

**RESEARCH ACCOMPLISHMENT
AND
RECOMMENDATIONS
2020**



**DIRECTORATE OF RESEARCH
JUNAGADH AGRICULTURAL UNIVERSITY**

JUNAGADH-362 001 (Gujarat)

Citation:

**Research Accomplishments and Recommendations-2020
Junagadh Agricultural University, Junagadh (Gujarat)**

Edited & Published by:

**Director of Research & Dean, PG Studies
"University Bhavan"
Junagadh Agricultural University,
Junagadh-362001(Gujarat)
Phone: (0285) 2670131
Fax: (0285) 2674064
E-mail: dr@jau.in**

Compiled by:

**Dr. V. P. Chovatia
Dr. Pramod Mohnot
Dr. K. B. Parmar
Er. D. B. Barad
Sh. S. J. Vekariya**

Publication No.:

3-1-8

Year of Publication:

2021

Copies:

300

Printed at:

**Rudraksh World
Moti Baugh, Junagadh. Mo. 9924834014**



Junagadh Agricultural University
Junagadh - 362 001 (Gujarat)



Dr. V. P. Chovatia
Vice Chancellor (I/c)

MESSAGE

The Junagadh Agricultural University was carved out from erstwhile Gujarat Agricultural University on May 01, 2004. The University provides excellent working environment for education, research and extension with fast changing national and international scenario. Apart from basic research, JAU is excelling in adoptive research to come out with a package of integration of Science, Management and Agriculture for the service of the farming community.

Thirty one research stations of the University spread over 10 districts of Saurashtra are undertaking multidisciplinary, farmer centric, demand driven research to make the farmers equipped with modern agricultural development. The Scientists are exploiting the potential of the emerging new areas of specialization to fulfill the vision and mission of University by matching the upcoming technologies with local issues of farmers.

The research recommendations for crop improvement, crop production, plant protection, horticulture, mechanization, value addition, animal sciences and fisheries by respective faculties were discussed at ZREAC, AGRESO and Combined Joint AGRESO. I congratulate and appreciate the scientists for their contribution in the form of four new crop varieties, 46 technologies developed for farmers and 28 technologies for scientific community. I put on record for special contribution of Director of Research and his team for nicely compilation and publishing **“Research Accomplishment and Recommendations-2020”**. Hoping that all stake holders will be benefitted from this for overall development.

Junagadh
July 08, 2021



(V. P. Chovatia)



Director of Research & Dean, PG Studies
Junagadh Agricultural University
Junagadh - 362 001 (Gujarat)
Phone (O.) : +91 (0285) 2670131
Fax : +91 (0285) 2674064
Email : dr@jau.in



Dr. V. P. Chovatia

PREFACE

It is my moral duty to explore and to highlight the research work done by devotee scientists during the year 2019-20 in the University. The recommendations drawn out of the whole year's extensive work and new technical programmes prepared were critically discussed and approved in respective 16th AGRESKO meetings of various sub-committees of Junagadh Agricultural University. Same were presented in 16th Combined Joint AGRESKO virtual meeting organized by Navsari Agricultural University.

The Junagadh Agricultural University represents ten districts and about 32.74 per cent area of the state representing draught prone, water logged or coastal problematic soils. There are eight colleges imparting education from graduation to doctorate level in various disciplines of Agriculture and allied subjects, seven polytechnic colleges are also creating semi-skilled work force to cater the of supporting manpower. Total 31 research stations spread over all ten districts of Saurashtra, which include multidisciplinary main research stations, sub research stations for various crops as well as testing centers are functioning in the University. The conveners of nine different sub-committees have been appointed to plan and monitor the research work. All the sub-committees have successfully completed their responsibilities. The University has also arranged 17th Research Council meeting on January 15, 2020 for approval of new research projects and research activities to be under taken during this year. The university has also signed three MoU for research collaboration during the year.

Total 23 new projects worth of Rs. 888.00 lakh were sanctioned from Government of Gujarat, ICAR and Private sectors in the University. The main sanctioned projects are:

1. Development of protocol for procurement, safe storage and milling outturn of major pulses.
2. Seed replacement rate enhancement for the year 2019-20.
3. Centre of Excellence for quality testing of cotton.
4. Production of value added cow based by products to sustain Gaushalas.
5. Commercial Exploitation of Date palm through tissue culture.
6. Strengthening of seed multiplication farm (Sagdividi farm).

The breeder seeds of different crops were planned and produced to fulfill the demand of private and public sectors as per the national and state indents. The truthful/ foundation/ certified seeds of different crops were also produced and distributed to the farmers along with subsidy in seedhub project.

As a part of capacity building program, under HRD component of the University, 126 scientists/teachers were deputed to attend winter & summer school, Short/Refresher Course, training; 217 attended seminar, symposium, conference, convention; 139 attended the workshops, group/annual/QRT meeting of their respective projects and 157 scientists/teachers were deputed to attend AICRP monitoring, visit of other stations etc. at national as well as state level. The University has also organized seven national/state level programs like winter/ summer school, seminar, symposium. Training etc.

In the 16th Combined Joint AGRESCO Meeting, four varieties viz., Groundnut [Gujarat Groundnut-23 (GG-23) and Gujarat Groundnut-35 (GG-35)], Pearl millet [Gujarat Hybrid Bajra-1231 (GHB-1231)] and Brinjal [Gujarat Round Brinjal – 7 (GRB-7)] were recommended for release in the state. Besides this, 46 technologies/ recommendations were made for farmers and 28 recommendations were made for Scientific Community. In addition, as many as 79 new technical programmes were formulated to initiate the new research programmes based on the feedback for the solutions of the applied and basic problems of agriculture and allied fields.

Summary of the recommendations approved in 16th Combined Joint Agresco

Sub Committee	No. of Recommendations		New Technical Programs
	Farmers	Scientific	
Crop Improvement	04*+02	-	01
Crop Production	11	03	28
Plant Protection	19	12	16
Horticulture & Agro Forestry	03	01	03
Agricultural Engineering	08	02	07
Animal Health	-	03	03
Animal Production & Fisheries Science	01	01	07
Basic Science	01	02	06
Social Science	-	04	08
Dairy Science	01	-	-
Total	04*+46	28	79

* No. of Varieties released.

Junagadh
July 08, 2021


(V. P. Chovatia)

RECOMMENDATIONS FOR FARMERS

I. CROP IMPROVEMENT

Four varieties viz. Groundnut (GG 23 and GG 35), Pearl millet (GHB 1231) and Brinjal (GRB 7) were recommended for farmers of the state during the year 2019-20.

VARIETIES RELEASED

1. Groundnut Variety: Gujarat Groundnut-23 (GG-23: Sorath Kiran)

The farmers of Gujarat state growing groundnut during *kharif* season are advised to grow *Virginia* bunch groundnut variety Gujarat Groundnut 23 (GG 23). This variety has recorded mean pod yield of 2800 kg/ha, which was 13.85 and 17.17 per cent higher over the check varieties, GJG 22 (2459 kg/ha) and GG 20 (2390 kg/ha), respectively. This variety has also recorded higher kernel yield, oil yield and number of pods per plant over the check varieties. This variety was found comparable to the check varieties against tikka, rust, stem rot and collar rot diseases. The damage due to leaf defoliators was lower in GG 23 than the check varieties.



[Main Oilseeds Research Station, JAU, Junagadh]

2. Groundnut variety: Gujarat Groundnut-35 (GG-35: Sorath Gold)

The farmers of Gujarat state growing groundnut during *kharif* season are advised to grow Spanish bunch groundnut variety Gujarat Groundnut 35 (GG 35). This variety has recorded mean pod yield of 3177 kg/ha, which was 29.54, 28.59 and 15.17 per cent higher over the check varieties, GG 7 (2452 kg/ha), GJG 9 (2471 kg/ha) and TG 37A (2758 kg/ha), respectively. This variety has also recorded high kernel yield, oil yield and number of pods per plant over the check varieties. This variety was found comparable to the check varieties



against tikka, rust, stem rot and collar rot diseases. The damage due to leaf defoliators was also lower in GG 35 than the check varieties.

