RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

Year 2023

DIRECTORATE OF RESEARCH
JUNAGADH AGRICULTURAL UNIVERSITY
JUNAGADH -362001 (Gujarat)

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JUNAGADH -362001 (Gujarat)

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Dr. V. P. Chovatia
Vice Chancellor

MESSAGE

Doing research is only half of the picture. Publishing the research is important because it is an act of cooperation from which all can benefit. The developments in technology have made all the stakeholders in the research set-up right from researchers to practitioners, policy makers and farmers to access, search and share information increasingly with greater ease and speed. All these attributes need to put in use for common betterment and social upliftment. Junagadh Agricultural University extends its excellence in tripartite activities *viz*. education, research and extension in agricultural and allied science in the Saurashtra region of Gujarat state with its jurisdiction extending over ten districts encompassing four agro-climatic zones.

Total 24 research stations of the university spread over 10 districts of Saurashtra are extensively engaged in multidisciplinary, farmer centric and demand driven research to make farmers equipped with modern agricultural technology and development. The research recommendations by respective faculties were discussed with length in ZREAC, AGRESCO and Combined AGRESCO meeting. I congratulate and appreciate the scientists for their endless efforts for farming community.

It is my pleasure as well as honour to present this compilation entitled **"Research Accomplishments and Recommendations-2023"** of the university covering seven new varieties, 36 need based technologies developed for farmers and 25 technologies for scientific community. I convey my best wishes to the Director of Research and his team for compiling and publishing this book hoping that the farmers of the region as well as the state would immensely benefit from this publication

Junagadh

(V. P. Chovatia)

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Dr. R. B. Madariya

PREFACE

It is a matter of great pleasure for me to put on record the research work carried out during 2022-23 in the Junagadh Agricultural University. The recommendations and new technical programmes were critically discussed and approved in 19th AGRESCO Subcommittee Meetings of Junagadh Agricultural University. Same were presented in 19th Combined AGRESCO meeting of SAUs, which was organized by Anand Agricultural University, Anand during April 25 - May 17, 2023 through virtual mode.

The Junagadh Agricultural University represents Saurashtra region of Gujarat and about 32.74 per cent area of the state. There are 25 research stations, which include multidisciplinary main research stations, sub research stations for various crops as well as testing centers spread over 10 districts. The eight different sub-committees have been constituted and conveners were nominated to plan and monitor the research work. All the sub-committees have successfully completed their responsibilities. The University has also arranged 20th Research Council meeting on February 14, 2023 for approval of new research projects and research activities to be under taken during year. The university has also signed two MoUs for research activities. Total 23 new projects of ICAR, RKVY and other Agencies worth Rs. 270.00 lac were approved in the University during the year 2022-23.

During the year 2022-23, total 9734 quintal breeder/ nucleus seeds of different crops were produced to fulfill the demand of private and public sectors as per the national and state indents. Under Megaseed project, 8339 quintal of truthful/ foundation/ certified seeds of different crops were produced and supplied to the farmers & various farms of the University under the brand “Gir Sawaj”. Apart from these, 1.87 lac planting material of different fruit crop graft, sapling, seedling, ornamental & medicinal plants

were produced and provided to the farmers. Total 95.30 tonne Bioagents *viz. Trichoderma, Beauveria, Metarihizium*; 3515 liter liquid biofertilizers *viz. Rhizobium, Azotobacter*, PSB, KMB, HNPV, SNPV; 36055 Fruit fly trap/ lure; 53235 Pheromone trap/ lure etc. were produced in large amount and supplied to the farmers at reasonable price.

A patent "A Foldable container for Storage and Transportation of Agricultural Produce" and a design "Batch type biomass Pyrolyser" were granted. A total of 162 different farm machinery, implements, equipments have been tested by Gujarat's only Farm Machinery Testing and Training Center operating at the University for the testing of machines and implements.

In the 19th Combined AGRESCO meeting of SAUs, Seven varieties *viz.*, Chickpea (GG 8 and GKG 2), Mungbean (GM 10), Garlic (GG 8), Coriander (G.Cr. 4), Endorsement of Cotton (G.Cot.46) and Sesame (G.Til 8) were recommended for release in the Gujarat state. Besides this, 36 technologies/ recommendations were made for farmers and 25 recommendations were made for Scientific Community. In addition, as many as 82 new technical programmes were formulated to initiate the new research programmes for the solutions of the applied and basic problems of agriculture and allied fields.

Summary of 19th Combined AGRESCO meeting of SAUs

Sub Committee	No. of Recommendations		New Technical Programs
	Farmers	Scientific	
Crop Improvement	07*+01	-	02
Crop Production	15	03	20
Plant Protection	05	04	30
Horticulture & Forestry	04	01	10
Agricultural Engineering	10	04	11
Basic Science	01	04	05
Social Science	-	09	04
Total	**07*+36**	**25**	**82**

*No. of crop varieties released

Junagadh

Dr. R. B. Madariya

RECOMMENDATIONS FOR FARMERS

I. CROP IMPROVEMENT

CROP VARIETIES RELEASED

Seven new crop varieties *viz.* Chickpea (GG 8 and GKG 2), Mung bean (GM 10), Garlic (GG 8), Coriander (G.Cr 4), Cotton (G.Cot. 46) and Sesame (G.Til 8) were recommended for farmers during the year 2020-21.

Chickpea (Mechanical Harvesting): Gujarat Gram 8 (GG 8: Sorath Vikram)

The farmers of Gujarat state growing chickpea under irrigated and rainfeed conditions are recommended to grow Gujarat Gram 8 (GG 8: Sorath Vikram). This variety is suitable for mechanical harvesting as it possesses plants with more height and erect growth habit. This variety has produced 2814 kg/ha seed yield which was 25.3, 26.3, 12.8, 75.5 and 43.8 per cent higher over check varieties Dahod Yellow, GG 1, GG 5, NBeG 47 and JG 24, respectively under irrigated condition. Under un-irrigated condition, it recorded 2017 kg/ha seed yield, which was 25.5, 30.4, 16.9, 11.9 and 24.5 per cent higher over GG 1, GG 2, GJG 3, GJG 6 and JG 24, respectively. Seeds of this variety are of medium size and brown in colour. This variety is resistant to wilt and stunt diseases and showed low pod borer damage. This variety has higher iron content as compared to the check varieties.


[Pulses Research Station, JAU, Junagadh]

Kabuli Chickpea: Gujarat Kabuli Gram 2 (GKG 2: Sorath Kabuli 2)

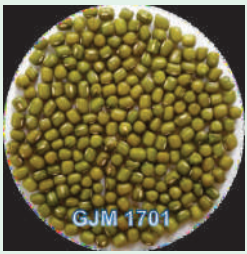
The farmers of Gujarat state growing *kabuli* chickpea under irrigated condition are recommended to grow early maturing variety Gujarat Kabuli Gram 2 (GKG 2: Sorath Kabuli 2). It recorded 2117 kg/ha seed yield, which was 29.1, 16.5 and 24.8 per cent higher over check varieties KAK 2, JGK 1 and PG 0517, respectively. Seeds of this

variety are of large size (35.8 g/100 seeds). This variety showed resistant reaction against wilt and stunt diseases with low pod borer damage. It has higher dhal recovery (67.45 %), iron (63.58 ppm) and zinc (38.68 ppm) content than check varieties KAK 2, JGK 1 and PG 0517.


