

RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

2016



JUNAGADH AGRICULTURAL UNIVERSITY
JUNAGADH-362 001(Gujarat)



DIRECTORATE OF RESEARCH
JUNAGADH AGRICULTURAL UNIVERSITY
JUNAGADH-362 001(Gujarat)

Citation:

Research Accomplishments and Recommendations-2016
Junagadh Agricultural University, Junagadh (Gujarat)

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Publication No.:

3-1-28

Year of Publication:

September-2016

Copies: 500**Printed at:**

Metro Offset

Dolatpara, Junagadh.

Ph. : 0285 - 2661254



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**MESSAGE**

Junagadh Agricultural University is providing commendable services to the farmers of Saurashtra region of Gujarat by doing location specific research on mandated crops and scientists are developing suitable technologies of agriculture, horticulture, agricultural engineering, fisheries, veterinary science & animal husbandry and agri-business management, as a result of their untiring efforts. Basic research is also carried out useful for the scientific community for their future plan of action.

I feel proud to present very useful information in the form of "**Research Accomplishment and Recommendations-2016**" for farmers, scientists, extension workers planners, students and entrepreneurs for their future endowment.

I congratulate scientists/ teachers for their appreciable/distinguish contribution to bring such recommendations as a result of their hard work in laboratory as well as in field. I also complement the entire team of Directorate of Research for nicely compiling and publishing this booklet.

Junagadh
September 22, 2016

(A. R. PÁTHAK)

VICE-CHANCELLOR





Junagadh Agricultural University
Junagadh - 362 001 (Gujarat)



PREFACE

It is a matter of great pleasure for me to highlight the research work carried out in during 2015-16 in the University. The contents of recommendations and new technical programmes were critically discussed and approved in respective 12th AGRESO meeting of various sub-committees of Junagadh Agricultural University. These were presented in 12th Combined Joint AGRESO meeting held at Navsari Agricultural University, Navsari during April 11-13, 2016.

The Junagadh Agricultural University represents ten districts and about 32.74 per cent area of the state. There are seven colleges, six polytechnic colleges and 31 research stations, which include multidisciplinary main research stations, sub research stations for various crops as well as testing centers in the University. 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 job. The University has also arranged 13th Research Council meeting on December 22, 2015 for approval of new research projects and research activities during this year.

Total 32 new projects worth of Rs. 426.05 lakh were sanctioned from ICAR, Government of India, ICRISAT and Private sectors in the University. The main sanctioned projects are:

1. Transcriptome and proteome analysis for identification of candidate genes responsible for pistillate nature in castor.
2. Transcriptome analysis in coriander for identification of candidate genes against stem gall disease.



3. Estimation of coconut yield and production in the state of Gujarat.
4. Heterotic pool formation in pearl millet.
5. Shuttle breeding for developing wheat genotypes for warmer areas.

The breeder seeds of different crops to fulfill the demand of private and public sectors as per the national and state indents were successfully produced. The required nucleus seeds of different crops were also produced for the breeder seed production in the ensuing seasons.

Under the HRD component of the University, 160 scientist/teachers were deputed to attend winter/summer school training, 244 attended different seminar/symposium/ conference at state and national level, 152 attended the workshops and group meet of their respective projects and 141 scientist/teachers were deputed to attend monitoring, academic work, visit etc. The University has also organized three national level programmes like winter school & seminar as well as four state level seminars/training/workshops.

In the 12th Combined Joint AGRESO Meeting, Wheat, Gujarat Junagadh Wheat 463 (GJW 463) and Onion, Gujarat Junagadh White Onion 3 (GJWO 3) were recommended for release in the state. Red Onion variety (GJRO 11) is to be recommended for areas expansion of South Gujarat. Besides, 24 technologies/recommendations were made for farmers and 36 recommendations were made for Scientific Community. In addition, as many as 127 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.

Junagadh
September 22, 2016

(V. P. CHOVATIA)

DIRECTOR OF RESEARCH & DEAN
FACULTY OF P.G. STUDIES



Summary of new released varieties and developed agro technologies during the 2015-16

Sub-Committee	No. of Recommendations finalized for		Approved New Technical Programmes
	Farmer	Scientific Community	
Crop Improvement	3*	-	07
Crop Production	10	05	28
Plant Protection	03	07	36
Horticulture & Agro Forestry	02	-	04
Agricultural Engineering	04	04	07
Basic Science	03	07	12
Social Science	-	02	12
Animal Science	-	09	16
Fisheries Science	02	02	05
Total:	3*+24	36	127

* Varieties released

RECOMMENDATIONS FOR FARMERS

I. CROP IMPROVEMENT

Three varieties viz., Wheat: (GJW-463), Onion (GJWO 3) & (GJRO 11) were recommended for farmers of the state during 2015-16.

Wheat: Gujarat Junagadh Wheat 463 (GJW 463)

The wheat variety Gujarat Junagadh Wheat 463 has recorded 5575 kg/ha grain yield under early sown condition which was 28.1, 30.0, 21.7 and 12.9 per cent higher over



check varieties GW 496 (4338 kg/ha), LOK 1 (4287 kg/ha), GW 366 (4565 kg/ha) and GW 190 (4938 kg/ha), respectively. Whereas, the proposed variety has recorded 5091



kg/ha grain yield under timely sown condition which was 13.7, 6.9, 1.1 and 6.2 per cent higher grain yield over check varieties GW 496 (4479 kg/ha), LOK 1 (4763 kg/ha), GW 322 (5037 kg/ha) and GW 366 (4792 kg/ha), respectively. It possesses amber seed like GW 496. This variety is tolerant against rust disease. The Gujarat Junagadh Wheat 463 variety was approved for wheat growing area of the state.