[Main Oilseeds Research Station, JAU, Junagadh]

3. Brinjal variety: Gujarat Round Brinjal -7 (GRB-7: Sorath Ravaiya)

The farmers of Gujarat State growing brinjal crop during late *kharif* season (15th August to 15th September) are advised to grow brinjal variety Gujarat Round Brinjal-7 (GRB-7). The proposed variety has recorded the mean fruit yield of 401.46 q/ha, which was 20.47, 30.61 and 28.68 per cent higher over check varieties; GJB-3 (333.25 q/ha), GRB-5 (297.30 q/ha) and GNRB-1 (301.74 q/ha), respectively. The fruits of GRB-7 are medium in size with medium round shape and pink purple in colour and good shining. This variety contains higher protein content. The variety has cluster fruit bearing habit. The proposed variety was found comparable with checks for insect-pests and diseases.



[Vegetable Research Station, JAU, Junagadh]

4. Pearl Millet Hybrid: Gujarat Hybrid Bajara-1231 (GHB-1231: Sawaj Shakti)

The farmers of Gujarat state growing pearl millet during *kharif* season are recommended to grow GHB 1231 as a late type dual purpose (grain and fodder) bio-fortified hybrid. This hybrid recorded mean grain yield of 2760 kg/ha which was 9.22 per cent higher than check hybrid GHB 732 (2527 kg/ha). It has also recorded 7471 kg/ha dry fodder yield which was 16.1 per cent higher than check hybrid GHB 732 (6434 kg/ha). This hybrid also gave higher grain and dry fodder yield than public sector check hybrid GHB 558 and private sector check hybrid. The proposed hybrid is resistant to major pearl millet disease and pest. The grain of this hybrid possess higher content of Fe and Zn (> 70 ppm and > 40 ppm) which is additional benefit of pearl millet to the farming and consumer community for their nutritional security.



[Main Pearl millet Research Station, JAU, Jamnagar]

RECOMMENDATION FOR FARMERS

1. Effect of micronutrient application on seed yield and quality of coriander (*Coriandrum sativum* L.)

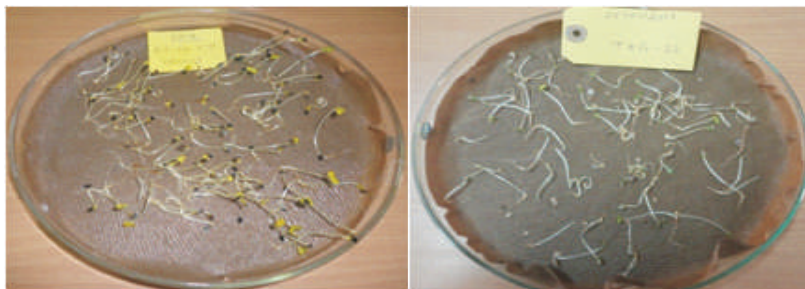
The farmers of South Saurashtra Agro-climatic Zone associated with seed production of coriander are advised to apply FeSO_4 @ 25 kg/ha as soil application at the time of sowing or foliar application of FeSO_4 @ 0.5 % (75 g/15 litre) + 0.1 % Citric Acid (15 g/15 litre) at 30 & 45 DAS in addition to recommended dose of fertilizer (20:10:0 NPK kg/ha) to obtain higher seed yield with high germination and seedling vigour.



[Dept. of Seed Science & Tech., CoA, JAU, Junagadh]

2. Study the fresh seed dormancy in sesame

Sesame growing farmers of Saurashtra region are advised that freshly harvested seeds of white seeded sesame varieties GT-2, GT-3, TKG 22, Pragati and GT-5 produced in the previous season, could not be utilized for sowing, as seed dormancy was found in these varieties and it was released after 115, 115, 95, 105 and 105 days after harvesting, respectively. However, black seeded variety GT 10 could be utilized for sowing in the next season, as it released the dormancy 35 days after harvesting (DAH).



[Dept. of Seed Science & Tech., CoA, JAU, Junagadh]

II. CROP PRODUCTION

(A) Nutrient Management

1. Evaluation of different *kharif* groundnut varieties under organic farming

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* bunch groundnut under organic farming are recommended to apply 50 % RDN through FYM (1250 kg/ha) + 50 % RDN through vermicompost (312.50 kg/ha) for higher pod yield and net return.



(Main Oilseeds Research Station, JAU, Junagadh)

2. Application of bio-formulations in *kharif* groundnut production

The farmers of South Saurashtra Agro-climatic Zone growing groundnut during *kharif* season are recommended to apply 75 % recommended dose of chemical fertilizers (9.37-18.75-37.5 kg NPK/ha) with seed treatment of NPK liquid bio-fertilizer (250 ml for seed of 1 ha) + Zn solubilizing bacteria (125 ml for seed of 1 ha) for obtaining higher pod yield and net return.



(Main Oilseeds Research Station, JAU, Junagadh)

3. Nutrient and pest management in pigeon pea

The farmers of South Saurashtra Agro-climatic Zone, growing *kharif* pigeon pea are recommended to apply recommended dose of fertilizer (25-50-50 N-P₂O₅-K₂O kg/ha) and spray of indoxacarb 14.5 SC 0.010 % (7 ml/10 L of water) at 50 % flowering and spray of chlorantraniliprole 18.5 SC 0.006 % (3 ml/10 L of water) 15 days after 1st spray.

Alternatively, apply recommended dose of fertilizer (25-50-50 N-P₂O₅-K₂O kg/ha) and spray of multi micronutrient formulation Grade IV 20 ml/10 liter and spray of indoxacarb 14.5 SC 0.010 % (7 ml/10 L of water) at 50 % flowering and spray of chlorantraniliprole 18.5 SC 0.006 % (3 ml/10 L of water) 15 days after 1st spray for obtaining higher seed yield and net realization.



Recommendation for PHI as per CIB guidelines									
Year	Crop	Pest	Pesticides with formulation	Dosage			Dilution in water	Application schedule	Waiting period/ PHI (days)
				g a.i./ ha	Quantity of formulation (g or ml/ha)	Conc. (%)			
2020	<i>Kharif</i> pigeon pea	Pod borer complex	Indoxacarb 14.5 SC	50.75	350	0.010	500 liters	First spray at 50% flowering	15
			Chlorantraniliprole 18.5 SC	27.75	150	0.006		Spray at 15 days interval after 1 st spray	29

(Pulses Research Station, JAU, Junagadh)

4. Effect of mulching and hydrogel on the productivity of pearl millet in rainfed condition

The farmers of North Saurashtra Agro-climatic Zone growing pearl millet in *kharif* season are recommended to apply hydrogel (350 µm mesh) 2.5 kg/ha as soil application at the time of sowing + pearl millet straw mulch 5.0 t/ha at 30 days after sowing for getting higher yield and net returns and improving moisture availability in soil.



(Main Pearl millet Research Station, JAU, Jamnagar)

5. Effect of multi-micronutrient formulations on papaya

The farmers of South Saurashtra Agro-climatic Zone growing papaya in medium black calcareous soil are recommended to apply multi micronutrients formulation Grade-V (40 g/plant) as basal or micronutrient as per soil test value in addition to recommended dose of chemical fertilizers (200-200-250 N-P₂O₅-K₂O g/plant) as well as 5 kg FYM/plant to papaya for getting higher yield and net return.



(Dept. of Agril. Chem. & Soil Science and Dept. of Horticulture, CoA, JAU, Junagadh)

6. Effect of nano boron on yield and nutrients uptake by *kharif* groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut in medium black calcareous soil are recommended to apply three sprays of 0.2 % boric acid OR

0.2 % nano boron (20 ml/10 lit water) at 30, 45 and 60 DAS in addition to recommended dose of fertilizers (12.5-25-50 N-P₂O₅-K₂O kg/ha) to *kharif* groundnut for getting higher yield and net return.



(Dept. of Agril. Chem. & Soil Science and Main Oilseeds Research Station, JAU, Junagadh)

7. Effect of N, P and K levels on growth, yield and nutrients uptake by coriander

The farmers of South Saurashtra Agro-climatic Zone growing coriander are recommended to apply 40 kg N/ha in two equal splits (½ as basal and ½ at 30 DAS), 30 kg P₂O₅/ha and 20 kg K₂O/ha as basal for getting higher seed yield and net return.