(Pulses Research Station, JAU, Junagadh)

Mungbean: Gujarat Mung 10 (GM 10: Sorath Moti)

The farmers of Gujarat state growing mung in *kharif* season are recommended to grow early (65 days) maturing variety Gujarat Mung 10 (GM 10: Sorath Moti). This variety has produced 1036 kg/ha seed yield, which was 12.8, 15.0, 20.8, 4.5 and 11.1 per cent higher over check varieties GM 4, GAM 5, Meha, GM 6 and GM 7, respectively. Seeds of this variety are of medium in size and greenish in colour. This variety is resistant to MYMV, leaf curl, anthracnose and powdery mildew diseases.

(Pulses Research Station, JAU, Junagadh)

Garlic: Gujarat Garlic 8 (GG 8: Sorath Mohini)

The farmers of Gujarat state growing garlic crop during *rabi* season are recommended to grow variety Gujarat Garlic-8 (GG-8: Sorath Mohini). This variety recorded 87.26 q/ha bulb yield, which was 16.4, 20.7, 22.1 and 22.1 per cent higher over the check varieties GJG-5, GAG-6, GG-7 and G-282, respectively. The bulb of this variety contains higher Total soluble solids (40.36 %), Pyruvic acid (2.98 mg/g), Carotenoids (0.82 mg/ 100 g), Reducing sugar (2.34 %), Ascorbic acid

(9.42 %), True protein (3.13 %), Total carbohydrate (27.32 %) and Phenol (38.12 %) as compared to all the check varieties. The bulbs are medium in size, compact and creamy white in colour with purple tinch. The variety also reported low infestation of thrips and moderately susceptible to diseases.



(Vegetable Research Station, JAU, Junagadh)

Coriander: Gujarat Coriander 4 (G. Cr 4: Sorath Sugandha)

The farmers of Gujarat state growing coriander crop during *rabi* season are recommended to grow Gujarat Coriander 4 (G. Cor 4: Sorath Sugandha). It has recorded the mean seed yield of 2083 kg/ha, which was 17.3 and 8.6 per cent higher over check varieties; Gujarat Coriander 2 and Gujarat Coriander 3, respectively. The seeds of G. Cor 4 are medium in size, oblong in shape and brown in colour. This variety has early maturity and excellent aroma in seed due to higher Linalool content (68.80 %) in volatile oil. This variety was moderately resistant to aphid and resistant to powdery mildew disease as compared to check varieties.


(Vegetable Research Station, JAU, Junagadh)

Endorsement Cotton: Gujarat Cotton 46 (G. Cot 46: Sorath Swet Hem)

The farmers of Gujarat state growing Non Bt cotton (*Gossypium hirsutum* L.) are recommended to grow cotton variety Gujarat Cotton 46 (G.Cot 46: Sorath Swet Hem) under irrigated condition. This variety has

recorded 2121 kg/ha seed cotton yield which was 27.7, 26.6, 27.7 and 15.1 per cent higher over check varieties *viz*., G.Cot 20, GN.Cot 22, GN.Cot 32 and Phule Yamuna, respectively. This variety gave lint yield of 812 kg/ha which was 48.5, 43.2, 35.5 and 33.4 per cent higher over check varieties *viz*., G.Cot 20, GN.Cot 22, GN.Cot 32 and Phule Yamuna, respectively. It possesses 36.7 % ginning outturn. It is found moderately resistant to *alternaria* leaf spot and bacterial leaf blight disease and also against sucking pests.

(Cotton Research Station, JAU, Junagadh)

Sesame: Gujarat Til 8 (G. Til 8: Sorath Ratna)

The farmers of Gujarat state growing sesame in summer season are recommended to grow Gujarat Til 8 (G. Til 8: Sorath Ratna). The variety recorded seed yield of 1318 kg/ha which was 10.6 and 15.5 per cent higher over the check varieties G. Til 3 and GJT 5, respectively. Seeds of this variety are white and bold; and it contains 48.44 % oil. This variety showed lower incidence of stem and root rot, phyllody diseases and thrips infestation.

(Agricultural Research Station, JAU, Amreli)

RECOMMENDATION FOR FARMERS

Assessment of best practices for storage of turmeric planting material

The farmers of Saurashtra region growing turmeric are recommended to store the rhizomes of turmeric from their produce for

six months storage *i.e.* from January to June to be used as planting material in next season should be stored under tree shed in soil pit (1m deep and 0.5 m width and 0.5 m length for 4 kg). It showed maximum germination per cent with higher number of healthy rhizomes.


(Dept. of Genetics & Plant Breeding, CoA, JAU, Junagadh)

II. CROP PRODUCTION

Nutrient Management

Effect of NPK levels on growth, yield and nutrient uptake by isabgol

The farmers of Saurashtra region growing isabgol are recommended to apply 30 kg nitrogen, 30 kg phosphorus and 30 kg potash/ha along with FYM 5 t/ha at the time of sowing and remaining 30 kg N as top dressing at 45 DAS for getting higher seed yield and net realization.

(Department of Agronomy, CoA, JAU, Junagadh)

Effect of N, P and K levels on growth, yield and nutrients uptake by bottle gourd

The farmers of South Saurashtra Agro-climatic Zone growing bottle gourd in summer season are recommended to apply 125-75-75 kg N-P_2O_5-K_2O/ha for achieving higher yield and net return. Nitrogen should be applied in three equal splits (Basal and remaining nitrogen at 30 and 45 days after sowing as spot application), full dose of phosphurus and potash as basal.

(Dept. of Soil Science & Agril. Chemistry, CoA, JAU, Junagadh)

Effect of fresh cow dung on yield, quality and uptake of nutrients in groundnut

The farmers of South Saurashtra Agro-climatic Zone growing

kharif groundnut are recommended to apply slurry of 1500 kg/ha fresh (up to five days) cow dung (cow dung: water - 1:3) through drenching at the time of sowing or RDN (12.5 kg/ha) through FYM (about 2.5 t/ha) + 25:50 kg P_2O_5:K_2O per ha for getting higher yield and net return.

(Dept. of Soil Science & Agril. Chemistry, CoA, JAU, Junagadh)

Effects of nutrient management and high density planting of Bt cotton under rainfed condition in Saurashtra region

The farmers of North Saurashtra Agro-climatic Zone growing Bt cotton under rainfed condition are recommended to sow Bt cotton at 60 cm x 45 cm spacing and apply 120 kg N, 10 t FYM and 500 kg castor cake/ha for obtaining higher yield and net return. The nitrogen should be applied in three splits i.e. 25 % as basal at the time of sowing, 50 % and 25 % as top dressing at 35-40 and 60-65 days after sowing, respectively by drilling in 10 cm soil depth.

(Main Dry Farming Reearch. Station, JAU, Targhadia)

Nutrient management in gram under conserve soil moisture condition

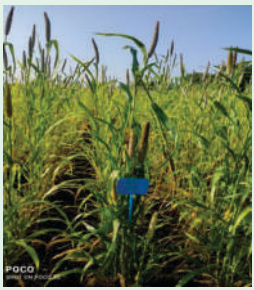
The farmers of Bhal region growing gram under conserved soil moisture condition are recommended to apply 20-40-00-20 kg N-P_2O_5-K_2O-S/ha for obtaining higher yield and net monetary returns.

(Main Dry Farming Research Station, JAU, Targhadia and Dry Farming Research Station, JAU, Vallabhipur)

Evaluation of microbial consortia enriched vermicompost in pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing *kharif* pearl millet under organic condition are recommended to apply FYM 5 t/ha along with vermicompost 2 tonne/ha enriched with *Azospirillum* 2 L/ha, PSB 2 L/ha, KSB 2 L/ha, *Trichoderma harzianum* 3

kg/ha, *Pseudomonas fluorescens* 3 L/ha and *Beauveria bassiana* 3 kg/ha to obtain higher yield and net return and to improve soil health.



