JUNAGADH AGRICULTURAL UNIVERSITY, JUNAGADH

RESEARCH RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY

II. CROP PRODUCTION

Thirty eight scientific recommendations developed by crop production disciplines are described herein.

Nutrient Management

Year: 2007-08

Soil test based fertilizer application for targeted yields of castor crop

The Soil Testing Laboratories of the state are recommended to adopt following equations for achieving targeted yield (25 q/ha) of castor.

N: FN = 6.13 x T - 0.23 SN,

P: FP_2O_5 = 3.35 x T - 0.77 SP,

K: FK_2O = 3.38 x T - 0.11 SK

Where,

T = Targeted yield in quintal/ha

S = Soil test value of respective elements

F = Fertilizer

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

Year: 2008-09

Establishment of critical limit of zinc in cotton in medium black calcareous soils

The critical limit of DTPA extractable Zn content in soil is worked out to be 0.89 ppm. The critical Zn content in 4th developed leaf of cotton at 30 DAS is worked out to be 57.50 ppm.

(*Department of Agril. Chem. & Soil Science, CoA, JAU, Junagadh)*

Year: 2009-2010

Establishment of critical limit of phosphorus for black gram grown on medium black calcareous soils

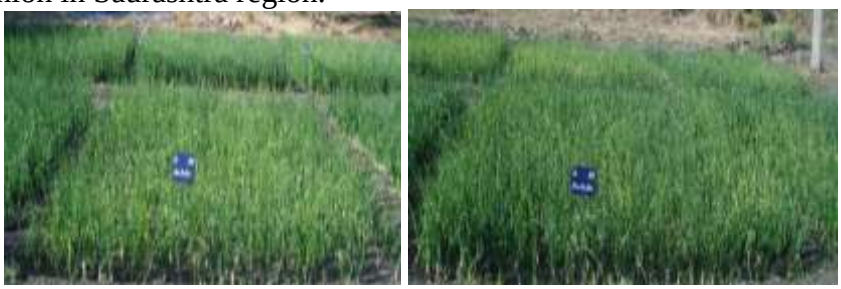
The critical limit of available P_2O_5 (Olsen's method) is 24 kg P_2O_5 ha^{-1} in medium black calcareous soils and that for P content in leaves (3rd leaf) of black gram at 30 DAS is 0.471 per cent.

(*Department of Agril. Chem. & Soil Science, CoA, JAU, Junagadh*)

Year: 2010-2011

Soil test based fertilizer recommendation for targeted yields of onion crop

The fertilizer prescription equations of N (FN=0.84 x T–0.45 SN), P (FP_2O_5 = 0.72 x T–2.21 SP) and K (FK_2O = 0.43 x T–0.17 SK) is fit up to yield target of 225 q/ha in onion. The yield targeting approach is also found effective in economic return and soil fertility build up for cultivation of onion in Saurashtra region.



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

Soil test based fertilizer recommendation for targeted yields of garlic crop

The fertilizer prescription equations of N (FN= 3.73 x T–0.52 SN), P (FP_2O_5 = 2.10 x T–2.36 SP) and K (FK_2O = 2.90 x T–0.45 SK) is fit up to yield target of 70 q/ha in garlic. The yield targeting approach is also found effective in economic return and soil fertility built up for cultivation of garlic in Saurashtra region.

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

Establishment of critical limit of potassium for cotton (G. Cot. Hy-10) in medium black calcareous soils

The critical limit for cotton variety G. Cot. Hy-10, available K_2O (ammonium acetate-K) for cotton was obtained 152.0 kg K_2O/ha in medium black calcareous soil, while the critical value of K content in plant was observed 1.72 per cent at 30 DAS.

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

Potassium supplying power of soils of Rajkot district

- The soils of Rajkot district were neutral to moderately alkaline reaction, non calcareous to highly calcareous, low to medium in organic carbon content. The 33.6, 1.8, 32.1, 20.7, 36.4 and 3.9 per cent soils were found low in availability of P, K, S, Fe, Zn and Mn, respectively.
- The maximum and minimum values of various potassium fractions were recorded in soils of Malia-Miyana and Paddhari Taluka, respectively.
- The higher and lower values of various potassium fractions were recorded with cotton-cotton and cotton-*rabi* crops sequences, respectively.
- Availability of K and values of different K fractions were increased with increase in soil depth.
- The different K fractions and availability of K were lower in irrigated conditions as compared to un-irrigated conditions.