(Wheat Research Station, JAU, Junagadh)

Onion: Gujarat Junagadh White Onion 3 (GJWO 3)

The white onion variety recorded bulb yield of 398.06 q/ha, which was 20.8, 11.3 and 7.8 per cent higher over check varieties viz., PWF-131 (329.54 q/ha), GWO-1 (357.75 q/ha) and qualifying variety GAWO-2 (369.26 q/ha), respectively. The proposed variety bulbs contain higher total soluble solid (13.15%) as compared to check varieties viz., PWF-131 (12.80%), GWO-1 (12.88%) and



GAWO-2 (12.18%). Bolting per cent and jointed bulb per cent were less as compared to check varieties and the bulbs of this variety were medium in size with flat globe shape and white in colour preferred by industry. The variety was approved for Gujarat state.

(Vegetable Research Station, JAU, Junagadh)

Onion: Gujarat Junagadh Red Onion 11 (GJRO 11) (Area Expansion)



The red onion variety recorded bulb yield of 336.29 q/ha, which was 16.0, 27.3 and 21.3 per cent higher over check varieties, AGFL Red (289.9 q/ha), Pilli Patti (264.2 q/ha) and Talaja Red (277.3 q/ha), respectively. This variety

was found less pungent (pyruvic acid, 1.22 $\mu\text{M/g}$) as compared to check varieties AGFL-Red and Talaja-Red and the bulbs of this variety were medium in size with flat globe shape and red in colour. The variety was found good as compared to check varieties against diseases and insect-pest reactions. The variety was approved for South Gujarat too.

(Vegetable Research Station, JAU, Junagadh)



II. CROP PRODUCTION

Nutrient Management

Effect of potassium fertilizer on castor hybrid

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor are recommended to apply potash @ 50 kg $\text{K}_2\text{O}/\text{ha}$ (25 kg/ha as basal and 25 kg/ha at 45 days after sowing) along with recommended dose of nitrogen and phosphorus (120:50 N: P_2O_5 kg/ha) for obtaining higher seed yield and net return.



(Main Oilseeds Research Station, JAU, Junagadh)

Nutrient management in Bt cotton under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone (AES-10) growing Bt cotton are recommended to apply 20 kg P_2O_5 , 40 kg K_2O and 20 kg sulphur (150 kg gypsum/ha) along with recommended dose of nitrogen (80 kg N/ha) for obtaining higher yield and net return as well as maintaining soil fertility under rainfed condition.

(Main Dry Farming Research Station, JAU, Targhadia & Dry Farming Research Station, JAU, Jamkhambhalia)

Effect of potassium and sulphur on growth and yield of wheat crop

The farmers of South Saurashtra Agro-climatic Zone growing wheat are recommended to apply 60 kg potash and 40 kg sulphur (through gypsum) per hectare as basal in addition to recommended dose of N and P (120:60 N: P_2O_5 kg/ha) to wheat crop for getting higher yield and net return.

(Department of Agril. Chem. & Soil Sci. & Wheat Research Station, JAU, Junagadh)



Effect of multi-micronutrient formulations on okra

The farmers of South Saurashtra Agro-climatic Zone growing kharif okra in medium black calcareous soil are recommended to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (150:50:50 N:P₂O₅:K₂O kg/ha) to okra for getting higher yield and net return.



Alternatively, foliar spraying of multi-micronutrient formulation Grade IV (Fe-Mn-Zn-Cu-B, 4.0-1.0-6.0-0.5-0.5 %) @ 1% at 45, 60, 75 and 90 DAS in addition to recommended dose of fertilizers (150:50:50 N:P₂O₅:K₂O kg/ha) to okra is recommended for getting higher yield and net return.

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

Efficacy of multi-micronutrient formulations in improving crop production in Bt cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton in medium black calcareous soil are recommended to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (240-50-150 N-P₂O₅-K₂O kg/ha) to Bt cotton for getting higher yield and net return.



Alternatively, foliar spraying of multi-micronutrient formulation Grade IV (Fe-Mn-Zn-Cu-B, 4.0-1.0-6.0-0.5-0.5 %) @ 1% at 45, 60, 75 and 90 DAS in addition to recommended dose of fertilizers (240-50-150 N-P₂O₅-K₂O kg/ha) is recommended to Bt cotton for getting higher yield and net return.

(Department of Agril. Chem. & Soil Sci. & Cotton Research Station, JAU, Junagadh)

Package of Practices

Development of organic farming packages for system based high value crops (Groundnut-Onion)

The farmers of South Saurashtra Agro-climatic Zone adopting Groundnut (*kharif*)-Onion (*rabi*) cropping sequence are recommended to apply 50% RDF (6.25-25 N-P₂O₅ kg/ha) for groundnut and 37.5-60-50 N-P₂O₅-K₂O kg/ha for onion + 50% RDN as FYM to groundnut (1250 kg/ha) and onion (7500 kg/ha) for securing higher groundnut equivalent yield and net realization along with maintenance of soil fertility.