For enrichment of vermicompost, above each components should be mixed with 2 tonne vermicompost and sprinkled with little water (moisture content 20 %) and use in field after 10 days incubation period.

(Pearl millet Research Station, JAU, Jamnagar)

Response of summer sesame to levels of potassium and sulphur

The farmers of North Saurashtra Agro-climatic Zone growing sesame during summer season are recommended to apply 40 kg K_2O and 20 kg sulphur per hectare as a basal dose with recommended dose of nitrogen and phosphorus (50 : 25 N, P_2O_5 kg/ha) fertilizers for getting higher seed yield and net return.

(Agricultural Research Station, JAU, Amreli)

Cultural Practices

Standardization of periodicity of sulphur, zinc and iron in prevalent kharif groundnut -based cropping system

The farmers of South Saurashtra Agro-climatic Zone growing kharif groundnut - rabi wheat sequence cropping are recommended to apply Fe 10 kg/ha, Zn 5 kg/ha and S 20 kg/ha in form of ferrous sulphate, zinc sulphate and cosavet (Fertis), respectively once in two years as basal, in both groundnut and wheat, for obtaining higher groundnut equivalent yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Management of reddening in Bt cotton

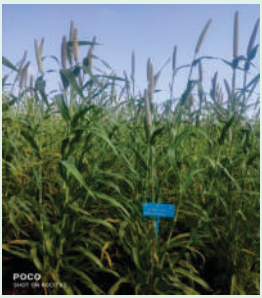
The farmers of South Saurashtra Agro-climatic Zone growing Bt

cotton are recommended to spray multimicro nutrient Grade -IV @ 1 % (100 g/10 lit) at 100 DAS or apply 40 kg S/ha as basal dose along with RDF 240-50-150 N-P_2O_5-K_2O kg/ha for reducing cotton reddening, achieving higher yield and net realization.

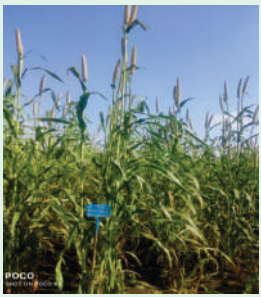
(Cotton Research Station, JAU, Junagadh)

Agronomic biofortification of pearl millet cultivars through zinc fertilizer

The farmers of North Saurashtra Agro-climatic Zone growing *kharif* pearl millet are recommended to apply 20 kg $ZnSO_4$/ha in soil as basal, seed treatment of 3 g $ZnSO_4$/kg seed and foliar spray of 0.5 % $ZnSO_4$ with 0.25 % lime at tillering and flowering stage in addition to recommend dose of fertilizers (80-40-00 N-P_2O_5-K_2O kg/ha) to increase the Zn content of grain and fodder of pearl millet cultivar GHB-732 having low Zn content.



The farmers are also recommended to sow high zinc content (>40 ppm) pearl millet cultivar GHB 1225 and apply foliar spray of 0.5 % $ZnSO_4$ with 0.25 % lime at tillering and flowering stage in addition to recommended dose of fertilizers (80-40-00 N-P_2O_5-K_2O kg/ha) to obtain higher yield and net returns as well as to improve quality of grain and fodder.



(Pearl millet Research Station, JAU, Jamnagar)

Feasibility of seed spices intercropping with autumn-planted sugarcane (*Saccharum* complex hybrid)

The farmers of South Saurashtra Agro-climatic Zone growing autumn-planted sugarcane are recommended to grow one row of fenugreek as intercrop in sugarcane planted at 90 cm row spacing for securing higher yield and additional net return.

(Main Sugarcane Research Station, JAU, Kodinar)

Improving phosphorus use efficiency in summer groundnut with microbial culture

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are recommended to apply 40 kg/ha of P_2O_5 + PSB (Bacillus subtilis-1 x 10^8 cfu/g) culture @ 15 ml/kg seed in addition to recomeded dose of nitrogen and potash (25-50 kg N-K_2O/ha) for securing higher yield and net income.

(Main Oilseeds Research Station, JAU, Junagadh)

Irrigation Management

Response of drip irrigated castor to plant geometry and nitrogen fertigation

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor during *kharif* season are recommended to adopt plant geometry of 120 cm x 60 cm or 150 cm x 60 cm and irrigate the crop with drip irrigation and apply RDN 30 kg/ha (25 %) as a soil application (15 kg/ha as basal and 15 kg/ha at 30 DAS), remaining 90 kg/ha (75 %) RDN through drip in form of urea in five equal splits at an interval of 12 days (starting after cessation of monsoon) along with recommended dose of phosphorus and potash (50-50 kg P_2O_5 and K_2O/ha) as basal for obtaining higher castor seed yield and net return.

The drip system details as under: -		
Details	**Month**	**Operating time (Minutes)**
Lateral spacing : 120 cm or 150 cm	October	110-125
Dripper spacing : 60 cm	November	100-110
Dripper discharge rate : 4 lph	Dec.-Jan.	95-105
Operating pressure :1.2 kg/cm^2	-	-
Operating frequency: Every 3rd day irrigation	-	-

(Main Oilseeds Research Station, JAU, Junagadh)

Weed Management

Weed management in *kharif* maize

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* maize are recommended to adopt following practices for effective weed management and achieving higher grain yield and net realization without any phytotoxic effect on succeeding crops *i.e.*, wheat, chickpea,

coriander and mustard.

For effective management of purple nutsedge and other weeds

- Atrazine 500 g/ha (50 % WP 20 g /10 L water) as pre-emergence *fb* Tank-mix halosulfuron-methyl 30 g/ha (75 % WG 0.8 g/10 L water) + Topramezone 12.5 g/ha (33.6 % SC 0.744 g/10 L water) as post-emergence at 30 DAS **OR**
- HW at 15 and 30 DAS.

For effective management of purple nutsedge

- Atrazine 500 g/ha (50 % WP 20 g/10 L water) as pre-emergence *fb* halosulfuron-methyl 60 g/ha (75 % WG 1.6 g/10 L water) as post-emergence at 30 DAS. OR
- HW at 15 and 30 DAS.

For effective weed management

- Atrazine 500 g/ha (50 % WP 20 g/10 L water) as pre-emergence *fb* Topramezone 25 g/ha (33.6 % SC 1.488 g/10 L water) as post-emergence at 30 DAS **OR**
- HW at 15 and 30 DAS.

(Department of Agronomy, CoA, JAU, Junagadh)

Weed management in Bt cotton under dry farming condition (Vallabhipur)

The farmers of Bhal region growing Bt cotton under rainfed condition are recommended to apply pendimethalin (30 % EC) 0.900 kg/ha (3 lit./ha) as pre-emergence fb HW and IC at 30 and 60 DAS OR HW and IC at 30, 60 and 90 DAS for effective weed management and achieving higher seed cotton yield and net realization.

(Main Dry Farming Research Station, JAU, Targhadia and Dry Farming Research Station, JAU, Vallabhipur)

III. PLANT PROTECTION

Entomology

Bio-efficacy of insecticides against leaf eating caterpillar, *Spodoptera litura* Fab. infesting soybean

The farmers of Gujarat growing soybean are recommended to spray spinetoram 11.70 SC, 0.011 % (9 ml/10 l of water) or emamectin benzoate 1.9 EC, 0.002 % (8.5 ml/10 l of water), first at the initiation of pest infestation and second spray at 15 days after first spray, for effective and economical management of leaf eating caterpillar.