(Dept. of Agril. Chem. & Soil Science and Vegetable Research Station, JAU, Junagadh)

(B) Cultural Practices

8. Influence of plant geometry and fertilizer levels on the productivity of semi-spreading groundnut

The farmers of South Saurashtra Agro-climatic Zone growing semi-spreading groundnut during *kharif* are recommended to sow at a spacing of 45 cm x 10 cm (seed rate 135 kg/ha) and apply either 50 % RDF (6.25-12.5-25 N-P₂O₅-K₂O kg/ha) + 50 % RDN through FYM (1250 kg/ha) + Bio-fertilizer (*Rhizobium* 10 ml/kg seed, PSB & KMB soil application 3.0 liter/ha) or 100 % RDF (12.5-25-50 N-P₂O₅-K₂O kg/ha) + Bio-fertilizer (*Rhizobium* 10 ml/kg seed, PSB & KMB soil application 3.0 liter/ha) for obtaining higher pod yield and net return.



(Main Oilseeds Research Station, JAU, Junagadh)

9. Screening of sesame varieties/germplasm lines for yield performance under organic condition in summer season

The farmers of South Saurashtra Agro-climatic Zone of Gujarat state interested to grow summer sesame in organic condition are recommended to grow sesame variety G. Til 4 or GJT 5 or G. Til 6 for achieving higher seed yield.



(Agricultural Research Station, JAU, Amreli)

(C) Irrigation Management

10. Response of *rabi* onion (*Allium cepa* L.) to levels and application schedule of soluble fertilizers under drip irrigation

The farmers of South Saurashtra Agro-climatic Zone growing *rabi* onion (cv. Pilipatti) are recommended to apply 5 t FYM/ha along with 75 % RDF (i.e. 56.25-45.00-37.50 kg N-P₂O₅-K₂O/ha) in water soluble form through drip fertigation in six equal splits at 10 days interval after two common flood irrigations for getting higher yield and net return.



Details of drip system Particular	Detail	Particular	Detail
Lateral spacing	90 cm	Dripper distance	40 cm
Operation pressure	1.2 kg/cm ²	Irrigation interval	Alternate day
Dripper discharge rate	4 l/hr		

(Department of Agronomy, CoA, JAU, Junagadh)

(D) Weed Management

11. Integrated weed management in soybean

The farmers of south Saurashtra Agro-climatic zone growing soybean are recommended to apply pre-mix pendimethalin + imazethapyr 800 g/ha (30 + 2 % EC 50 ml/10 l water) as pre-emergence *fb* IC & HW at 40 DAS or IC & HW at 20 & 40 DAS for effective weed management and achieving higher seed yield and net realization.



(Department of Agronomy, CoA, JAU, Junagadh)

III. PLANT PROTECTION

(A) Entomology

1. Evaluation of new pheromone based mating disruption technology for shoot and fruit borer in brinjal

The farmers of South Saurashtra Agro-climatic Zone growing brinjal are advised to give three applications of Gir Sawaj Mating Disruption Paste (MDP) @ 400 g per application per hectare (uniformly distributed in 1000 dots between two branches), first at initiation of pest infestation and successive two application at an interval of 30 days for effective, economical and ecofriendly management of brinjal shoot and fruit borer.

Year	Crop	Pest	Pesticides with Formulation	Dosage				Total Qty. of Chemical suspension required/ha	Application schedule
				g.a.i./ha	Qty. of formulation/ha	Conc. (%)	Dilution in water (10 lit.)		
2020	Brinjal	Shoot and fruit borer	Gir Sawaj Mating Disruption Paste	-	400 g paste per application per hectare	-	-	-	First application at pest infestation, while second and third at 30 days interval after first application.

(Department of Entomology, CoA, JAU, Junagadh)

2. Impact of bio-pesticides and insecticides on foraging bee in mustard

The farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of *Beauveria bassiana* 1.15 WP (Min. 1×10^8 cfu/g) 0.0069 % (60 g/10 l of water), first at initiation of aphid and second at 15 days after first spray. *Beauveria bassiana* 1.15 WP found safer for foraging activities of bees in mustard.

Year	Crop	Target	Pesticides with formulation	Dosage				Total Qty. of Chemical suspension required/ha	Application Schedule
				g.a.i./ha	Qty. of formulation/ha	Conc. (%)	Dilution in water (10 lit.)		
2020	Mustard	Foraging bees	<i>B. bassiana</i> 1.15 WP	35	3.0 kg	0.0069 (Min. 1×10^8 cfu/g)	60 g	500 lit.	First spray at initiation of aphid and second spray at 15 days after first spray

(Department of Entomology, CoA, JAU, Junagadh)

3. Study on foraging activities of honeybees on seed spices

The farmers of South Saurashtra Agro-climatic Zone are advised to avoid the insecticidal spray during visiting time of honey bees from 12.00 to 16.00 hours on coriander, fennel and dill seed crops. Among the different honey bee species, *Apis florea* was the dominant forager.

(Department of Entomology, CoA, JAU, Junagadh)

4. Synergism of different plant oils with different insecticides against pod borer, *Helicoverpa armigera* infesting chickpea

The farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of chlorantraniliprole 18.5 SC 0.006 % + neem oil 0.5 % (3.25 + 50 ml /10 l of water) along with sticker (3 ml/10 l water), first spray when pest crosses the economic threshold level (0.75 larvae/plant before flowering and 0.5 larvae /plant after flowering) and second at 20 days after first spray for effective management of *Helicoverpa armigera* in chickpea. Pre-harvest interval (PHI) of 11 days should be kept.

Year	Crop	Pest	Pesticides with formulation	Dosage				Total Quantity of Chemical suspension required/ha	Application schedule	Waiting period /PHI (days)
				a.i./ha	Quantity of formulation/ha	Con. (%)	Dilution in water (10 lit.)			
2020	Chickpea	<i>Helicoverpa armigera</i>	Chlorantraniliprole 18.5 SC + Neem oil	30 + 2500	162.5 ml + 2.5 lit	0.006 % + 0.5 %	3.25 ml + 50 ml	500 lit.	First spray when pest crosses the economic threshold level (0.75 larvae/plant before flowering and 0.5 larvae /plant after flowering) and second spray at 20 days interval after first spray	11

(Department of Entomology, CoA, JAU, Junagadh)

5. Standardization of number of pheromone trap for fall army worm *Spodoptera frugiperda* (J. E. Smith) in maize

The farmers of South Saurashtra Agro-climatic Zone are advised to install 50 sex pheromone traps per hectare (20 sex pheromone traps per acre) at 10 days after germination and replace lure at 40 days for effective management of fall army worm in maize.

(Department of Entomology, CoA, JAU, Junagadh)

6. Bio-efficacy of different biopesticides against fall army worm *Spodoptera frugiperda* (J. E. Smith) infesting maize

The farmers of South Saurashtra Agro-climatic Zone growing maize are advised to spray *Beauveria bassiana* 1.15 WP (1 x 10⁸ cfu/g) 0.009 % (80 g/10 l of water) OR *Nomuraea rileyi* 1.15



WP (1 x 10⁸ cfu/g) 0.009 % (80 g/10 l of water) OR *Beauveria bassiana* 1.15 WP (1 x 10⁸ cfu/g) 0.007 % (60 g/10 l of water) + S/npv 450 LE (10 ml/10 l of water), first spray at initiation of pest infestation and subsequent two sprays at 10 days interval for the effective and economical management of fall armyworm.

Year	Crop	Pest	Pesticides with formulation	Dosage				Total Quantity of Chemical suspension required/ha	Application schedule
				a.i./ha	Quantity of formulation/ha	Con. (%)	Dilution in water (10 lit.)		
2020	Maize	Fall armyworm	<i>Beauveria bassiana</i> 1.15 WP (1 x 10 ⁸ cfu/g)	46	4.0 Kg.	0.009 %	80 g	500 lit.	First spray at initiation of pest infestation, subsequent second and third at 10 day interval
			<i>Nomuraea rileyi</i> 1.15 WP (1 x 10 ⁸ cfu/g)	46	4.0 Kg.	0.009 %	80 g		
			<i>Beauveria bassiana</i> 1.15 WP (1 x 10 ⁸ cfu/g) + S/npv	35 + --	3.0 Kg. + 0.5 lit.	0.007 + 450	60 g + 10 ml		

(Department of Entomology, CoA, JAU, Junagadh)

7. Bio-efficacy of different insecticides against fall army worm, *Spodoptera frugiperda* (J. E. Smith) infesting maize

The farmers of South Saurashtra Agro-climatic Zone growing maize are advised to spray spinetoram 11.7 EC 0.012 % (10 ml/10 l of water) OR emamectin benzoate 5 SG 0.0025 % (5 g/10 l of water) OR thiodicarb 75 WP 0.075 % (10 g/10 l of water), first at initiation of pest infestation and second after 15 days of first spray for effective and economical management of fall armyworm.