Farmers interested in adopting Groundnut (*kharif*) - Onion (*rabi*) cropping sequence under organic farming are recommended to follow nutrient management system as 50% RDN as FYM (1250 and 7500 kg FYM/ha for groundnut (*kharif*) and onion (*rabi*), respectively) + biofertilizer (Rhizobium / Azotobacter @ 1250 ml/ha) for N + rock phosphate to meet P requirement of crops (100 kg/ha in groundnut and 600 kg/ha in onion) + PSB (1250 ml/ha) for



higher groundnut equivalent yield and net income along with maintenance of soil fertility.

(Department of Agronomy, JAU, Junagadh)

Effect of sowing time and spacing on summer clusterbean

The farmers of South Saurashtra Agro-climatic Zone growing summer cluster bean are recommended to sow the crop in second week of February at 45 cm x 15 cm spacing



for obtaining higher yield and net realization.

(Department of Agronomy, JAU, Junagadh)

Evaluation of potentiality of organic farming for groundnut (*kharif*)-chickpea (*rabi*) cropping sequence

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut (*kharif*)-chickpea (*rabi*) cropping sequence under organic farming are recommended to apply FYM (1.25 t/ha) + castor cake (139 kg/ha) to groundnut and vermicompost (667 kg/ha) + castor cake (222 kg/ha) to chickpea in furrow before sowing for securing higher net realization and maintaining soil fertility.

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

Identification of suitable row ratio for sesame with pigeonpea and soybean intercropping system

The farmers of North Saurashtra Agro-climatic Zone growing sesame with intercropping system in *kharif* are recommended to sow pigeon pea as an intercrop with sesame in the row ratio of 2:1

with 60 cm distance between two rows to get higher yield and net return.

(Agricultural Research Station, JAU, Amreli)

Weed management

Integrated weed management in summer sweet corn

The farmers of South Saurashtra Agro-climatic Zone growing sweet corn in summer season are recommended to apply atrazine 500 g/ha (50% WP 20 g/10 lit) as pre-emergence followed by one interculturing and hand weeding at 40 DAS for effective weed management along with higher yield and net realization.



(Department of Agronomy, JAU, Junagadh)

III. PLANT PROTECTION

PLANT PATHOLOGY

Management of alternaria leaf blight of groundnut

The farmers of south Saurashtra growing summer groundnut are advised to apply three sprays of mancozeb 75 WP 0.2% (27 g/10 litre of water) at 35, 50 and 65 days after sowing for effective and economical management of alternaria leaf blight of groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

Refining integrated disease management in groundnut

The farmers of south Saurashtra growing *kharif* groundnut are advised to apply seed treatment with tebuconazole 25 WG @1.5 g/kg seed or seed treatment with *Trichoderma viride* 1% WP 10 g/kg seed, furrow application of *T. viride* at the time of sowing and broadcasting at 40 DAS @ 4 kg enriched in 50 kg FYM and two sprays of tebuconazole 25.9 SC @10 ml/ 10 lit at 15 days interval

from initiation of foliar disease for effective and economical management of collar rot, stem rot, tikka and rust disease.

(Main Oilseeds Research Station, JAU, Junagadh)

Efficacy of seed dressing chemicals against wilt and root rot complex of cotton

The farmers of south Saurashtra are advised to treat the cotton seeds with a ready mixture of carboxin 37.5% + thiram 37.5% DS @ 3.5 g/kg seeds before sowing for economical and effective control of wilt and root rot complex and to improve seed cotton yield.

(Cotton Research Station, JAU, Junagadh)

IV. HORTICULTURE & AGRO-FORESTRY

Effects of chemical fertilizers and vermicompost on yield and quality of banana (*Musa paradisiaca* L.) cv. Grand Naine

Farmers of South Saurashtra Agro-climate Zone cultivating banana cv. Grand Naine are advised to apply total 300 g nitrogen and 4 kg vermicompost per plant in four equal split at 2nd, 3rd, 4th and 5th month after planting; along with recommended dose of phosphorus 90 g and 200 g potash per plant at 3rd month after transplanting, while 5 kg FYM as basal dose at transplanting for getting good quality, higher yield and higher return.



(Department of Horticulture, JAU, Junagadh)

Feasibility of organic farming in coconut (*Cocos nucifera*) under saline water irrigation condition

The farmers of South Saurashtra Agro-climatic Zone interested organic cultivation of coconut cv. West Coast Tall (WCT) are advised to apply FYM @ 60 kg per tree under saline irrigation (EC 10-14 dSm⁻¹) condition for obtaining higher return and improving soil fertility.



(Fruit Research Station, JAU, Mangrol)

V. AGRICULTURAL ENGINEERING

Evaluation of different mulches for sapota crop under drip irrigation

Farmers of South Saurashtra Agro-climatic Zone growing sapota (Kalippati) are advised to adopt drip irrigation (2 drippers per plant up to 2 years and after that 4 dripper per plant, dripper discharge of 4 lph) covered with black plastic mulch of 100 micron and irrigate every alternate day at 0.6l W/ETc (or apply water 14, 34,



48, 34, 8, 11 and 9 liters per day per plant during January-February, March-April, May, June, July-August, September-October and November-December, respectively) for acquiring higher yield and net return of sapota over no mulch.

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

Preparation of extruded products from flour of amaranth grain, sago and defatted groundnut

Food processors are advised to prepare quality cold extruded pasta by blending defatted groundnut flour, amaranth flour and sago flour (as a binder) in the ratio of 20, 70 and 10 % respectively followed by sun drying for 14 hours in summer months or in solar cabinet dryer for 1 hour at 55 °C. The product can be stored in transparent polyethylene (LDPE) bags of 75 micron to retain the good quality at least up to two months of storage period.