As per CIB & RC Format

Year	Crop	Pest	Pesticides/ Bio-pesticides formulation	Dosage				Quantity of water/ Soil amendments required (kg or l/ha	Application schedule	Waiting period/ PHI (days)
				a.i. (g/ha)	Quantity of formulation g or ml/kg seed, kg or l/ha	Con. (%)	Quantity of formulation in 10 l of water (g or ml)			
2022-23	Soybean	Leaf eating caterpillar, *S. litura*	Spinetoram 11.70 SC	53	0.450 l	0.011	9 ml	500 l	First spray at initiation of pest infestation, second spray at 15 days interval after first spray	30
			Emamectin benzoate 1.9 EC	8	0.425 l	0.002	8.5 ml			20

(Department of Entomology, CoA, JAU, Junagadh)

Management of mealybug, *Maconellicoccus hirsutus* Green infesting custard apple

The farmers of South Saurashtra Agro-climatic Zone having custard apple orchards are recommended to apply two sprays of fenobucarb 50 EC, 0.1 % (20 ml/10 l of water) or first spray of *Beauveria bassiana* 1.15 WP (Min. 1 x 10^8 cfu/g) 0.007 % (60 g/10 l of water) followed by second spray of fenobucarb 50 EC, 0.1 % (20 ml/10 l of water), first at initiation of pest infestation and second at 15 days after first spray for the effective management of mealybug.


(College of Horticulture, JAU, Junagadh)

Effect of solarization on infestation of pulse beetle and quality of chickpea seeds

The farmers of Gujarat are recommended that solarization of chickpea seeds in transparent polythene (700 gauge) packet (5 cm thick seed layer) for 6 days (4 hrs on each day between 11.00 to 15.00 hours) during summer sunny days can protect from pulse beetle damage and maintain seed germination (Above 85.00 % IMSCS level) up to 9 months of storage.

(Pearl Millet Research Station, JAU, Jamnagar)

Plant Pathology

Efficacy of ready-mix formulation of fungicides against foliar diseases of cumin

The farmers of Saurashtra region growing cumin are recommended to spray metiram 55 + pyraclostrobin 5 WG, 0.180 % (30 g/10 l of water) or pyraclostrobin 13.3 + epoxiconazole 5 SE, 0.027 % (15 ml/10 l of water) for blight and metiram 55 + pyraclostrobin 5 WG, 0.180 % (30 g/10 l of water) for powdery mildew disease, first at 30 days after sowing and subsequent two sprays at an interval of 20 days for effective and economical management.


As per CIB & RC Format

Year	Crop	Pest	Pesticides/ Biopesticides formulation	Dosage				Quantity of water/ Soil amendments required (kg or l/ha	Application schedule	Waiting period/ PHI (days)	Remarks
				a.i. (g/ha)	Quantity of formulation g or ml/kg seed, kg or l/ha	Con. (%)	Quantity of formulation in 10 l of water (g or ml)				
2023	Cumin	Blight & Powdery mildew diseases	Metiram 55 + Pyraclostrobin 5 WG	900	1.5 kg	0.180	30 g	500 l	First spray at 30 DAS and subsequent two sprays at an interval of 20 days	20	This fungicide is registered in CIB- RC for blight and Powdery mildew diseases in cumin crop
			Pyraclostrobin 13.3 + Epoxiconazole 5 SE	137.25	0.750 l	0.027	15 ml	500 l		22	This fungicide is registered in CIB- RC for blight disease in cumin crop

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Chemical control of die-back of mango

The farmers of South Saurashtra Agro-climatic Zone cultivating mango are recommended to apply three sprays of tebuconazole 50 + trifloxystrobin 25 WG, 0.094 % (12.50 g/10 l of water) after pruning, first spray just before onset of monsoon and subsequent two sprays at 30 days interval after first spray for effective and economical management of die-back disease.

As per CIB & RC Format

Year	Crop	Pest	Pesticides/ Biopesticides formulation	Dosage				Quantity of water/Soil amendments required (kg or l/ha	Application schedule	Waiting period/ PHI (days)	Remark (s)
				a.i. (g/ha)	Quantity of formulation g or ml/kg seed, kg or l/ha	Con. (%)	Quantity of formulation in 10 l of water (g or ml)				
2023	Mango	Die back	Tebuconazole 50 + Trifloxystrobin 25 WG	940	1.25 kg	0.094	12.50 g	1000 l	First spray at before onset of monsoon and subsequent two sprays at an interval of 30 days	15	Fungicide is labelled for mango crop

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

IV. HORTICULTURE

Effect of time and intensity of pruning on yield of Jasmine (Mogra) *Jasminum sambac* (L) cv. Double type

Farmers of Saurashtra region growing jasmine (Mogra) are

recommended to prune the crop up to 30 cm above ground level (Medium pruning) during 4th week of October for getting higher yield and net return.


(College of Horticulture, JAU, Junagadh)

Effect of different drying techniques with use of various media for drying of flower *Butea monosperma*

Recommendation for processors:

The dry flower processors are recommended to keep the flower of flame of the forest at open condition for sun drying for two days with embedded in borex powder as a media for obtaining good quality dried flower.


(College of Horticulture, JAU, Junagadh)

Effect of integrated nutrient management on growth, yield and quality in rejuvenated guava (*Psidium guajava*) cv. Bhavnagar Red.

Farmers of Saurashtra region having rejuvenated orchard of guava are recommended to apply 187.5 g of each N: P_2O_5: K_2O/plant along with well decomposed FYM 5 kg/plant + Vermicompost 2.5 kg/plant + Azospirillum 125 ml/plant + PSB 15 ml/plant as basal dose during kharif season 187.50 g N/plant as split after completion of *kharif* season for getting higher yield and net return.

(College of Horticulture, JAU, Junagadh)

Nutrient management in cucumber under polyhouse

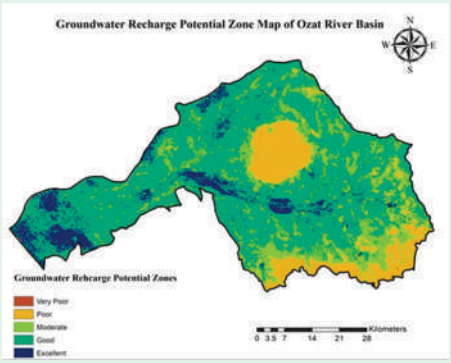
The farmers of Gujarat growing parthenocarpic cucumber under greenhouse are recommended to apply fertilizer 8.0-5.0-5.0 kg NPK/1000 m2 as a basal + panchgavaya 3 % with three sprays at 30, 40 and 50 days after sowing to obtain higher yield and net return.

(College of Horticulture, JAU, Junagadh)

V. AGRICULTURAL ENGINEERING

Identification of potential groundwater recharge zones in ozat river basin

It is recommended to the Farmers, NGOs and Government line departments that the Ozat river basin is divided in to five groundwater potential recharge zones namely excellent, good, moderate, poor and very poor having an area of 220.14 km^2 (6.93 %), 2094.81 km^2 (65.95 %), 430.05 km^2 (13.54 %), 430.87 km^2 (13.57 %) and 0.36 km^2 (0.01 %) respectively.



(Dept. of Irrigation & Drainage Engg., CAET, JAU, Junagadh)

Cotton crop response to drip fertigation

The farmers of South Saurashtra Agro-climatic zone growing Bt. cotton crop are recommended to apply 25 % of RDF (240 N:50

P_2O_5:150 K_2O kg/ha) as basal doze and remaining NPK through drip fertigation in 12 equal splits after 30-45 days of sowing at 9 days interval using following drip irrigation system to get higher yield, net return, and water productivity as compared to conventional fertilizer applications adopted by farmers.