Year	Crop	Pest	Pesticides with formulation	Dosage				Total Quantity of Chemical suspension required/ha	Application schedule
				a.i./ha	Quantity of formulation/ha	Con. (%)	Dilution in water (10 lit.)		
2020	Maize	Fall armyworm	Spinetoram 11.7 EC	59.00	0.5 lit.	0.012	10 ml	500 lit.	First spray at initiation of pest infestation and second at 15 day interval
			Emamectin benzoate 5 SG	13.00	0.250 lit.	0.0025	5 g		
			Thiodicarb 75 WP	375	0.5 lit.	0.075	10 g		

(Department of Entomology, CoA, JAU, Junagadh)

8. Wide area integrated management of white grub in groundnut

The farmers of South Saurashtra Agro-climatic Zone growing groundnut are advised to spray chlorpyrifos 20 EC 0.04 % (20 ml/10 l water) on surrounding host trees at onset of monsoon, seed treatment of chlorpyrifos 20 EC@ 25 ml/kg seed, soil application of *Metarhizium anisopliae* OR *Beauveria bassiana* 1.15 WP @ 5 kg/ha (Min. 1×10^8 cfu/g) + castor cake (300 kg/ha) before sowing and drenching of *M. anisopliae* or *B. bassiana* @ 5 kg (1×10^8 cfu/g) dissolved in 1000 l of water/ha in root zone of plant after 30 days of germination for the effective and economical management of white grub.



Year	Crop	Pest	Pesticides with formulation	Dosage				Total Quantity of Chemical suspension required/ha	Application schedule
				a.i./ha	Quantity of formulation /ha	Con. (%)	Dilution in water (10 lit.)		
2020	Groundnut	White grub	Chlorpyrifos 20 % EC (spray) + Chlorpyrifos 20 % EC (Seed treatment) + <i>Metarhizium anisopliae</i> 1.15 WP (Soil application and drenching)	200.0 + 600.0 + 57.50 + 57.50	1.0 lit.+ 3.0 lit+ 5.0 kg + 5.0 kg	0.04 + -- + 0.006+ 0.006	20 ml + NA+ 50.0 g	1000 lit (Drenching)	Spraying on surrounding host trees at onset of monsoon, Seed treatment and soil application before sowing and drenching after 30 days of germination
			Chlorpyrifos 20 % EC (spray) + Chlorpyrifos 20 % EC (Seed treatment) + <i>Beauveria bassiana</i> 1.15 WP (Soil application and drenching)	200.0 + 600.0 + 57.50 + 57.50	1.0 lit.+ 3.0 lit+ 5.0 kg + 5.0 kg	0.04 + -- + 0.006+ 0.006	20 ml + NA+ 50.0 g		

(Department of Entomology, CoA, JAU, Junagadh)

9. Bio-efficacy of new insecticidal molecules against sucking pest of summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are advised to apply two sprays of imidacloprid 17.8 SL 0.005 % (2.8 ml/10 l of water) at 10 days interval starting from pest infestation for effective and economical management of thrips. Pre-harvest interval (PHI) of 40 days should be kept.

Year	Crop	Pest	Pesticides with formulation	Dosage			Total Quantity of Chemical suspension required/ha	Application schedule	Waiting Period/PHI (days)	
				g.a.i./ha	Quantity of formulation/ha	Concentration (%)				Dilution in water (10 lit)
2020	Groundnut	Thrips	Imidacloprid 17.8 SL	24.9	0.140 lit.	0.005	2.80 ml	500 lit.	First spray at initiation of pests and second at 10 days after first spray	40

(Main Oilseeds Research Station, JAU, Junagadh)

10. Bio-efficacy of biopesticides against sucking pest infesting groundnut

The farmers of South Saurashtra Agro-climatic Zone growing groundnut in *kharif* season are advised to apply two sprays of imidacloprid 17.8 SL 0.005 % (3.0 ml/10 l of water) at 10 days interval starting from pest infestation for effective and economical management of thrips. Pre-harvest interval (PHI) of 40 days should be kept.



Year	Crop	Pest	Pesticides with formulation	Dosage				Total* Quantity of Chemical suspension required/ha	Application schedule	Waiting Period/PHI (days)	Remark(s)
				g.a.i./ha	Quantity of formulation /ha	Concentration (%)	Dilution in water (10 lit)				
2020	Groundnut	Thrips	Imidacloprid 17.8 SL	26.7	0.150 lit.	0.005	3 ml	500 lit.	Two sprays at 10 days interval starting from pest infestation	40	Registered under CIB approved list

(Main Oilseeds Research Station, JAU, Junagadh)

11. Management of white grub in groundnut

The farmers of South Saurashtra Agro-climatic Zone growing groundnut in *kharif* season are advised to apply seed treatment with imidacloprid 600 FS @ 4 ml OR chlorpyrifos 20 EC @ 25 ml per kg of seeds for effective and economical management of white grub.

Year	Crop	Pest	Pesticides with formulation	Dosage				Total* Quantity of Chemical suspension required/ha	Application schedule
				g.a.i./ha	Quantity of formulation/ha	Concentration (%)	Dilution in water (10 lit)		
2020	Groundnut	Root feeders (White grub)	Chlorpyrifos 20 EC	--	3.000 lit.(ST)	0.5	25 ml/ kg seed	--	Seed treatment before sowing
			Imidacloprid 600 FS	--	0.480 lit.(ST)	0.192	4 ml/ kg seed	--	

(Main Oilseeds Research Station, JAU, Junagadh)

12. Testing of IPM modules with farmers practice against pest complex of pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing *kharif* pearl millet are advised to apply seed treatment of imidacloprid 600 FS @ 8.75 ml/kg at the time of sowing, removal of shoot fly dead hearts, installation of fish meal traps @ 10/ha at 7 days after germination (fish meal to be replaced once in a week) and spraying of dimethoate 30 EC 0.03 % (10 ml/10 l of water) at 35 days after germination for effective and economical management of shoot fly.

Year	Crop	Pest	Pesticides with Formulation	Dosage				Total qty. of chemical suspension required /ha	Application schedule	Waiting period / PHI (days)	Remarks
				g.a.i./ha	Qty. of formulation/ha	Concentration (%)	Dilution in water (10 lit.)				
2020	Pearl millet (bajra)	Shoot fly	Imidacloprid 600 FS	16.80	8.75 ml/kg seed	--	--	35 ml	Seed treatment at the time of sowing	Nil	Reg. in CIB
			Dimethoate 30 EC	150.00	0.5 L/ha	0.03	10 ml	500 ml	Single spray at 35 days after germination	Nil	Reg. In CIB

(Main Pearl millet Research Station, JAU, Jamnagar)

(B) Plant Pathology

13. Biological control of root rot of coriander

The farmers of South Saurashtra Agro-climatic Zone growing coriander are advised to apply talc based *Trichoderma harzianum* 1 % WP (2×10^7 cfu/g) @ 6.0 kg mixed in 500 kg of FYM per hectare at the time of sowing in furrows for effective and economical management of root rot.

Year	Crop	Disease	Pesticides/ Biopesticides formulation	Dosage				Quantity of water/ soil amendments require/ha	Application schedule
				g.a.i. /ha	Quantity of formulation /ha	Conc. (%)	Quantity of formu- lation in 10 l of water (g or ml)		
2020	Coriander	Root rot	<i>Trichoderma Harzianum</i> 1.0 % WP	--	6.0 kg/ha	2 x 10 ⁷ cfu/g	--	500 kg FYM	Soil application in open furrow at the time of sowing

(Department of Plant Pathology, CoA, JAU, Junagadh)

14. Impact of *Rhizobium* isolates on groundnut under field condition

The farmers of South Saurashtra Agro-climatic Zone growing groundnut during *kharif* season are advised to give seed treatment of *Rhizobium leguminosarum* isolate-1 (10⁷ cfu/ml) @ 10 ml/kg seeds along with soil application of recommended dose (RD) of P₂O₅ (25 kg/ha) & K₂O (50 kg/ha) and 75 % RD of N (9.4 kg/ha) at the time of sowing for obtaining higher pod yield and net return.