(Dept. of Processing & Food Engg., College of Agril. Engg. & Tech., JAU, Junagadh)

Development of power operated sapota cleaner

The farmers are recommended to use power operated sapota cleaner developed by Junagadh Agricultural University for cleaning and shining sapota surface after harvesting. This machines saves 90 per cent cost of cleaning as compared to manual cleaning. Machine capacity is 575 kg/hr.



(Dept. of Processing & Food Engg., College of Agril. Engg. & Tech., JAU, Junagadh)

Effect of different structures on protection of cumin crop against adverse climate

The farmers of South Saurashtra Agro-climatic Zone are recommended to adopt plastic (LDPE - 50



micron) low tunnel (sing tunel size: 4 x 2 x 1 m) covered with 30% shade net at both the ends for cultivation of cumin. This type of structure protects the crop from adverse climate, insects/pests, diseases and results in better quality and higher yield of cumin. It can be used for seed production also.

(Dept. of Renewable Energy & Rural Engg., College of Agril. Engg. & Tech., JAU, Junagadh)

VI. BASIC SCIENCE

Effect of foliar spray of micro-nutrients on growth and yield parameters of summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are advised to apply the foliar spray of zinc



sulfate 0.5% (2.5 Kg ha⁻¹ in 500 liter water) at 35 and 70 DAS for higher vegetative growth, pod yield and net return.

(Main Oilseeds Research Station, J.A.U., Junagadh)

Effect of plant growth regulators and detopping on yield of Bt cotton (*Gossypium hirsutum* L.) under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone growing Bt cotton in *kharif* season are advised for detopping at 75 DAS + spray of ethrel (Ethylene-39 %) 50 ppm (1.3 ml/10 liter water)



at 90 DAS for obtaining higher yield and net return. This is due to higher values of tap root length, number of monopodia and number of sympodia per plant and improved quality of seed i.e. ginning percentage, increase uniformity ratio, elongicity percentage and tenacity.

(Dry Farming Research Station, JAU, Targhadia)

Effect of plant growth regulators and detopping on morpho-physiological components of yield in cotton (*G. hirsutum* L.)

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton under irrigated condition are recommended for detopping the cotton plant at 75 DAS for balance growth to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increases in thickness of leaves, length and number of sympodia, plant spread and number of bolls.

(Cotton Research Station, J.A.U., Junagadh)

VI. FISHERIES SCIENCE

Study of density dependent growth and survival of *Macrobrachium rosenbergii* (scampi)

Fish farmers are recommended to stock freshwater prawn *Macrobrachium rosenbergii* (Scampi) seeds @ 20,000 per hectare in grow-out ponds for obtaining better growth, survival rate and economic returns.

(Inland Fisheries Research Station, JAU, Junagadh)

Aspects of biology and fishery of *Scylla serrata* and *Portunus pelagicus* in and around Sikka

Fishermen community engaged in Crab fishing are advised to avoid capture of berried female Crabs having orange, greenish, brownish or blackish eggs for sustainable Crab resource.

(Fisheries Research Station, JAU, Sikka)

RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY

I. CROP PRODUCTION

Weed management in pre-monsoon groundnut

The effective weed management along with higher yield and net return from pre-monsoon groundnut can be achieved by pre-plant incorporation of pendimethalin 38.7% CS @ 0.75 kg a.i./ha followed by interculturing and hand weeding at 40 DAS under South Saurashtra Agro-climatic Zone.

(Department of Agronomy, JAU, Junagadh)

Integrated weed management in *kharif* pearl millet

The application of atrazine @ 0.4 kg/ha as post emergence at two leaf stage of weed followed by one hand weeding at 35 days after sowing for effective weed management in *kharif* pearl millet was found as effective as pre-emergence application of atrazine @ 0.5 kg/ha followed by one hand weeding at 35 days after sowing under North Saurashtra Agro-climatic Zone.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Bio-efficacy of different herbicides for broad spectrum weed management in chickpea

The application of pendimethalin 30% EC 1.0 kg a.i./ha as a pre-emergence followed by hand weeding at 25-30 days after sowing gave higher yield with effective weed management in chickpea. However, pendimethalin 38.7% CS 1.0 kg a.i./ha as a pre-emergence followed by hoeing at 30-35 days after sowing found economical under South Saurashtra Agro-climatic Zone.

(Pulses Research Station, JAU, Junagadh)

Soil test based fertilizer recommendation for targeted yield of pigeon pea crop

The nutrient requirements for production of one quintal pigeon pea seed was assessed as 6.09, 1.98 and 1.78 kg; N, P₂O₅ and K₂O, respectively. The fertilizer prescription equation are as: for N (FN: 5.46 T - 0.25 SN - 0.16 FYM), P (FP₂O₅: 4.11 T - 1.34 SP - 0.15 FYM) and K (FK₂O: 11.93 T - 0.51 SK - 0.45 FYM) with FYM. Targeted yield concept could be effectively adopted to bring in site specificity in fertilizer use and achieve high yields of pigeonpea in the medium black calcareous soils of Saurashtra region of Gujarat.