Specifications of drip irrigation system and its operating time

Drip irrigation system details			Drip irrigation system operating time at every 3 days		
SN	**System components**	**Specification**	**SN**	**Month**	**Operating time (min.)**
1	Lateral size	16 mm (OD)	1	September	60
2	Dripper rate	4 lph	2	October	90 to 125
3	Lateral type	Inline Drip	3	November	90 to 120
4	Dripper spacing	0.5 m	4	December	70 to 90
5	Lateral spacing	1.2 m	5	January	70 to 90
6	Nos. of rows /drip line	1 no.			

(Dept. of Irrigation & Drainage Engg., CAET, JAU, Junagadh)

Influence of crop cultivation method and slope on runoff and soil loss under natural rainfall condition

The farmers of south Saurashtra Agro-climatic zone growing cotton and groundnut are recommended to keep the land slope up to 0.75 % to conserve more water into the medium black soil. In order to reduce the soil loss, they are recommended to cultivate groundnut crop along land slope up to 0.5% and across the land slope up to 0.75 %.

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

Response of fertigation under different irrigation systems on sweet corn

Farmers of Saurashtra region growing sweet corn during *rabi* season are recommended to apply 100 % phosphorous of 75% RDF (90:45:45 N:P_2O_5:K_2O) and 25 % N and K of 75 % RDF as a basal dose and rest N and K through sub surface drip irrigation (installed at 30cm

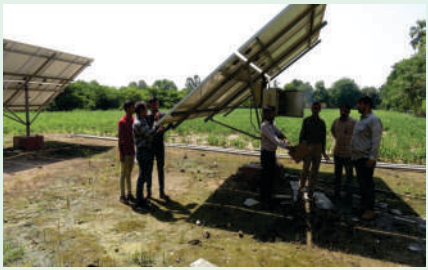
depth) in 10 equal splits after 25 days of sowing at 6 days interval to obtain higher yield, fertilizer use efficiency, water use efficiency and net return.

Details of drip system	Irrigation scheduling
Lateral spacing :1.2 m Dripper spacing: 0.40 m Dripper discharge: 4 lph Operating pressure: 1.2 kg/cm^2	At 0.8 ETc with 3 days interval a) November : 40 min b) December : 1hr 5 min c) January : 1 hr 20 min d) February : 2 hr 10 min

(Research, Testing & Training Centre, JAU, Junagadh)

Techno-economic performance of solar pump

Farmers of south Saurashtra Agro-climatic zone are recommended to use the solar photovoltaic pump for getting higher water horse power, discharge, array efficiency and overall efficiency during 10 am to 4 pm as the period is feasible to apply irrigation in field. The total cost of solar photovoltaic pump is lower as compared to electric motor pump and diesel engine pump and it is ecofriendly.



(Research, Testing & Training Centre, JAU, Junagadh)

Hydraulic study of rain pipe irrigation system under solar photovoltaic pump

Farmers of south Saurashtra agroclimatic zone are recommended to use solar photovoltaic pump operated rain pipe irrigation system to irrigate the field during 10 am to 4 pm.

Particular	:	Details
Solar photovoltaic pump	:	5 hp AC
Solar Panel output	:	4800 W
Rain pipe	:	Diameter: 32 mm, Wall thickness: 300 micron
Operating pressure	:	0.5 kg/cm^2
Length of rain pipe	:	30m
Spacing between two rain pipe	:	5m

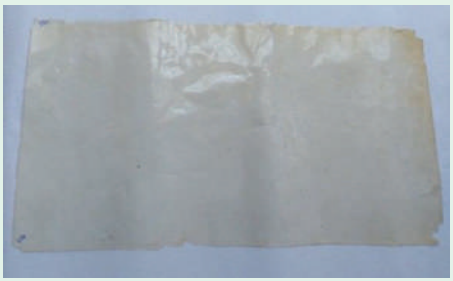
(Research, Testing & Training Centre, JAU, Junagadh)

Adaption to climate change: Effect of hydrogel and organic manures to mitigate biotic stress in Bt. cotton

The farmers of north Saurashtra agro-climatic zone growing Bt. Cotton (G. Cot Hybrid-8 BG-II) under dry farming conditions are recommend to apply hydrogel @ 2.5 kg/ha before sowing (1:10 mixture of Pusa hydrogel and sand through drilling in the furrow) or FYM @ 10 t/ha to minimize moisture stress during dry spells and obtaining maximum rain water use efficiency, higher productivity and net returns.

(Main Dry Farming Research Station, JAU, Targhadia)

Development of biodegradable packaging film based on whey protein isolate



The entrepreneurs and industrialists are recommended to adopt a process technology developed by Junagadh Agricultural University for the preparation of biodegradable plastic film based on whey protein isolate by using 1.4:1 WPI to glycerol ratio, 6.6 pH and 93 % ultra-

sonication power by casting method to replace synthetic plastic to use as carry bag and dry matter packaging film.

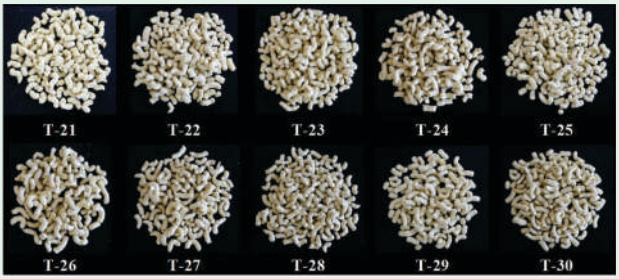
(Dept. of Processing & Food Engg., CAET, JAU, Junagadh)

Modification of gel expulsion machine for aloe vera leaves

The farmers and entrepreneurs are recommended to use aloe vera gel expulsion machine developed by Junagadh Agricultural University to get maximum gel recovery (39 %), gel expulsion efficiency (79 %) and output capacity (98 kg/h) with better quality of gel to operate at 75 rpm expulsion roller speed for aloe vera leaves having thickness more than 20 mm to reduce 79 % cost of expulsion.

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

Development and evaluation of defatted sesame flour incorporated protein enriched extruded products



The extrudate manufacturing units and farmers are recommended to adopt the process technology developed by Junagadh Agricultural University for making corn based protein enrich extrudates products using defatted sesame flour. The extrudates should be produce by taking a proportion of defatted sesame flour and corn flour as 23:77 to increase the protein content of extrudates by using twin screw extruder

machine. The suggested optimum condition to prepare extrudates using defatted sesame flour is feed moisture content : 15.60 % (wb), die head temperature : 130°C, feed temperature : 60°C, barrel temperature : 100°C and screw speed: 250 rpm. The developed method givegood quality extrudates with 19.21 % high protein content.

(Agricultural Research Station, JAU, Amreli)

VI. BASIC SCIENCE

Preparing for climate change - Growth and development of arboreum cotton in response to growth regulators

The farmers of South Saurashtra Agro-climatic Zone growing arboreum cotton under irrigated condition are recommended to timely sow the crop with foliar spray of Salicylic Acid @ 70.00 ppm (0.70 g/10 lit. water) at 45 and 60 DAS for balance growth to obtain higher seed cotton yield and net return.

(Cotton Research Station, JAU, Junagadh)

RECOMMEDATIONS FOR SCIENTIFIC COMMUNITY

I. CROP PRODUCTION

Optimization of nutrient package in Bt cotton under irrigated condition

If soil status of available nitrogen and phosphorus is low and potassium is high, than apply 180:50:113 kg/ha N:P_2O_5:K_2O to Bt cotton. N fertilizer apply in five splits of 20 % each *viz*: as basal, at 30, 60, 90 and 120 DAS and K_2O in two splits *viz*; 50 % as basal and at 30 DAS and P_2O_5 as basal. In addition, apply *Azatobactor,* PSB and KSB each 3 lit./ha through drenching for getting higher yield.