(*Main Dry Farming Res. Station, JAU, Targhadia*)

Year: 2013-14

Status of sulphur fractions in medium black soils of Rajkot district (Gujarat)

- In general, minimum and maximum values of various sulphur fractions were recorded in soils of Tankara and Upleta, respectively.
- The higher and lower values of various sulphur fractions were recorded with groundnut-groundnut mono sequence and cotton/groundnut-*rabi* crops sequences, respectively.
- The values of all the sulphur fractions were recorded higher with medium deep soil (>60 cm) in comparison to shallow soil (<60 cm).
- The higher and lower values of various fractions of sulphur were recorded with irrigated and unirrigated conditions, respectively.
- Value of organic sulphur was lower with irrigation applied through bore well in comparison to open or canal/river sources.
- District as whole 32.1 per cent soils fall under deficient category, while 44.6 per cent in medium and only 23.2 soils are in high range.

(*Main Dry Farming Research Station, JAU, Targhadia*)

Establishment of critical limit of sulphur under onion crop in medium black calcareous soils

For recommending sulphur application to onion crop grown on calcareous soils of Saurashtra, Soil Testing Labs (STLs) of Gujarat should consider critical limit of 10 ppm S in soil and 0.56 per cent in onion plant at 60 DAS.

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

Establishment of critical limit of sulphur for garlic crop in medium black calcareous soils

For recommending sulphur application to garlic crop grown on calcareous soils of Saurashtra, Soil Testing Labs (STLs) of Gujarat should consider critical limit of 10 ppm S in soil and 0.45 per cent in garlic plant at 60 DAS.

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

Soil test based fertilizer application for targeted yields of Bt. cotton in Saurashtra region of Gujarat

The Soil Testing Labs (STLs) of Gujarat are advised to use following equation for achieving targeted yield (up to 30 q/ha) of Bt cotton grown in Saurashtra region.

$FN = 20.80 \times T - 1.55\ SN$

$FK_2O = 18.97 \times T - 1.47\ SK$

Where; FN = Fertilizer N to be applied (kg/ha)
SN = Available soil N (kg/ha)
T = Targeted yield (q/ha)
FK_2O = Fertilizer K_2O to be applied (kg/ha)
SK = Available soil K_2O (kg/ha)

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

Year: 2014-15

Study of uptake pattern of phosphorus in different varieties of castor

In castor crop, phosphorus uptake was 47.6, 33.1 and 19.3 per cent by leaf, stalk and root at branching stage, while at flowering stage 23.8, 13.3, 5.3 and 57.6 per cent and at capsule formation stage 13.7, 16.9, 3.4 and 66.0 per cent by leaf, stalk, root and spike, respectively. Among the different stages of plant growth, the maximum phosphorus uptake was obtained at capsule formation stage (370 mg/plant) followed by flowering stage (118 mg/plant) and branching stage (29 mg/plant). Among the different varieties, maximum phosphorus uptake by crop was observed with GCH-7 at all the growth stages.

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

Year: 2015-16

Soil test based fertilizer recommendation for targeted yield of pigeonpea crop

The nutrient requirements for production of one quintal pigeonpea seed was assessed as 6.09, 1.98 and 1.78 kg; N, P_2O_5 and K_2O, respectively. The fertilizer prescription equation are as: for N (FN: 5.46 T - 0.25 SN - 0.16 FYM), P (FP_2O_5:4.11 T - 1.34 SP - 0.15 FYM) and K (FK_2O: 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., CoA, JAU, Junagadh)

Year: 2016-17

Establishment of critical limit of sulphur for pigeon pea crop in medium black calcareous soils

The critical limit for S application to pigeon pea crop grown on calcareous soils of Saurashtra has been fixed. The limit is noticed as 12.5 ppm (Heat soluble S) in soil and 0.455 per cent in pigeon pea plant at 60 DAS.

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

Cultural Practices

Year: 2007-08

Crop-weather relationship of *kharif* groundnut

Based on the results of crop-weather relationship study, the farmers of South Saurashtra Agro-climatic Zone are advised to sow the spreading and semi-spreading varieties of groundnut from 21st May to 10th June with one or two pre-monsoon irrigations to harness benefits of favorable weather conditions during the monsoon period and to obtain higher yields.