(Department of Agril. Chem. & Soil Sci., & Pulses Research Station, JAU, Junagadh)

Establishment of critical limit of sulphur for Bt cotton in medium black calcareous soils

The critical limit for sulphur application to Bt cotton crop grown on calcareous soils of Saurashtra, was found as 15 ppm in soil and 0.475 per cent in cotton plant at 60 DAS.

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

II. PLANT PROTECTION

AGRICULTURAL ENTOMOLOGY

Field efficacy of newer insecticides against sucking pests of cumin

Spray of imidacloprid 17.8 SL 0.004% (2.24 ml/10 lit water) or spinosad 45% SC 0.009% (2.0 ml/10 lit water) or acetamiprid



20% SP 0.004% (2.0 g/10 lit water) at the appearance of pests was found effective and economical for control of aphids and thrips in cumin.

Residue was not detected in cumin at harvest of imidacloprid 17.8 SL 0.004% or spinosad 45% SC 0.009% or acetamiprid 20% SP 0.004%.

(Department of Entomology, JAU, Junagadh)

Management of sucking pests through seed treatments in cluster bean

Seed treatment with imidacloprid 600 FS @ 10 ml/kg seed or thiamethoxam 30 FS @ 10 ml/kg seed found effective and economical for control of whitefly of cluster bean var. Pusa Navbahar.

(Department of Entomology, JAU, Junagadh)

Field efficacy of newer insecticides against inflorescence pests of mango

For effective management of inflorescence pests of mango viz., hopper, thrips and flower bug, two sprays of spinosad 45 % SC 0.018% (4 ml/10 lit water) or carbosulfan 25 % EC 0.05% (20 ml/10 lit water) or acetamiprid 20 % SP 0.01% (5 g/10 lit water) at 15 days interval starting from pests infestation were found effective.

(Department of Entomology, JAU, Junagadh)

Survey of various pests in mango orchard

The incidence of leaf gall midge, mango hopper, shoot borer and thrips were found enormously during the month of September to October, January to March, July to September and August to December, respectively.

Maximum population of leaf gall midge and mango hopper was noticed in Chalala and Mendarda area, while shoot borer and thrips were found maximum in Talala area of Saurashtra region.

(Department of Entomology, JAU, Junagadh)



PLANT PATHOLOGY

Management of alternaria leaf blight of groundnut

Three sprays of difenconazole 25EC 0.025% (10 ml/10 lit of water) at 35, 50 and 65 days after sowing was found effective and economical for management of alternaria leaf blight of groundnut grown in summer season.

(Main Oilseeds Research Station, JAU, Junagadh)

Integrated management for wilt disease of chickpea

Seed treatment of *Trichoderma harzianum* 1% WP @ 4 g/ kg of seed or carboxin 37.5 + thiram 37.5 DS (Ready mix Vitavex powder) @ 2 g/kg seed along with soil application of *T. harzianum* 1% WP



@ 4.0 kg/ha at the time of sowing in furrow was found effective against chickpea wilt under irrigated condition.

(Pulse Research Station, JAU, Junagadh)

Management of foliar and fruit spot diseases in bottle gourd

Four sprays of difenconazole 25 EC 0.025 % (10 ml/10 lit of water) or hexaconazole 5 EC 0.005 % (10 ml/10 lit of water) at 10 days interval after appearance of the disease was found effective and economical for management of foliar and fruit spot diseases of bottle gourd grown in kharif season.

(Vegetable Research Station, JAU, Junagadh)

III. AGRICULTURAL ENGINEERING

Response of groundnut to supplemental irrigation

The farmers of North Saurashtra Agro-climatic Zone growing

groundnut GG-20 are advised to apply supplemental irrigation at soil moisture deficit of about 40 per cent (about 20% soil moisture content) for obtaining higher productivity, maximum net returns and improving crop and field water use efficiency under dry farming conditions.



(Main Dry Farming Research Station, JAU, Targhadia)

Performance of MIS in canal command area

Irrigation planners are advised to use either the regression formula or ANN approach for determining seasonal runoff from the seasonal rainfall for Uben command area:

$$Y = 0.010X^{1.118}, R^2 = 0.754 \dots \dots \dots \text{ and}$$

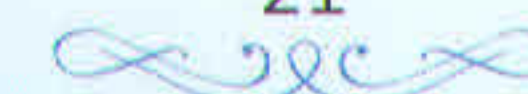
ANN model architecture 1 - 6 - 1 with $R^2 = 0.82, \eta_{\text{model}} = 80\%$

- Irrigation planners are advised to adopt the following optimal cropping pattern under surface irrigation system for Uben command area:

Under surface irrigation system, 250 ha groundnut and 2250 ha green gram during the *kharif* season and 50 ha wheat and 1529 ha onion during the *rabi* season can be irrigated to get maximum return with cropping intensity of 163.15.

- Irrigation planners are advised to adopt the following optimal cropping pattern under drip irrigation system for Uben command area:

Under drip irrigation system, 2475 ha groundnut and 25 ha green gram during the *kharif* season and 50 ha wheat and 1992



ha onion during the *rabi* season i.e. an additional 463 ha area can be brought under irrigation in *rabi* season by constructing 315 intermediate storage structures having 260 m³ capacity each to serve one chuck (8 ha area).

