainfall from June to September by Double Fourier Series and Artificial Neural Networks

To predict the monthly rainfall with greater accuracy from June to September in middle Gujarat using 55 years of weather data in two non linear models. It is recommended to use Double Fourier Series with two inputs monthly mean Maximum air temperature and relative humidity whereas four inputs namely, Maximum air temperature of May, monthly mean Relative humidity, monthly rainfall and monthly wind speed of previous year in Artificial Neural Network.

(Professor & Head, Dept. of Agril. Meteorology, BACA, AAU, Anand)

4. Development and standardization of scale to measure the attitude towards Yoga as a tool of human resource development

A scale was developed to measure the attitude towards Yoga as a tool of human resource development. The scale consists of twelve statements. This, scale is recommended for Scientific community of the state and country for measuring the attitude towards Yoga as a tool of human resource development.

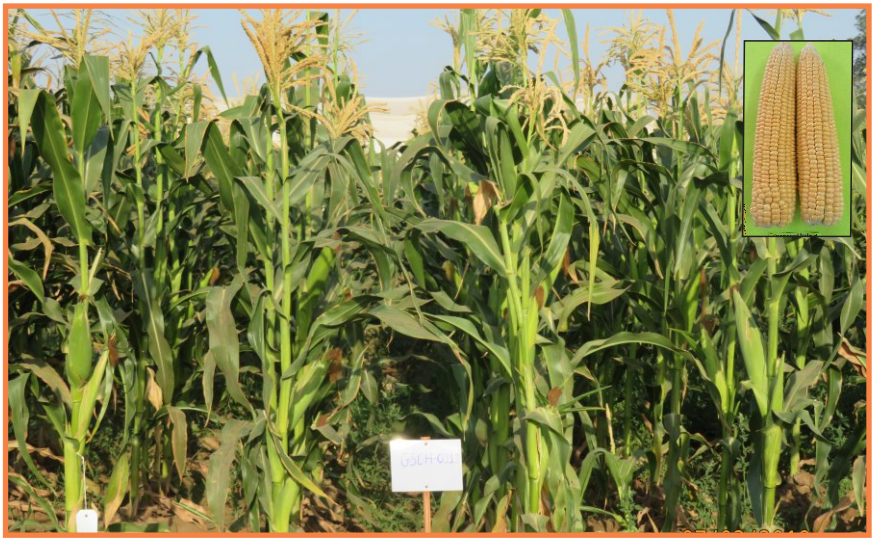
Final selected statements to measure attitude towards yoga as a tool of human resource development

No.	Statements	SA	A	UD	DA	SDA
1	Yoga is an original tool of meditation to develop human as resource (+)	5	4	3	2	1
2	I doubt that Yoga develops intelligence of human being (-)	1	2	3	4	5
3	I think yoga enhances the efficiency of internal glands of body (+)	5	4	3	2	1
4	I feel that practicing Yoga is wastage of time (-)	1	2	3	4	5
5	I believe that Yoga refreshes mind (+)	5	4	3	2	1
6	I feel that Yoga is impractical to develop human employability (-)	1	2	3	4	5
7	I am convinced that the Yoga helps in reviving human power (+)	5	4	3	2	1
8	I feel that Yoga is useless in developing managerial ability of human (-)	1	2	3	4	5

9	I believe exercising yoga helps in staying lively (+)	5	4	3	2	1
10	I think that yoga increases instability of human mind (-)	1	2	3	4	5
11	I understand that Yoga provides the strength to the human heart (+)	5	4	3	2	1
12	I believe that Yoga makes total development of human (+)	5	4	3	2	1

(Professor & Head, Dept. of Agril. Extension and Communication, BACA, AAU, Anand)

Kufri Sadabahar



Gujarat Anand Sweet Corn Hybrid 11
(GASCH 11: Madhuram)

Moraiyo Kheer

Carrot *Rabri*

Low Calorie Muffins

Cookies with 10% GCSP

Control

Cookies