(*Department of Agronomy, CoA, JAU, Junagadh*)

Year: 2009-10

Determination of thermal requirement for different *kharif* crops under rainfed condition

Based on the field experiment, it was concluded that with delay in onset of monsoon, the Growing Degree Days (GDD) and Heat Use Efficiency (HUE) of different crops were tended to decline. The phenophase wise GDD is given herein.

Sr. No.	Particular	Short duration crops								
		Sesame			Pearl millet			Black gram		
		I	II	III	I	II	III	I	II	III
	Yield (kg/ha)	747	547	158	1980	1709	539	667	384	94
	HUE	0.40	0.34	0.10	1.20	1.18	0.38	0.41	0.24	0.07
	Phenophase	Growing Degree Days (GDD)								
1.	Germination	105	125	118	105	132	124	76	94	87
2.	Branching	752	583	558	644	551	569	455	421	355
3.	Flowering	722	377	361	407	298	293	347	318	247
4.	Capsule/pod/ear head formation	370	312	311	327	300	261	525	544	414
5.	Maturity	212	221	172	158	170	128	306	258	254
	Total	**1862**	**1619**	**1517**	**1641**	**1452**	**1375**	**1708**	**1635**	**1356**

Sr. No.	Particular	Long duration crops								
		Cotton			Castor			Spreading G'nut		
		I	II	III	I	II	III	I	II	III
	Yield (kg/ha)	531	357	96	1597	1350	467	665	443	36
	HUE	0.17	0.13	0.04	0.51	0.49	0.19	0.29	0.22	0.02
	Phenophase	Growing Degree Days (GDD)								
1.	Germination	115	113	123	153	133	123	153	153	123

2.	Branching	808	715	679	876	768	639	700	647	463
3.	Flowering	1093	1009	749	1156	1051	821	443	422	326
4.	Capsule/pod/ boll formation	722	620	417	545	486	308	593	495	401
5.	Maturity	384	336	257	365	257	277	436	451	402
	Total	**3120**	**2792**	**2224**	**3092**	**2694**	**2167**	**2325**	**2066**	**1715**

Where, I Onset of monsoon, II 15 days after onset of monsoon, III 30 days after onset of monsoon

(*Main Dry Farming Res. Stat., JAU, Targhadia and Dept. of Agronomy, CoA, JAU, Junagadh*)

Relative salt tolerance of different groundnut (*Arachis hypogaea* L.) genotypes in simulated saline soils

Based on the biomass yield and Na/K ratio in haulm of spreading type GG 13, semi-spreading type GG 20 and bunch type J 33533 varieties of groundnut were found tolerant to salinity (ECe 2 dS/m). Whereas, GG 20 (semi-spreading) and J 33533 (bunch) were found more tolerant to higher salinity (ECe 4 dS/m) than other varieties.

(*Department of Agril. Chem. & Soil Science, CoA, JAU, Junagadh*)

Year: 2010-11

Relative salt tolerance of different wheat genotypes in simulated saline soil condition

The wheat varieties GW-322 and KRL-119 were found tolerant to salinity up to ECe 4 dS/m.

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

Year: 2013-14

Relative salinity tolerance of different wheat genotypes

The relative salt tolerant of wheat varieties was found in order of GW 322 > GW 366 > Lok 1 > GW 273 > GW 496 up to EC 4.0 dS/m of irrigation water.

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

Year: 2016-17

Yield maximization in medium duration pigeon pea crop

It is for the knowledge of the scientific community that grow pigeon pea by adopting full package of practices [INM (FYM 5 t/ha + RDF (N:P:S:Zn : 25:50:20:15 kg/ha + IWM (Pendimethalin 30% EC @ 0.75 kg a.i./ha at 3 DAS + Imazethapyr @ 100 g a.i./ha at 10-15 DAE of weeds + 1 HW at 50 DAS) + IPM (Indoxacarb 15.8% EC at flowering @ 375 ml/ha + Chloramiliprole 18.5 SC at 15 days after 1st spray @ 100 ml/ha)]. Among the production factors, maximum contribution was shown by INM (54.75 %) followed by IWM (43.83 %) and IPM (35.74 %).