Type of Irrigation system in Command Area	Season	Crop	Crop Area (ha)	Cropping Intensity (%)	Remark
Surface	Kharif	Groundnut	250	163.15	
		Green gram	2250		
	Rabi	wheat	50		
		Onion	1529		
Pressurized	Kharif	Groundnut	2475	181.68	315 intermediate storage structures having 260 m ³ capacity (9m x 9m x 3.2m) each to serve a chuck of 8 ha area will bring additional area of 462 ha in <i>rabi</i> season under irrigation.
		Green gram	25		
	Rabi	Wheat	50		
		Onion	1992		

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

Online HRD Programme

It is recommended to staff members of JAU to use the online HRD programme developed by Junagadh Agricultural University to obtain the permission from concerned authority for participating or attending the programmes as per statute 121 Item No. 28.

(Department of processing & Food Engg., College of Agril. Engg. & Tech., JAU, Junagadh)

Assessment of microbial floral strength during post-harvest handling of mango, custard apple and lemon

The presence of harmful fungus and bacteria during transportation stage was observed maximum amongst all stages of post-harvest handling in mango, custard apple and lime fruits and found increasing in subsequent stages. Therefore, farmers and



traders are recommended to take control measures to check microbial growth prior to transportation.

(Department of processing & Food Engg., College of Agril. Engg. & Tech., JAU, Junagadh)

IV. BASIC SCIENCE

Effect of date of sowing and pre-treatment of seeds with GA₃ on seed germination and seedling vigour of cumin (*Cuminum cyminum* L.)

It is informed to the scientific community that sowing of cumin seed in the third week of November along with pre-soaking treatment of 50 mg/lit gibberellic acid (GA₃) for 12 hrs to cumin seed at ambient temperature increases germination with enhanced seedling vigour in cumin.

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

The study of fresh seed dormancy in sesame

It is informed to scientific community that the fresh seed dormancy of sesame variety G Til-10 is broken after storage for a month (30 days) after harvest followed by drying, this increases the seed germination percentage and seedling vigour.

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

Effect of plant growth regulators and detopping on morpho-physiological components of yield in cotton (*G. hirsutum* L.)

The scientific community is informed for detopping the cotton plant at 75 DAS with foliar spray of growth inhibitor maleic hydrazide (MH)* 30 ppm (0.3g/10 lit. water) at 90 DAS for balance growth to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increases in thickness of leaves, length, no. of sympodia, plant spread and no. of bolls.

*Use of MH is banned by Government of India.

(Cotton Research Station, JAU, Junagadh)



The effect of storage conditions, packing materials and seed treatments on viability and seedling vigour of onion (*Allium cepa* L.) seeds

It is informed to scientific community that onion seed may be stored in cold storage ($7^{\circ}\text{C} + 2^{\circ}\text{C}$) condition packed with cloth bag or polythelene bag (500 gauge) with seed treatment (Carbendazim 2g/kg seed or mancozeb 2g/kg seed or thirum 3g/kg seed or neem leaf powder 10g/kg seed) or without seed treatment for a period of two years without deterioration in germination and seedling vigour.

(Department of Seed Science and Technology, JAU, Junagadh)

Seed viability in soybean (*Glycine max* (L.) Merr.) under different storage conditions and seed treatments

It is informed to scientific community that soybean seed may be stored under cold storage ($7^{\circ}\text{C} + 2^{\circ}\text{C}$) condition in cloth bag with seed treatment of mancozeb 2g/kg seed or carbendazim 2g/kg seed or neem leaf powder 10 g/kg seed for a period of two years without deterioration in germination and seedling vigour.

(Department of Seed Science and Technology, JAU, Junagadh)

Qualitative and quantitative evaluation of seed vigour and viability by Tetrazolium test in pearl millet [*Pennisetum glaucum* (L.) R. Br.]

It is informed to scientific community that pearl millet seed may be stored in air tight plastic containers for a period of 16 months without deterioration in germination seedling vigour.

(Department of Seed Science and Technology, JAU, Junagadh)

Performance of neem products on the storability of mungbean [*Vigna radiata* (L.) Wilczek]

It is informed to scientific community that mungbean seed may be stored in normal condition packed in HDPE bags (500 gauge) with seed treatment of cloth bag or polythelene bag (500 gauge) with seed treatment (Neem seed kernel powder 5 to 10 g/kg seed or Neem cake 5–10 g/kg seed) for a period of two years



without deterioration in germination and seedling vigour.

(Department of Seed Science and Technology, JAU, Junagadh)

IV. ANIMAL HEALTH & ANIMAL PRODUCTION

Preliminary evaluation of antibacterial activity of extracts of *Cassia auriculata*, *Prosopis juliflora* and *Annona squamosa*

Alkaloid rich fractions of *Prosopis juliflora* leaves can be a good drug entity against resistant bacteria due to its antibacterial property against various bacteria including methicillin-resistant *Staphylococcus aureus*.

(Department of Veterinary Pharmacology & Toxicology, Veterinary College, JAU, Junagadh)

Survey on indigenous plants use for medicinal purpose in animals in Junagadh region

Farmers of Junagadh, Mendarda and Vanthali taluka are commonly using *Adansonia digitata* (Gorakh ambli) for gastric problems, *Elephantopus scaber* (Ghaa Jadvu) and *Clerodendrum phlomidis* (Arni) for wound healing, *Psoralea corylifolia* (Baauchi) for skin infection, *Enicostemma littorale* (Mamejvo) for internal parasites and *Tecomella undulata* (Ragat rohido) for fracture healing in animals.

(Department of Veterinary Pharmacology & Toxicology, Veterinary College, JAU, Junagadh)

Assessment of blood cells' immunocompetence around parturition in Gir cows and Jaffarabadi buffaloes

During peripartum period phagocytic activity and lymphocyte proliferation responses are lower in Gir cows as compared to Jaffarabadi buffaloes.