(Department of Plant Pathology, CoA, JAU, Junagadh)

15. Impact of *Azotobacter* isolates on cotton under field condition

The farmers of South Saurashtra Agro-climatic Zone growing *Bt* cotton are advised to give seed treatment of *Azotobacter chroococcum* isolate-1 (10⁷ cfu/ml) @ 10 ml/kg seeds along with soil application of recommended dose (RD) of P₂O₅ (50 kg/ha) and K₂O (150 kg/ha) at the time of sowing in furrow and 75 % RD of N (180 kg/ha) [in equal four splits of 45 kg first at basal and remaining at 30, 60 and 90 days after sowing] for obtaining higher seed cotton yield and net return.



(Department of Plant Pathology, CoA, JAU, Junagadh)

16. Impact of phosphate solubilizing microorganism on cotton under field condition

The farmers of South Saurashtra Agro-climatic Zone growing *Bt* cotton are advised to

give seed treatment of *Bacillus subtilis* JAU isolate-1 (10^7 cfu/ml) @ 10 ml/kg seeds along with soil application of recommended dose (RD) of N (240 kg/ha) [in equal four splits of 60 kg first at basal and remaining at 30, 60 and 90 days after sowing] and K_2O (150 kg/ha) and 75 % RD of P_2O_5 (37.5 kg/ha) at the time of sowing for obtaining higher seed cotton yield and net return.



(Department of Plant Pathology, CoA, JAU, Junagadh)

17. Impact of phosphate solubilizing microorganism on groundnut under field condition

The farmers of South Saurashtra Agro-climatic Zone growing groundnut during *kharif* season are advised to give seed treatment of *Bacillus subtilis* JAU isolate-1 (10^7 cfu/ml) @ 10 ml/kg seeds along with soil application of recommended dose (RD) of N (12.50 kg/ha) and K_2O (50.00 kg/ha) and 75 % RD of P_2O_5 (18.75 kg/ha) at the time of sowing for obtaining higher pod yield and net return.



(Department of Plant Pathology, CoA, JAU, Junagadh)

18. Biological control of root rot (*Macrophomina phaseolina*) of groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are advise to apply talc based *Trichoderma harzianum* 1 % WP (2×10^7 cfu/g) @ 1.5 kg/ha + *Trichoderma viride* 1 % WP (2×10^7 cfu/g) @ 1.5 kg/ha OR *Trichoderma viride* 1 % WP (2×10^7 cfu/g) @ 1.5 kg/ha + *Pseudomonas fluorescens* 1 % WP (1×10^8 cfu/g) @ 1.5 kg/ha mixed in 500 kg/ha well decomposed farm yard manure in furrow at the time of sowing, for effective and economical management of root rot of groundnut.



Year	Crop	Disease	Pesticides/ Biopesticides formulation	Dosage				Quantity of water/soil amendments required/ha	Application schedule
				a.i. (g/ha)	Quantity of formulation/h a	Conc. (%)	Quantity of formulation in 10 l of water (g or ml)		
2020	Groundnut	Root rot	<i>Trichoderma harzianum</i> 1 % WP+ <i>Trichoderma viride</i> 1 % WP	--	1.5 kg/ha (1% WP) + 1.5 kg/ha (1% WP)	2 x 10 ⁷ cfu/g + 2 x 10 ⁷ cfu/g	--	500 kg FYM	Furrow application at the time of sowing
			<i>Trichoderma viride</i> 1 % WP + <i>Pseudomonas fluorescens</i> 1% WP	--	1.5 kg/ha (1% WP) + 1.5 kg/ha (1% WP)	2 x 10 ⁷ cfu/g + 1 x 10 ⁸ cfu/g	--	500 kg FYM	Furrow application at the time of sowing

(Department of Plant Pathology, CoA, JAU, Junagadh)

19. Management of major foliar diseases of groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *khari* groundnut are advised to apply seed treatment of mancozeb 75 % WP @ 3 g/kg seeds followed by two sprays of hexaconazole 5 % SC, 0.005 % (10 ml/10 l of water) at 40 and 65 DAS for effective and economical management of early and late leaf spots (ELS & LLS) diseases of groundnut.

Year	Crop	Pest	Pesticides with formulation	Dosage				Total* Quantity of Chemical suspension required/ha	Application schedule	Waiting Period/PHI (days)
				g.a.i./ha	Quantity of formulation/ha	Concentration (%)	Dilution in water (10 lit)			
2020	Groundnut	Foliar diseases of groundnut	Mancozeb 75 % WP	0	3 g/kg seed	--	--	0.36 kg	As a seed treatment	58
			Hexaconazole 5 % SC	25	0.500 lit.	0.005	10 ml	500 lit.	Foliar spray at 40 and 65 DAS	58

(Main Oilseeds Research Station, JAU, Junagadh)

IV. HORTICULTURE

1. Effect of fertilizers and paclobutrazol on bearing behavior of rejuvenated mango trees (*Mangifera indica* L.) cv. Kesar

Farmers of South Saurashtra Agro-Climatic Zone having rejuvenated Kesar mango orchard are advised to apply paclobutrazol @ 7.5 g a.i. per tree in mid month of July in soil and apply 150 per cent RDF in two split from 4th year after rejuvenation (i.e. 150 kg FYM + 562.5:240:562.5 NPK g/tree as basal and 562.5:0:562.5 NPK g/tree at February) for getting higher yield and net return.



(Department of Horticulture, CoA, JAU, Junagadh)

2. Integrated nutrient management in pomegranate (*Punica granatum* L.) cv. Bhagwa

The farmers of South Saurashtra Agro-climatic Zone growing pomegranate cv. Bhagwa are advised to apply ½ dose of 75 % RDNK i.e. 188 g/plant Nitrogen and Potash (K₂O) with full dose of Phosphorus (P₂O₅) i.e. 250 g/plant as basal dose (in the form of DAP-543 g, Urea-195 g, Muriate of Potash - 313 g/plant), *Azotobacter* and Potassium Solubilizing bacteria (KSB) each @ 5.0 ml/plant in the month of October. Apply remaining ½ doses of Nitrogen and Potash (408 g urea and MOP 313 g /plant) in the month of February for getting higher yield and net return.

(Department of Horticulture, CoA, JAU, Junagadh)

3. Effect of chemical fertilizer application in split on coconut cv. TxD (Mahuva)

The farmers of South Saurashtra Agro Climatic Zone growing coconut cv. T×D (Mahuva) are advised to apply FYM 50 kg/palm/year with 125 % RDF NPK @1875, 938, 1875 g/palm/year in four equal split [June-Sept-Dec.-March] for securing higher nut yield and net return.

(Agricultural Res. Station (Fruit Crops), JAU, Mahuva)

V. AGRICULTURAL ENGINEERING

1. Design and development of a manually operated seed drill for small seeds

Farmers and manufacturers are recommended to adopt JAU developed manually operated drum seeder for sowing of small seeds (like sesame, pearl millet *etc.*). The drum seeder sows 45 cm spaced two rows at a time with the effective field capacity of 0.18 ha/h. The drum seeder is found useful for precision sowing of small seeds.



(Department of Farm Machinery & Power Engg., CAET, JAU, Junagadh)

2. Development of device for dung collection from cattle shed

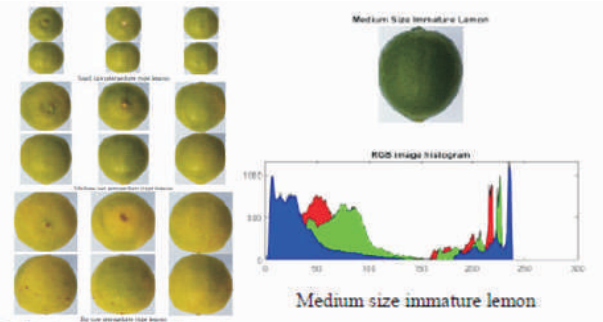
Animal rearers and Gaushala owners are recommended to use 'Mini Tractor Operated Cattle Dung Collecting Device' developed by Junagadh Agricultural University. It reduces the labour requirement by 87 % with collection efficiency of about 91 % and it is also beneficial from hygiene point of view for labourers and animals.