(Dept. of Soil Science & Agril. Chemistry, CoA, JAU, Junagadh)

Improving phosphorus use efficiency in summer groundnut with microbial culture

It is informed to scientific community that in summer groundnut apply 40 kg/ha of P_2O_5 + DGRC (microbial consortia) culture (10 g/kg seed) for obtaining higher groundnut pod and haulm yield.

(Main Oilseeds Research Station, JAU, Junagadh)

Response of sugarcane (*Saccharum* complex hybrid) to N, P and K nano- fertilizers

The scientific community is informed that application of recommended dose of fertilizers viz. 250-125-125 kg N, P_2O_5 and K_2O/ha or the application of 1/5th of RDF Nano- fertilizer (50-25-25 kg N, P_2O_5 and K_2O/ha) + *Azotobacter* + PSB each @ 4 litre/ha gave higher cane yield in sugarcane.

(Main Sugarcane Research Station, JAU, Kodinar)

II. PLANT PROTECTION

Entomology

Effect of detopping on defoliators and stem rot in kharif groundnut

The farmers of South Saurashtra Agro-climatic Zone growing groundnut in *kharif* season are recommended to detop the crop 5 cm in length from the top at 30 days after sowing for effective and economical management of defoliators *viz*; *Helicoverpa* & *Spodoptera*.

(Main Oilseeds Research Station, JAU, Junagadh)

Plant Pathology

Efficacy of ready-mix formulation of fungicides against foliar diseases of cumin

Three spray of azoxystrobin 11 + tebuconazole 18.3 SC, 0.044 (15 ml/10 l of water), first at 30 days after sowing and subsequent two sprays at an interval of 20 days found effective for the management of blight and powdery mildew diseases of cumin.

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

Efficacy of different fungicides against powdery mildew diseases of fenugreek

Three spray of difenoconazole 25 EC, 0.013 % (5 ml/10 l of water) or tebuconazole 50 + trifloxystrobin 25 WG, 0.038 % (5 g/10 l of water) or tebuconazole 10 + sulphur 65 WDG, 0.150 % (20 g/10 l of water), first spray at 30 days after sowing and subsequent two sprays at 20 days interval after first spray found effective for management of powdery mildew of fenugreek. Treat the seeds with thiram @ 3 g/kg seed at the time of sowing.

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

Utilization of different wastes on the yield of oyster mushroom (*Pleurotus sajor* caju)

Sugarcane bagasse can be used as substrate with 5 per cent spawn rate for the higher sporophore production (biological efficiency) with better nutritional and biochemical properties of oyster mushroom (*Pleurotus sajor* caju).

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

Chemical control of die-back of mango

Three spray of azoxystrobin 18.2 + difenoconazole 11.4 SC, 0.037 % (12.50 ml/10 l of water) or azoxystrobin 18.2 + difenoconazole 11.4 SC, 0.030 % (10 ml/10 l of water), first spray just before onset of monsoon and subsequent two sprays at 30 days interval after first spray found effective for management of die-back of mango.

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

III. HORTICULTURE

Effect of time of irrigation and level of pruning on yield and quality of off seasonal custard apple (*Annona squamosa* L.) cv. GJCA-1

It is inform to scientific community that the custard apple should not be irrigated after completion of rest in the month of March resulted to dropping of flowering and fruit setting due to higher temperature with lower humidity.

(College of Horticulture, JAU, Junagadh)

IV. AGRICULTURAL ENGINEERING

Soil moisture based irrigation water management in canal command using remote sensing technology

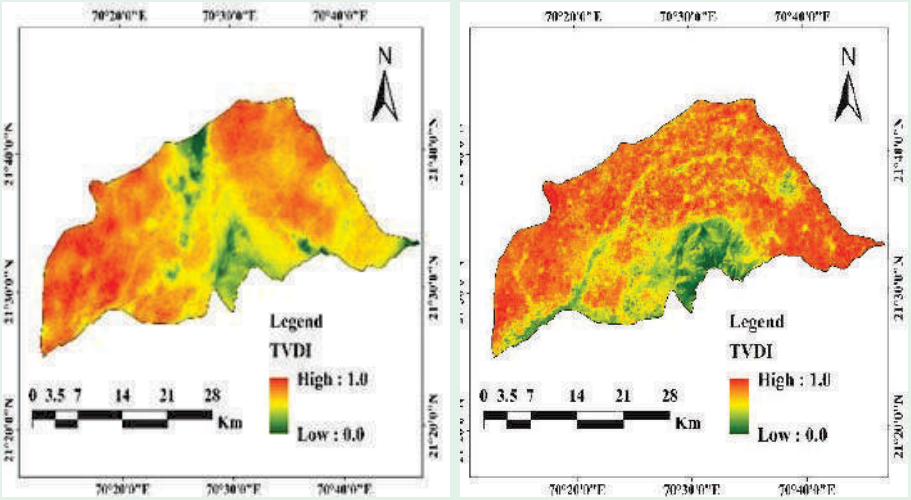
The Planners, NGOs and Government Departments of South Saurashtra Agro Climatic region are recommended to use the following relationship of surface soil moisture with remote sensing images based Temperature Vegetation Dryness Index (TVDI) to find out the spatial

surface soil moisture for the estimation of crop water requirement for the agricultural fields.

Surface Soil Moisture (%) = -45.457 TVDI + 43.71

Where,

TVDI = Temperature Vegetation Dryness Index



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

Influence of crop cultivation method and slope on runoff and soil loss under natural rainfall condition

On availability of daily rainfall data, the following empirical rainfall-runoff models are recommended for the hydrologic design of water harvesting/conservation structures to estimate the runoff from the field of cotton and groundnut crop cultivation either along or across the land slope up to 1 % for medium black soil.

Crop	Cultivation practices	Rainfall-runoff model	R^2
Cotton	Along	RO = 0.6307(RF) - 7.7509	0.901
Cotton	Across	RO = 0.5908(RF) - 7.3239	0.898
Groundnut	Along	RO = 0.5752(RF) - 7.1512	0.895
Groundnut	Across	RO = 0.5195(RF) - 6.4703	0.888
Where, RO is daily runoff (mm) and RF is the daily rainfall (mm)			

On the availability of daily rainfall and land slope data, following empirical models are recommended to estimate the runoff from the fields of cotton and groundnut crop cultivation either along or across the land slope up to 1 % for medium black soil.

Cultivation practices	Model	R^2
Cotton Along	$RO = 0.2546 (RF)^{1.1787} (S)^{0.2450}$	0.885
Cotton Across	$RO = 0.2404 (RF)^{1.1787} (S)^{0.2759}$	0.882
Groundnut Along	$RO = 0.2535 (RF)^{1.1774} (S)^{0.3900}$	0.878
Groundnut Across	$RO = 0.2167 (RF)^{1.1720} (S)^{0.2571}$	0.866
Where, RO is the predicted daily runoff (mm), RF is the daily rainfall (mm) and S is the slope of the bed (%).		

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

Influence of crop cultivation method and slope on runoff and soil loss under natural rainfall condition

On the availability of annual rainfall and land slope data, the following empirical models are recommended to estimate the annual soil loss from the fields of cotton and groundnut crop cultivation either along or across the land slope up to 1 % for medium black soil.

Cultivation practices	Model	R^2
Cotton Along	$AS_L = 1.1669(ARF)^{0.2281} (S)^{0.2269}$	0.904
Cotton Across	$AS_L = 2.0660(ARF)^{0.1356} (S)^{0.2397}$	0.961
Groundnut Along	$AS_L = 1.1016(ARF)^{0.2277} (S)^{0.3603}$	0.951
Groundnut Across	$AS_L = 0.6235(ARF)^{0.2910} (S)^{0.2532}$	0.956
Where, AS_L is the annual soil loss (ton/ha/year), S is the slope of the bed (%) and ARF is the annual rainfall (mm).		