(Department of Veterinary Physiology & Biochemistry, Veterinary College, JAU, Junagadh)

Haemato-biochemical profiles of horses in and around Junagadh

In Kathiawari horses, total granulocyte per cent and MCHC



(g/dl) are higher in females and lymphocyte per cent higher in males.

(Department of Veterinary Physiology & Biochemistry, Veterinary College, JAU, Junagadh)

Diagnosis of *Babesia bigemina* and *Trypanosoma evansi* in bovines in and around junagadh: traditional vs molecular detection and assessment of risk factors

In cattle and buffaloes PCR is the most effective technique in diagnosis of subclinical and latent infections of *Babesia* spp. (Sensitivity, 100%; Specificity, 82.90%) and *Trypanosme* spp. (Sensitivity, 100%; Specificity, 95.92%).

(Prof. & Head, Department of Veterinary Parasitology, Veterinary College, JAU, Junagadh)

Study of parasitic infections/infestations in animals presented at TVCC, Junagadh

The major parasites recorded in domesticated animals in and around Junagadh are as below:

Name of Parasite	Animal species
<i>Buxtonella sulcata</i> , <i>Eimeria</i> spp., <i>Fasciola gigantica</i> , <i>Aamphistomes</i> , <i>Babesia</i> spp.	Cattle, Buffaloes
<i>Eimeria</i> spp.	Goat, Bird
Strongyle, <i>Babesia</i> spp.	Horse
Hook Worm, <i>Babesia</i> spp., Demodex	Dog
<i>Trypanosoma evansi</i>	Camel

(Department of Veterinary Parasitology, Veterinary College, JAU, Junagadh)

Effect of replacement of graded levels of maize with raw and detoxified mango seed kernel (*Mangifera indica*) in conventional concentrate mixture on *in vitro* rumen fermentation pattern

Total phenol content in raw mango seed kernels is reduced by 60.00 per cent and 70.40 per cent by boiling in water and treatment with 1.00 per cent calcium hydroxide, respectively. Based on *in vitro* studies, treated mango seed kernel can replace 100 per cent maize in ISI grade-II concentrate mixture for cattle.

(Department of Animal Nutrition, Veterinary College, JAU, Junagadh)

Aetio-Pathological studies on broiler mortality in and around Junagadh

E. coli infection is the major cause (31.21 per cent) of mortality in broilers of 16-30 days (22.55 per cent) during winter (22.40 per cent) in and around Junagadh.

(Department of Veterinary Pathology, Veterinary College, JAU, Junagadh)

Study on postnatal development of adrenal gland in gohilwadi goat (*Capra hircus*)

Adrenal gland of day old Gohilwadi kid has definite foetal cortex and medulla, while adult adrenal exhibits the structures of typical zones of cortex and medulla. Width of definite cortex increases, while that of foetal zone decreases with increasing age.

(Department of Veterinary Anatomy, Veterinary College, JAU, Junagadh)

V. FISHERIES SCIENCE

Impact of insectivorous birds on fish drying grounds at Veraval

Fishes dried on open grounds during the fishing season are infested with maggots and adults of technids fly attracting of several insectivorous birds especially cattle egret, which play an important role in the natural control of the infested pests.

(Fisheries Resource Management, College of Fisheries, JAU, Veraval)

Study of seaweed diversity at selected intertidal areas of Saurashtra and Diu (UT)

In the coastal belt of Saurashtra and Diu, 117 seaweed species are available (Intertidal and drifted), of which 38 Chlorophyceae, 34 Phaeophyceae and 45 species of Rhodophyceae are found during September to April. The economically important species from Chlorophyceae group are 14, Phaeophyceae group 07 and Rhodophyceae group 15.

(Fisheries Research Station, JAU, Okha)

VI. SOCIAL SCIENCE

An economic analysis of groundnut productivity differentials in Saurashtra region of Gujarat

Increase in the frequency of contact of extension functionaries with farmers throughout the crop season for crop specific information would reduce the productivity differences in groundnut crop. Increase in provision of incentives is needed for mechanization, micro irrigation system and to develop the assured irrigation sources to boost up the productivity. The availability of institutional credit should increase adequately to adjust the prevailing inflation level to enhance the productivity level.

(Department of Agricultural Economics, JAU, Junagadh)

Effective number of replications for field experiment on wheat crop in Saurashtra (*Triticum aestivum* L.)

For effective control of soil variation, an experiment plot having 12 basic units each of 0.90 m² with size 4.0 m x 2.7 m (4 x 3 units) were found optimum with minimum two replications are recommended for scientific community to conduct field experiment on wheat crop at Junagadh.