(Department of Farm Machinery & Power Engg., CAET, JAU, Junagadh)

3. Lemon grading simulation based on image processing technique

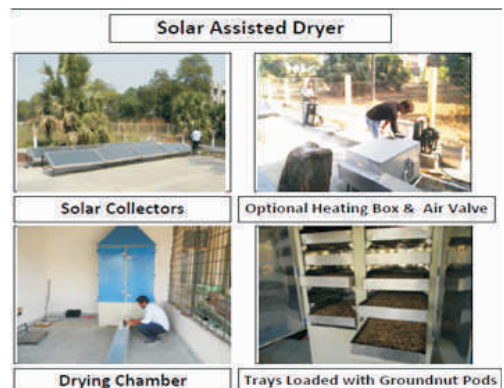
Fruit grading machine manufacturers are recommended to adopt the image processing technique-based simulation developed by Junagadh Agricultural University, Junagadh for grading of lime (kagji) based on their size and colour. The limes can be graded in 3 x 3 different categories according to their size (small, medium and big) x maturity (immature, intermediate and mature) by applying the size and colour features of lime obtained through this simulation.



(Department of Processing & Food Engg., CAET, JAU, Junagadh)

4. Design and development of on farm solar assisted dryer for drying of groundnut pods for longer storage

The farmers growing groundnuts and processors drying groundnut pods are recommended to use the solar assisted dryer developed by Junagadh Agricultural University. Use of solar assisted dryer for drying of threshed groundnut pods to reduce moisture content from 11 to 13.9 % (wb) to safer storage moisture content of 6 to 7 % (wb) using dryer condition of about 50 °C air temperature and about 0.099 m³/s air flow in 7 to 8 hours (i.e. 1 day). Use of solar assisted dryer can reduce drying time (7 h) to seven times less than sun drying (50 h) and reduces the post-harvest losses of groundnut pods in drying, handling, storage as compared to sun drying. Details of solar assisted dryer



- Capacity of dryer : 125 kg per batch (Groundnut pods)
- Drying trays : 12 trays arranged in 6 tiers (10±0.50 kg per tray)
- Solar collectors: 8 Nos. (1 m x 2 m)
- Drying air temperature : about 50 °C
- Air flow rate: 1.0 m/s
- Blower capacity: 1.5 hp, 28 m³/min
- Maximum increment in drying temperature: 26.9 °C to 39.8 °C
- Drying time: 7 to 8 hours

(Department of Processing & Food Engg., CAET, JAU, Junagadh)

5. Forced air curing of onion

The farmers curing traditionally and storing red onion are recommended to use forced air curing at about 40 °C temperature with air flow rate about 0.24 m³/s and without foliage onion bulb for obtaining higher quantity of marketable onion after six months of storage.

(Department of Processing & Food Engg., CAET, JAU, Junagadh)

6. Development of high protein extruded product using defatted peanut flour

Snack manufacturing units are recommended to adopt a process technology developed by Junagadh Agricultural University for the preparation of extruded product by using a proportion of defatted peanut flour and corn flour as 26:74 (w/w) with the help of twin screw extruder machine to increase the protein content in Ready-to-Eat extruded products. The suggested optimum conditions to prepare extruded product using defatted peanut flour are feed moisture content: 13 % (wb), die head temperature: 135 °C, feed temperature: 60 °C, barrel temperature: 100 °C and screw speed: 250 rpm. This process can prepare the extruded product of increased protein content with desired product characteristics.



(Department of Processing & Food Engg., CAET, JAU, Junagadh)

7. Value addition in sesame: Standardization of technology for preparation of Sani - Jaggery based crushed sesame

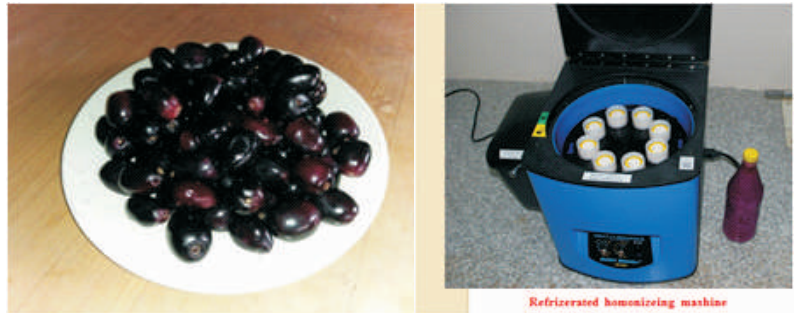
Sesame producers and processors are recommended to adopt the process technology developed by Junagadh Agricultural University to prepare *Sani*. The *Sani* should be prepared from black raw sesame, added with 60 % jaggery as well as 10 % shredded cashew nut and almond (1:1). *Sani* prepared through this method and packed in PET (Polyethylene

Terephthalate) container remains safe up to 25 days of storage. This method can prepare the good quality *sani* with benefit cost ratio (BCR) of 1.51.

(Agricultural Research Station, JAU, Amreli)

8. Preparation and storage studies of Jamun Juice

Farmers/ Food processors are advised to heat the Jamun juice at 67 °C temperature for 13 minutes and add 0.03 % (w/w) sodium benzoate at little warm state to preserve its nutrients. The Jamun juice, thus, prepared packed in 1 litre PET bottle, can safely be stored up to 30 days in the refrigerator (7 + 2 °C).



(Department of Processing & Food Engg., CAET, JAU, Junagadh)

VI. ANIMAL PRODUCTION AND FISHERIES SCIENCE

1. Effect of shrimp (*Litopenaeus vannamei*) pond sludge on growth of Tilapia (*Oreochromis mosambicus*) in cemented circular tank

Fish farmers culturing Tilapia (*Oreochromis mosambicus*) are recommended to utilize dried shrimp sludge as feed @ 10 % of fish body weight along with 5 % self-formulated shrimp feed (SFSF) of 30 % protein content to obtain better growth and survival rate.



(Fisheries Research and Training Center, JAU, Mahuva)

VII. BASIC SCIENCE

1. Effect of integrated nutrient management on growth and yield of chickpea under North Saurashtra region

The farmers of North Saurashtra Agro-climatic Zone growing chickpea (GJG-3) in *rabi* season are advised to apply 50 % of RDF (N:P:K 10:20:0 kg) + 10 kg K₂O + 5 kg bentonite + 500 kg vermicompost per hectare under three irrigations for obtaining higher yield and net returns due to enhancement in growth parameters like increase in number of pods and pod weight.



(Main Dry Farming Research Station, JAU, Targhadia)

VIII. DAIRY SCIENCE – FOOD PROCESSING TECHNOLOGY & BIO ENERGY

1. Incorporation of *Cucurbita pepo* (pumpkin) pulp for the preparation of value added flavoured buffalo milk

The dairy entrepreneurs are informed to incorporate 15 % *Cucurbita pepo* (pumpkin) pulp and 10 % ground sugar for the preparation of good and acceptable quality Pumpkin flavoured buffalo milk. The shelf life of good quality pumpkin flavoured buffalo milk can be maintained for at least 6 months at room temperature subjecting to “in bottle heat treatment” at 110 ± 2 °C for 15 minutes after filling into cleaned and sterilized glass bottle.



[Dept. of Livestock Products Tech., College of Vet. Sci. & A.H., JAU, Junagadh]

RECOMMENDATION FOR SCIENTIFIC COMMUNITY

I. CROP PRODUCTION

1. Screening of sesame varieties/germplasm lines for yield performance under organic condition in summer season

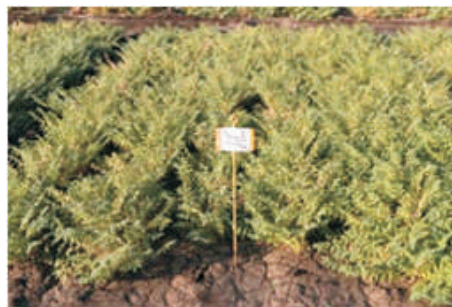
It is for the information of scientific community that under South Saurashtra Agro-climatic Zone of Gujarat state sesame varieties /germplasm GT 4, AT 319, GJT 5 and GT 6 gave higher seed yield in summer season under organic condition.



(Agricultural Research Station, JAU, Amreli)

2. Management of chickpea crop under organic farming

It is for the information of scientific community that under South Saurashtra Agro-climatic Zone, application of FYM @ 4 t/ha + vermicompost 1.0 t/ha + either *Trichoderma harzianum* (2×10^7 cfu/g) @ 2.5 kg/ha or *Pseudomonas fluorescens* (1×10^8 cfu/g) 2.5 kg/ha + *Rhizobium* culture (1×10^7 cfu/g) 5 ml/kg seed + PSB (1×10^7 cfu/g) 5 ml/kg seed + two spray of *Beauveria bassiana* (2×10^6 cfu/g) 40 g/10 L water at 50 % flowering and 2nd spray at 15 days after 1st spray found the most economical in chickpea.