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

Identification of potential groundwater recharge zones in ozat river basin

The scientific communities are infromed that the planning for recharging of 610.18 MCM runoff (75 % dependibility) of Ozat basin may be done by recharging through 4520 check dams, 51113 farm ponds, 22599 open wells, 5650 tube wells in excellent and good groundwater recharge potential zones, while 10496 Gabion/loose rock dams in moderate groundwater potential zones.

(Dept. of Irrigation & Drainage Engg., CAET, JAU, Junagadh)

V. BASIC SCIENCE

Development of biochemical and molecular markers for heat tolerance in chickpea

The chickpea genotype namely ICC-4958 was identified highly tolerant when exposed to 42/37 oC temperature at germination stage. This genotype had high antioxidant activity, ascorbic acid, glutathione, super oxide dismutase, ascorbate peroxidase, glutathione reductase

along with Quinone oxidoreductase, glutaredoxine and heat shock protein 70. SSR markers namely Cam1536, TA27, TR 58 could also reveal this genotype different at DNA level. Hence, this genotype can be exploited in breeding to develop heat tolerant lines/varieties of chickpea.

(Department of Biotechnology, CoA, JAU, Junagadh)

Biochemical analysis based lipid indices of edible, non-edible and medicinal herbs oils

Scientific community involved in lipid indices of edible oil research is recommended to use the sets of following biochemical based fatty acids calculation for the quality of oils and their lipid indices.

Edible oils	DR	ODR	LDR	MUFA	PUFA	SFA	DU	UI	AI	TI
GG -20	0.009	0.247	0.001	63.72	20.64	15.64	105.0	590.5	0.14	10.32
GG-21	0.008	0.185	0.003	69.62	15.67	14.71	101.0	597.0	0.13	9.18
GG-3	0.009	0.451	0.001	44.47	35.93	19.6	116.3	562.8	0.19	13.30
Coconut seed oil	0.007	0.396	0.011	11.43	7.05	81.52	25.5	129.4	20.73	34.60
Corn oil	0.012	0.563	0.005	33.24	41.43	25.33	116.1	522.7	0.67	23.17
Cotton seed oil	0.003	0.645	0.035	26.01	40.88	33.11	107.8	468.2	2.19	28.78
Soybean	0.022	0.612	0.025	23.5	53.88	22.62	131.3	541.7	0.36	14.30
Sunflower	0.007	0.630	0.019	30.71	47.09	22.2	124.9	544.6	4.32	17.60
Brown mustard seed	0.181	0.647	0.439	57.51	30.26	12.23	118.0	614.4	0.06	40.74
White sesame	0.001	0.558	0.011	39.17	48.19	12.64	135.6	611.5	0.09	10.00
Black sesame	0.001	0.574	0.007	38.07	50.47	11.46	139.0	619.8	0.08	8.34

DR= Desaturation ratio; ODR= Oleic desaturation ratio; LDR= Linoleic desaturation ratio; MUFA= Monounsaturated fatty acid; PUFA= Polyunsaturated fatty acid; SFA = Saturated fatty acid; DU= Degree of unsaturation; UI= Index of unsaturation; AI= Atherogenic index; TI= Thrombogenic index

(Department of Biotechnology, CoA, JAU, Junagadh)

Biochemical analysis based lipid indices of edible, non-edible and medicinal herbs oils

Scientific community involved in the essential oil research of the following crops is recommended to use ma

Name of crops	Important Marker Bioactive compounds
Black pepper (*Piper nigrum* L.)	Piperine (α.-Phellandrene, 4.64 %) cis-sabinene (23.21 %) Caryophyllene (13.58 %) Caryophyllene oxide (0.33 %) 1, 4-Cyclohexadiene, 1-methyl-4-(1-methylethyl) (20.84 %)
Volatile oil of Cardamom	α-Terpinyl acetate (37.05 %) Eucalyptol (25.79 %) Sabinen (3.41 %)

Volatile oil of Cinnamom	Cinnamaldehyde, (E) (77.55 %) Copaene (2.98 %)
Volatile oil from leaves of cinnamom	Phenol, 2-methoxy-3-(2-propenyl) (79.17 %), Spathulenol (3.26 %) gamma.-Elemene (3.66 %)., Caryophyllene (1.24 %)
Volatile oil of cloves	Caryophyllene (37.5 %) and Phenol, 2-methoxy-3-(2-propenyl)-(44.04 %)
Volatile oil of coriander leaves	LINALOOL (63.23 %), 2, 6-Octadien-1-ol, 3, 7-dimethyl-, acetate (7.78 %),1, 6-Octadien-3-ol, 3,7-dimethyl (2.64 %), (1R)-2, 6, 6-Trimethylbicyclo [3.1.1]hept-2-ene (2.59 %)
Volatile oil of cumin seeds	Beta.-Pinene (19.09 %) Benzene, 1-methyl-4-(1-methylethyl) (12.4 %) 1, 4-Cyclohexadiene, 1-methyl-4-(1-methylethyl) (10.69 %) Benzaldehyde, 4-(1-methylethyl) (26.8 %) TERPIN-7-AL <GAMMA-> DB5-1106 (12.36%)
Volatile oil of curry leaves	Bicyclo [7.2.0] undec-4-ene, 4, 11, 11-trimethyl-8-methylene-, [1R-(1R@, 4Z, 9S@)] (29.28 %) Caryophyllene (4.44 %), alpha.-Caryophyllene (4.88 %) Azulene, 1, 2, 3, 3a, 4, 5, 6, 7-octahydro-1, 4-dimethyl-7-(1-methylethenyl) - (21.24 %) [1R-.alpha., 3a.beta., 4.alpha.,7.beta.)]-Caryophyllene oxide (4.05 %).
Volatile oil of Dill seed	Tetrahydro carvone (19.82 %) trans-dihydrocarvone (14.53 %) cis-Carvyl acetate (25.7%) Eugenol (0.01 %) And Apiol (Abotion drug) (17.59 %)
Volatile oil of Dry ginger	CURCUMENE (16.56 %) Zingiberene (21.03 %); FARNESENE < (E, E)-ALPHA (15.26 %) beta-Sesquiphellandrene (7.61 %) VALERIANOL (5.91 %)
Volatile oil of fennel seed	Fenchone (8.93 %) Anisole, p-allyl (5.29 %) (Estragole) cis-Anethol (68.56 %)
Volatile of Garlic oil	1, 3-Dithiane (6.7 %) Dimethyl trisulfide (7.43 %) Diallyl disulphide (17.72 %) Hydroperoxide, 1, 4-dioxan-2-yl (26.34 %) Trisulfide, di-2-propenyl (31.49 %)
Volatile oil of holy basil	1, 6-Octadien-3-ol, 3,7-dimethyl (18.47 %)/(Linalool) METHYL CINNIMATE (8.48 %) and METHYL CINNIMATE < (E)-(45.94 %)
Volatile oil of mint leaves	Limonene (5 %) 2-Cyclohexen-1-ol, 2-methyl-5-(1-methylethenyl)-, trans-(35.63 %) 2-Cyclohexen-1-one, 2-methyl-5-(1-methylethenyl) (31.59 %) trans-Carveyl acetate (5.19 %)