(Department of Agril. Statistics, JAU, Junagadh)

Production of Nucleus / Breeder seeds during year 2015-16

Sr. No.	Crop	Variety	Nucleus Seed (q)	Breeder Seed (q)		Total(q)
				National	State	
1	Groundnut	GG-2	-	-	106.75	106.55
		GG-5	0.30	-	24.60	24.90
		GG-7	1.80	-	15.00	16.80
		GG-8	0.60	15.60	-	16.20
		GJG-9	1.90	25.80	54.90	82.60
		GJG-31	-	25.50	14.40	39.90
		GG-20	8.00	-	1487.15	1495.15
		GG-21	-	19.50	-	19.50
		GJG-22	2.60	-	152.46	155.06
		GJGHPS-1	0.30	-	20.70	21.00
		GG-11	0.60	-	43.20	43.80
		GG-16	2.80	4.80	-	7.60
		GJG-17	0.60	-	44.25	44.85
		GAUG-10	-	-	26.10	26.10
		Sub Total	19.50	91.20	1989.31	2100.01
2	Pearl millet	Hybrid seeds	-	-	7.70	7.70
		Parent seeds	-	-	0.99	0.99
		Sub Total	-	-	8.69	8.69
3	Sesame	G.Til-1	0.10	0.10	1.40	1.60
		G.Til-2	0.45	0.70	3.32	4.47
		G.Til-3	0.15	1.00	8.24	9.39
		G.Til-4	0.07	0.42	2.58	3.07
		G.Til-10	0.20	5.00	4.40	9.60
		Purva	0.02	-	0.35	0.37
		Sub Total	0.99	7.22	20.29	28.50
4	Chickpea	GG 1	1.25	16.50	14.00	31.75
		GG 2	4.13	8.00	12.53	24.66
		GJG 3	2.72	26.00	32.75	61.47
		GG 4	3.35	32.77	-	36.12
		Sub Total	11.45	83.27	59.28	154.00
5	Wheat	GW 366	13.50	129.40	13.00	155.90
		LOK-1	-	-	78.00	78.00
		GW-496	-	-	36.40	36.40
		Sub Total	13.50	129.40	127.40	270.30
		Grand Total	45.44	311.09	2204.97	2561.50

Production of nucleus/breeder/truthful seeds, planting materials, bio-agent and bio-fertilizer (SAWAJ BRAND)

SN	Name of Product	2015-16
1	Nucleus/Breeder Seed (q)	2561
2	Truthful Seeds (q)	4665
3	Fruit crop grafts (Nos.)	8374
4	Fruit crop sapling (Nos.)	19407
5	Seedlings (Nos.)	61005
6	Ornamentals & Medicinal plants (Nos.)	31841
7	<i>Trichoderma</i> (kg)	58262
8	<i>Rhizobium</i> (Bottle-500 ml)	2520
9	<i>Azotobacter</i> (Bottle-500 ml)	2857
10	PSB (Bottle-500 ml)	4552
11	<i>Beauveria</i> (kg)	37110
12	HNPV(Bottle-250 ml)	173
14	SNPV(Bottle-250 ml)	158
15	Trichocard (Nos.)	1802
16	Fruit fly traps (Nos.)	1913
17	Fruit fly lure (Nos.)	2632



Sawaj Azotobacter



Sawaj PSB

Products of Junagadh Agricultural University



SAWAJ Rhizobium



SAWAJ Kesar Mango Pulp



Seaweed



SAWAJ Beauveria



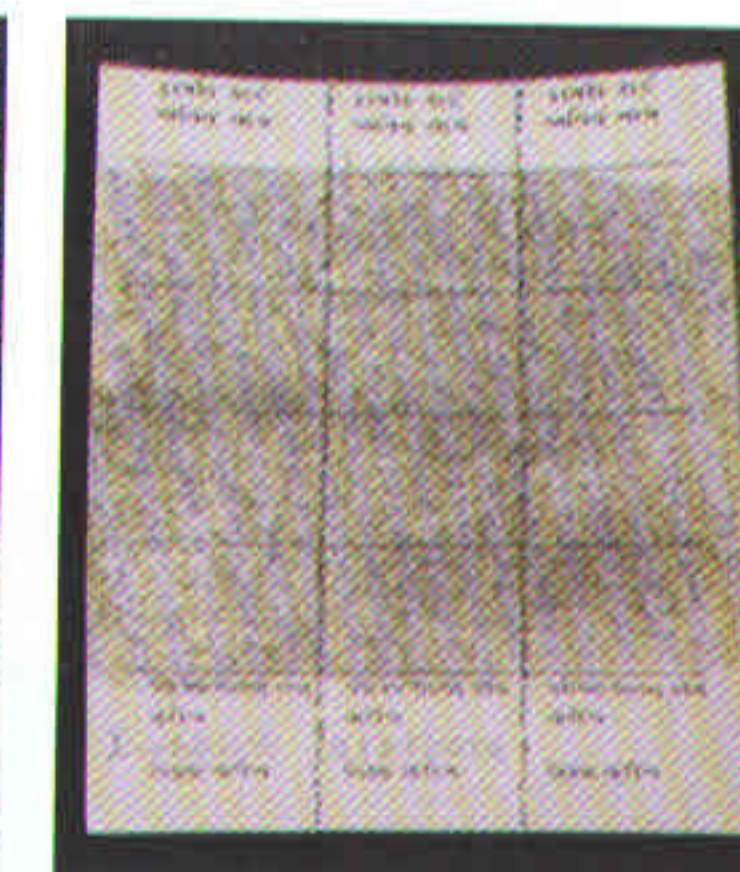
SAWAJ H-NPV & S-NPV



SAWAJ Trichoderma



Pheromone Trap



Trichocard



Fruit Fly Trap & Lure



Peer Review Team appointed by ICAR, New Delhi visited Junagadh Agricultural University, Junagadh for accreditation during January 03-06, 2016



Visit of Dr. Trilochan Mohapatra, Secretary (DARE) & Director General, ICAR, New Delhi to Junagadh Agricultural University on 4th September, 2016