(Pulses Research Station, JAU, Junagadh)

3. Relative salinity tolerance of different pigeon pea varieties

It is for the information of scientific community especially plant breeders that pigeon pea variety GJP 1 was found more salt tolerant [higher mean salinity index (60.04), higher mean seed yield (22.66 g/plant), minimum yield decline (66.45 %) at 8.0 dS/m and for 50 % yield reduction at EC 6.86 dS/m, as well as lower Na/K ratio in seed and stalk] compared to AGT 2 and GT 101 on the basis of salinity indices. The sequential order of salinity tolerance for pigeonpea varieties was observed as GJP 1 > BDN 2 > Vaishali > GT 101 > AGT 2.



(Dept. of Agril. Chem. & Soil Sci., CoA, JAU, Junagadh)

II. PLANT PROTECTION

(A) Entomology

1. Synergism of different plant oils with different insecticides against pod borer,

***Helicoverpa armigera* infesting chickpea**

Two sprays of flubendamide 48 SC 0.015 % + neem oil 0.5 % (3.20 + 50 ml/10 l of water) along with sticker (3 ml/10 l water), first spray when pest crosses the economic threshold level (0.75 larvae/plant before flowering and 0.5 larvae /plant after flowering) and second, at 20 days after first spray found effective against *Helicoverpa armigera* infesting chickpea.

(Department of Entomology, JAU, Junagadh)

2. Study on efficacy of different insecticides against white fly in papaya

Two sprays of acetamiprid 20 SP 0.006 % (3 g/10 l of water) OR thiamethoxam 25 WG 0.01 % (4 g/10 l of water), first at nymphs and adults infestation and second at 15 days after first spray found effective against whitefly (*Bemisia tabaci*) infesting papaya.

(Department of Horticulture, CoA, JAU, Junagadh)

3. Bio-efficacy of new insecticidal molecules against sucking pest of summer groundnut

Two sprays of clothianidin 50 WDG 0.004 % (0.8 g/10 l of water) OR spinosad 45 SC 0.014 % (3.0 ml/10 l of water) OR dinotefuran 20 SG 0.006 % (3.0 g/10 l of water) at 10 days interval starting from pest infestation found effective against thrips in summer groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

4. Bio-efficacy of biopesticides against sucking pest infesting groundnut

Two sprays of spinosad 45 SC 0.018 % (4 ml/10 l of water) at 10 days interval starting from pest infestation found effective against thrips in *kharif* groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

5. Management of white grub in groundnut

Seed treatment with clothianidin 50 WDG 4 g per kg of seed found effective against white grub in *kharif* groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

6. Phenology based application of selective insecticide/ biopesticide combinations for *Spodoptera exigua* and *Helicoverpa armigera* in chickpea

Spraying of profenophos 50 EC 0.13 % (26 ml/10 l water) followed by emamectin benzoate 5 SG 0.002 % (4 g/10 l water) 15 days after first spray was found effective against pod borer (*Helicoverpa armigera*) infesting chickpea.

(Pulses Research Station, JAU, Junagadh)

7. Testing of IPM modules with farmers practice against pest complex of pearl millet

Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg seeds + removal of shoot fly dead hearts + fish meal trap @ 10/ha at 7 days after germination (fish meal to be replaced once a week) + spraying of novaluron 10 EC 0.01 % (10 ml/10 l water) at 35 DAG recorded lowest

stem borer per cent incidence of pearl millet.

(Main Pearl millet Research Station, JAU, Jamnagar)

8. Testing the efficacy of different insecticides against shoot fly and stem borer in pearl millet

Seed treatment of clothianidin 50 WDG @ 7.5 g/kg seeds followed by spray of fipronil 5 SC 0.01 % (20 ml/10 l water) for shoot fly, while chlorantraniliprole 20 SC 0.006 % (3.0 ml/10 l water) for stem borer at 35 DAG were found effective in pearl millet.

(Main Pearl millet Research Station, JAU, Jamnagar)

9. Evaluation of pre-harvest spraying of insecticides for management of pulse beetle (*Callosobruchus* sp.) in green gram

Green gram seeds can be protected up to two months from pulse beetle infestation during storage (seed purpose) by giving spray in the field either profenophos 50 EC 0.05 % (10 ml/10 l of water) or emamectin benzoate 5 SG 0.0015 % (3.0 g/10 l of water) at 50 and 100 % pod maturity of green gram.

(Main Pearl millet Research Station, JAU, Jamnagar)

PLANT PATHOLOGY

10. Development of technologies for the management of soil borne diseases of groundnut

Deep ploughing in summer with mould board plough + furrow application of *Trichoderma harzianum* 1 % WP (2×10^6 cfu/g) @ 4 kg/ha enriched with 250 kg FYM/ha at the time of sowing + seed treatment with tebuconazole 2 DS @ 1.5 g/kg of seeds followed by seed treatment with PGPR (1×10^7 cfu/g) @ 5 ml/kg seeds + line application of *T. harzianum* 1 % WP @ 4 kg/ha enriched with 250 kg FYM/ha at 35 and 70 DAS near the base of plant found effective against collar rot and stem rot diseases in groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

11. Management of major foliar diseases of groundnut

Seed treatment of tebuconazole 2 DS @ 1.5 g/kg seeds with two spray of tebuconazole 50 % + trifloxystrobin 25 % WG @ 0.035 % (13.2 g/10 l of water) at 40 and 65 DAS found effective against foliar diseases (Early Leaf Spot and Late Leaf Spot) in *kharif* groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

12. Evaluation of different IPDM modules for management of major insect-pest and diseases in groundnut

Seed treatment with *Trichoderma harzianum* 1 % WP @ 4 g/kg seed + need based spray of imidacloprid 17.8 SL 0.005 % (3 ml/10 l water) for sucking pest + need based spray of novaluron 10 EC 0.010 % (10 ml/10 l water) for defoliators at 50-70 DAS + two sprays of

tebuconazole 25.9 EC 0.0259 % (15 ml/10 l water) at 50 and 70 DAS found effective against early leaf spot and late leaf spot diseases and leaf damage caused by defoliators (*Helicoverpa* & *Spodoptera*) of groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

III. HORTICULTURE

1. Effect of foliar spray of chemicals to induce flowering and fruiting on rejuvenated mango trees cv. Kesar

The scientific community is informed to spray cycocel (CCC) @ 1000 ppm (1 ml in one liter of water) during October and second spray after one month of first spray in rejuvenated Kesar mango orchard for obtaining higher yield and net return.

(Department of Horticulture, CoA, JAU, Junagadh)

IV. AGRICULTURAL ENGINEERING

1. Evaluation of hydraulic performance of oozing pipe irrigation

The irrigation applications through porous pipe system gives very poor uniformity coefficient of 6.65 % in case of 60 m lateral length at 100 cm input head to 47 % in case of 30m lateral length at 200 cm input head, which should be more than 90 %. The uniformity in the wetting bulb size along the length of lateral also varies greatly



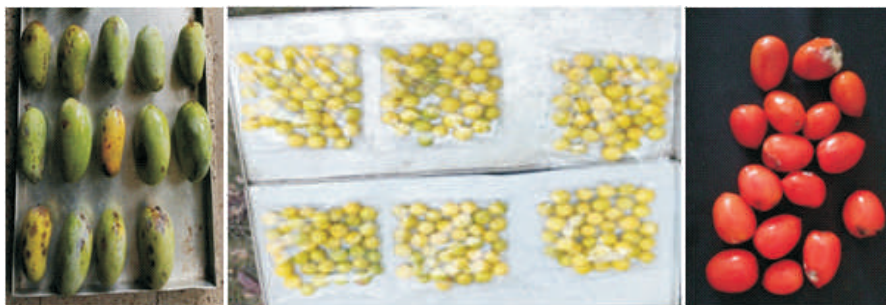
(Department of Soil & Water Conservation Engg., CAET, JAU, Junagadh)

2. Effect of ozonization against the microorganisms of fruits and vegetable

Scientific communities are advised to store mangoes & limes after applying a treatment of ozone 3 minutes (flow rate : 400 mg / hour) packed in 25 μ plastic bag (1 pinpoint hole per 2 x 2 square inch area of plastic bag) and kept at 10 $^{\circ}$ C temperature remain safe against the microbial load up to 50 days & 120 days respectively.