Volatile oil of nutmeg	1R)-2, 6, 6-Trimethylbicyclo [3.1.1] hept-2-ene/ (α-Pinene-14.64 %) Bicyclo [3.1.0] hexane, 4-methylene-1-(1-methylethyl)-(cis-sabinene-18.5 %) Cyclohexene, 1-methyl-4-(1-methylethenyl) -, (S) - (Limonene-5.84 %) 1, 4-Cyclohexadiene, 1-methyl-4-(1-methylethyl) - (α-Terpinene-5.13 %) 3-Cyclohexen-1-ol, 4-methyl-1-(1-methylethyl)-((R)-(-)-; (-)-Terpinen-4-ol-8.05 %) Benzene, 1, 2-(methylenedioxy)-4-propenyl-, (E)-(β-Isosafrole-5.4 %)
Volatile oil of nutmeg mace	α-Pinene-(15.97 %); cis-sabinene-(17.66 %);α-Terpinene-(6.23 %), L-4-terpineol-(9.11%)
Turmeric oil & Oleoresin	Caryophyllene (6.74 % and 0.29,%) ZINGIBERENE (18.86 % and 4.59 %) Benzene, 1-(1, 5-dimethyl-4-hexenyl)-4-methyl (9.49 % and 0.45 %) SESQUIPHELLANDRENE <BETA(14.25 % and 1.17 %) Tumerone (23.26 % and 17.39 %) Ar-tumerone (25.15 % and 8.93 %)

(Department of Biotechnology, CoA, JAU, Junagadh)

Diversity analysis of marine diatoms through SEM-EDX from surface microalgae of Saurashtra coastal belt

The scientific community working on diatoms of coastal belt of Saurashtra is recommended to use diatoms diversity analysis done through Scanning electron microscopy as ready references. The diatom analysis of marine samples from three locations (Okha, Veraval and Aadri) identified fifty diatom species and most of them are pennate types. The *Cocconeis* spp, *Grammatophora* spp, *Fragilaria* sp, *Nitzschia* sp, *Navicula* sp., *Achnanthes* spp and *Licmophora* were found dominant diatoms on the surface of microalgae. Again, diatom abundance of *Cocconeis scutellum* was reported higher than 52 % of total diatom considering three locations. The energy dispersive X-ray spectroscopy (EDS) graph prepared for individual species of diatoms from SEM images observed that the frustules of the diatoms were other than Si. It has many elements at various sites attached to them. The catalogue of diatoms and alfa-diversity index revealed many diverse rich populations in coastal belt of Saurashtra.

(Department of Biotechnology, CoA, JAU, Junagadh)

VI. SOCIAL SCIENCE

Growth, instability and decomposition analysis of major nutri-cereals production in Gujarat

It is recommended to the policy makers that the satisfactory yield growth rate of bajra and jowar about 2 to 4 per cent during last two decades in Gujarat even after less reduction in area and production as well as it's low to medium instabilities in major nutri-cereals growing districts. To enhance area and production of bajra and jowar in Gujarat, sustained focus needs to be given on the following districts as given below in particular season.

Crop	Season	Priority districts
Bajra	*Kharif*	Banaskantha, Bhavnagar, Anand, Kheda and Panchmahals
	Summer	Banaskantha, Patan, Junagadh, Anand, Kheda and Vadodara
Jowar	*Kharif*	Banaskantha, Surat, Narmada and Bharuch
	Rabi	Porbandar, Junagadh, Bharuch, Narmada and Vadodara

(Dept. of Agril. Economics, CoA, JAU, Junagadh)

Forecasting area, production and productivity of cotton and groundnut in Gujarat

It is advised to scientific community that the area, production and productivity of cotton and groundnut can be precisely predicted using the hybrid model in comparison to ARIMA and TDNN for Gujarat state.

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

Assessment of knowledge of agro-input dealers gained through certificate course on insecticide management

It is suggested that extension personnel to organize regular training programs/courses for agro-input dealers for effective transfer of agricultural technology at the grassroots level.

(Dept. of Agril. Extension Education, CoA, JAU, Junagadh)

Financial literacy among the students of Junagadh Agricultural University

It is advised to the competent authority that for enhancing financial literacy of Junagadh Agricultural University students, training should be imparted on financial attitude, financial behavior and especially financial knowledge as low level is more prevalent in this area of financial literacy.

(Post Graduate Institute of Agri. Business Management, JAU, Junagadh)

Business opportunities of exotic vegetables in Saurashtra

The entrepreneur of Saurashtra region is advised to grab the business opportunities for exotic vegetables by supplying timely and regularly highly demanded exotic vegetable like red and green bell pepper/capsicum, baby corn and broccoli in three-star hotels/restaurants.

(Post Graduate Institute of Agri. Business Management, JAU, Junagadh)

Knowledge of rural women regarding fruit processing and preservation in Amreli district

It is suggested to the extension functionaries to organize vocational/skill training programme for young, educated, having mass media exposure and innovative rural women on improved practices of processing and preservation of fruit crops. For effective and more participation of rural women training should be organised at village level in leisure time. It is important that women group should be linked with FPO for better marketing and branding of products.

(College of Agriculture, JAU, Mota Bhandariya)

Usefulness of Agro-met advisory service to the farmers of Jamnagar district

Scientific community advised that the Agro-met advisory service in local language is useful to take precaution measures which reduce crop losses. For improving the advisory, include information on different farming systems along with market intelligence & price forecast and long-range forecast advisory at village level given for pre-seasonal crop planning.

(Krishi Vigyan Kendra, JAU, Jamnagar)

Attitude of farmers towards Agro-met advisory service

It is suggested to agro-met advisory providers to include information on post-harvest operations, market-related information, sources of seed material, and disseminate advisory services in audio-visual form.

(Krishi Vigyan Kendra, JAU, Amreli)

Training need of farmers regarding rainwater harvesting and groundwater recharge

It is advised to extension personnel to organize one day training program on rooftop water harvesting for farm irrigation and borewell recharge through demonstration and field visit along with information of various government schemes for higher adoption.

(Krishi Vigyan Kendra, JAU, Amreli)

Table-1: Production and distribution of "Gir Sawaj" brand quality seeds; planting materials of fruit crops/ ornamental plants; bio-agent and liquid bio-fertilizers during the year 2022-23

Sr. No.	Particular	Production
1	Nucleus and Breeder Seeds (q)	9734
2	Truthful, foundation and certified seeds (q)	8339
3	Fruit crop graft (Nos.)	19216
4	Fruit crops saplings (Nos.)	111475
5	Seedlings (Nos.)	7539
6	Ornamentals & Medicinal plants (Nos.)	49226
7	Bioagents (*Trichoderma, Beauveria, Metarhizium*)	9513
8	Liquid biofertilizer (litre) (*Rhizobium, Azotobacter,* PSB, KMB, HNPV, SNPV)	3515
9	Fruit fly traps (Nos.)	15569
10	Fruit fly lure for fruit and vegetable crops (Nos.)	20486
11	Pheromone Trap (Nos.)	16063
12	Pheromone Lure for Pink bollworm (Nos.)	22154
13	Pheromone Lure (Nos.) (*Heliothis,* Brinjal shoot & fruit borer, *Spodoptera* and Fall armyworm)	15018

Table-2: Patent and Design Granted

Sr. No.	Title	Patent/Design No.
1	A patent on "A Foldable container for Storage and Transportation of Agricultural Produce"	Patent No. 404866
2	A design on "Batch type biomass pyrolyser"	Design No. 370646-001

Table-3: No. of Farm Machineries/ Implements/ equipments (category wise) tested at testing centre of FMPE, CAET during the year 2022-23

Category	Name of Equipment / Machine	Nos.
A	Land development, tillage & seedbed preparation equipment	44
B	Sowing and planting equipment	34
C	Intercultivation equipment	02
D	Plant protection equipment	20
E	Harvesting and threshing equipment	33
F	Equipment for residue management	13
G	Post-harvest and agro processing equipment	03
H	Hand tools	13
	Total	**162**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