Whereas exporters are recommended to store tomatoes up to 21 days by applying a treatment of ozone 3 minutes (flow rate: 400 mg / hour) packed in 50 μ plastic bag (1 pinpoint

hole per 2 x 2 square inch area of plastic bag) and kept at 10 °C temperature remain safe against the microbial load.



(Department of Processing & Food Engg., CAET, JAU, Junagadh)

V. ANIMAL HEALTH

1. Evaluation of an immunomodulatory effect of *Abrus precatorius* L. in mice

Oral administration of hydro-alcoholic extract of *Abrus precatorius* L. (Chanothi) leaves at the dose rate 200 mg/kg body weight/day for 14 days, revealed immunostimulant effect against Cyclophosphamide induced immunosuppression in mice.



(Dept. of Vet. Pharmacology & Toxicology, College of Vet. Sci. & A.H., JAU, Junagadh)

2. Studies on prevalence, haemato-biochemical & diagnostic aspects of fasciolosis by coprological examination in cattle & buffalo of Junagadh district

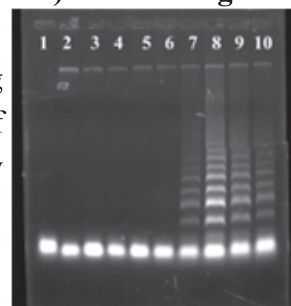
Overall prevalence of *Fasciola* infection is very less in bovines (1.88 %) in and around Junagadh



(Dept. of Vet.Parasitology, College of Vet. Sci. & A.H., JAU, Junagadh)

3. Optimization of Loop Mediated Isothermal Amplification (LAMP) test for diagnosis of *Trypanosoma evansi* infection in animals

The following designed and optimized primers targeting RoTat1.2 gene are equally specific and sensitive for detection of *Trypanosoma evansi* infection in animals through LAMP assay compared to PCR.



Primer ID	Types	Sequence (5' -3')
Tf3 (Forward)	Outer primer	gcacaaatgccgacgta
Tb3 (Reverse)		gtcgttgccggtattgct
FIP1 (Forward)	Internal primer	aggtagctgtctcctggggccgaaatcgacgcgctagg
BIP1 (Reverse)		ggcgacataagcgccgatgggcaggtgttgcttctaca
LF1 (Forward)	Loop primer	gtcatagttggcttcgccg
LB1 (Reverse)		cacaaaactaacagccgttgcag

(Dept. of Vet. Parasitology, College of Vet. Sci. & A.H., JAU, Junagadh)

VI. ANIMAL PRODUCTION AND FISHERIES SCIENCE

1. Receiver operating characteristic (ROC) analysis of milk components for sub clinical mastitis in Gir cows

In Gir cows, milk components particularly milk SNF, protein, lactose and ash decrease and Somatic Cell Counts increases in udder infection during early and mid-lactation. Healthy udder quarters could be differentiated from severely infected quarters by milk lactose threshold with moderate accuracy during early and mid-lactation.

(Polytechnic in Animal Husbandry JAU, Junagadh)

VII. BASIC SCIENCE

1. Phytochemical, antioxidant and antidiabetic characterizations of custard apple (*Annona squamosa* L.) genotypes

It is informed to the scientific community that, out of 30 custard apple genotypes tested, fruit pulp of genotypes DS-1, Aml-10 and Aml-6 recorded higher α amylase inhibition (as antidiabetic potential) and % DPPH (1,1-Diphenyl-2-picrylhydrazyl) free radical scavenging (as antioxidant activity). The ascorbic acids and phenols contributed positively for both α amylase inhibition and % DPPH free radical scavenging activities in fruit pulp of

custard apple. Phytochemicals analysis illustrated that terpenoids and flavonoids present in fruit pulp are positively correlated with antioxidant activity whereas alkaloids showed significantly positive correlation with antidiabetic potential.

(Department of Biochemistry and Biotechnology, CoA, JAU, Junagadh)

2. Qualitative and nutritional evaluation of promising genotypes of groundnut

The scientific community involved in groundnut improvement is recommended to use below mentioned groundnut genotypes for the qualitative and nutritional improvement of groundnut crop.

Sr. No.	Name of genotype	Name of quality/nutritional parameters	Range of quality/nutritional parameters
1	GG-16, KDG-123, GG-4, RG-578	Total soluble sugar	24.40 to 24.68 %
2	TG-51, ICGV-00440, JL-501	Total carbohydrate	10.56 to 10.75 %
3	RG-510	True protein	23.22 %
4	TLG-45, JSSP-35, ICGV-86156	Total oil	50.55 to 51.21 %
5	JL-501	Iron	95.85 ppm
6	GJG-9, ICGV-02266, TPG-41, GJG-17, RG-578	Calcium	1366.29 to 1403.67 ppm
7	ICGV-15055	Oleic acid	80.21, % of total fatty acid
8	ICGV-15035, ICGV-15033, ICGV-15005	O/L ratio	22.88 to 23.88

(Department of Biochemistry and Biotechnology, CoA, JAU, Junagadh)

VIII. SOCIAL SCIENCE

1. A comparative study on groundnut yield forecasting models for Junagadh district

The groundnut productivity can be forecasted at the 10th week after sowing and use multiple linear regression models having generated weather variables with correlation coefficient between groundnut productivity and weather variables as weight and original weather variables using week wise approach with higher predictability and lower deviations between forecasted and observed productivity.

(Department of Agril. Statistics, CoA, JAU, Junagadh)

2. Financial inclusion of farmers in Saurashtra region

To promote financial inclusion in Saurashtra region, the farmers with land holding up to 4 ha need to be provided with lesser used financial services viz. medium and long term credit, personal health insurance and pension within 14 km radius of their households.

(Post Graduate Institute of Agribusiness Management, JAU, Junagadh)

3. Assessment of hygienic milk production practices adapted by dairy farmers for quality milk production

To improve the adoption of clean milk production practices among dairy farmers, targeted training programmes need to be organized giving priority to the farmers' age, education level, extension participation and source of information.

(Dept. of Animal Husbandry Ext. Edu., College of Vet. Sci. & A.H., JAU, Junagadh)

4. Training needs of rural women in home science related activities

It is recommended to extension personnel of the Amreli district that trainings of bakery, papad and vadi making, jam making, value-added products of pearl millets as well as awareness about the government schemes for girl child is most needed for women empowerment. Extension personnel should prefer demonstrations, field visits and study tours for such trainings.

(Krishi Vigyan Kendra, JAU, Amreli)





Hon'ble Governor of Gujarat Shri Acharya Devvrat visited experiment on Natural Farming at Instructional Farm of Agronomy, JAU, Junagadh on February 08, 2020



Annual group meeting of AICRP on Integrated Farming System during November 27-29, 2019 organized by Department of Agronomy, JAU, Junagadh

Table: Production and selling of breeder/ truthful seeds, planting materials, bio-agent and liquid bio-fertilizers during the year 2019-20

Sr. No.	Particular	Production
1	Nucleus and Breeder Seeds (q)	4787
2	Truthful, foundation and certified seeds (q)	6711
3	Fruit crop graft (Nos.)	7709
4	Fruit crops saplings (Nos.)	86107
5	Seedlings (Nos.)	25448
6	Ornamentals & Medicinal plants (Nos.)	55169
7	<i>Trichoderma</i> (tonne)	215.39
8	<i>Rhizobium</i> (litre)	2114
9	<i>Azotobacter</i> (litre)	1674
10	PSB(litre)	3372
11	KMB(liter)	420
12	<i>Beauveria</i> (tonne)	89.55
13	<i>Metarhizium</i> (q)	61.11
14	HNPV (liter)	193
15	SNPV (liter)	101
16	Fruit fly traps (Nos.)	5289
17	Fruit fly lure for fruit crops (Nos.)	6039
18	Fruit fly lure for vegetable crops (Nos.)	1216
19	Pheromone Trap (Nos.)	59439
20	Pheromone Lure (Pink bollworm) (Nos.)	107135
21	Pheromone Lure (<i>Heliothis</i>) (Nos.)	10159
22	Pheromone Lure (<i>Prodenia</i>) (Nos.)	3638
23	Pheromone Lure (Brinjal shoot and fruit borer) (Nos.)	906
24	MDP Technology for Pink bollworm (100 gm Tube)	735
25	Honey (litre)	428