(Pulses Research Station, JAU, Junagadh)

Effect of saline irrigation water on onion (*Allium cepa*) crop

It is for the information of scientific community especially for plant breeder that onion variety Talaja Red recorded value of different salt tolerance criteria like higher mean salinity index (53.8), higher mean bulb yield (109 g) minimum yield decline in high salinity level at EC 6.80 dSm^{-1} for 50 %, minimum yield reduction (59.3 %) at 8.0 dSm^{-1} as well as lower Na/K ratio in straw. Onion variety Talaja red is found more salt tolerant compared to GWO-1, Pilipatti and Agri Found Light Red on the basis of salinity indices.

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

Irrigation Management

Year: 2006-07

Economics and yield potential of summer groundnut under different irrigation methods

The results of three years study revealed that the pod yield recorded with porous pipe irrigation system was as good as that obtained with drip or sprinkler method of irrigation.

(*Department of Agronomy, CoA, JAU, Junagadh*)

Study on evapotranspiration and crop coefficient during different phenophases of sorghum and green gram (Alternate year)

Mean Kc values during different phenophases of *kharif* sorghum and green gram.

Sorghum			**Green gram**		
Phenophases	***Period(days)***	***Kc***	***Phenophases***	***Period(days)***	***Kc***
Germination	03	0.69	Germination	03	0.55
Vegetative	50	0.82	Vegetative	39	1.24
Booting	12	0.86		-	-
Flowering	11	0.72	Flowering	11	1.30
Milky	08	0.51	Pod development	13	1.00
Maturity	07	0.44	Maturity	17	0.72
Total	91	4.04	Total	83	4.81

(*Main Dry Farming Research Station, JAU, Targhadia*)

Year: 2008-09

Feasibility of micro irrigation and organic manures in okra

In South Saurashtra Agro-climatic Zone, summer okra (Gujarat Okra-2) irrigated by drip system at 1.0 PEF gives 11 per cent net higher return. Moreover, application of recommended dose of fertilizer (100:50:50 NPK kg/ha) and FYM @ 10 t/ha further increases yield by 26 per cent and net realization to the extent of 100 per cent.

The system details are:

1. Lateral spacing=60cm
2. Dripper spacing=60cm
3. Dripper discharge=4 lph
4. Operating time = 1 hour and 45 minutes at alternate day
5. Operating pressure = 1.2 kg/cm^2

(*Department of Agronomy, CoA, JAU, Junagadh*)

Weed Management

Year: 2014-15

Weed management in garlic

The scientific community is informed that application of oxyfluorfen 240 g/ha as pre-emergence followed by hand weeding at 40 days after sowing (DAS) or application of oxadiargyl 90 g/ha as pre-emergence followed by hand weeding at 40 DAS gave higher yield and net realization as well as effective weed management.

(*Department of Agronomy, CoA, JAU, Junagadh*)

Weed management in cumin

The scientific community is informed that application of pendimethalin 900 g/ha as pre-emergence followed by hand weeding at 45 days after sowing (DAS) gave higher yield and net realization as well as effective weed management.

(*Department of Agronomy, CoA, JAU, Junagadh*)

Year: 2015-16

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, CoA, 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* pearlmillet 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)

Year: 2016-17

Weed management practices in spring planted sugarcane–based intercropping system

It is for the knowledge of the scientific community that application of pendimethalin @ 0.90 kg/ha as pre-emergence followed by hand weeding at 30 days after sowing of sesame or green gram or black gram as intercrop in sugarcane planted at 90 cm row spacing gives higher yield and net return as well as it gives effective weed management.

(Main Sugarcane Research Station, JAU, Kodinar)

Year: 2017-18

Integrated weed management in okra

Under South Saurashtra Agro-climatic Zone, effective weed management along with higher yield and net return in *kharif* okra can be achieved by pre-emergence application of pendimethalin 900 g/ha followed by hand weeding at 40 DAS.

(Department of Agronomy, CoA, JAU, Junagadh)

Weed management in *kharif* groundnut

Under South Saurashtra Agro-climatic Zone, effective weed management along with higher yield and net return in *kharif* groundnut can be achieved by application of pre-mix pendimethalin + imazethapyr 800 g/ha as pre-emergence *fb* HW and IC at 40 DAS or tank-mix pendimethalin 450 g/ha + oxyfluorfen 120 g/ha as pre-emergence *fb* HW and IC at 40 DAS.

(Department of Agronomy, CoA, JAU, Junagadh)

Integrated weed management in *rabi* fennel

Under South Saurashtra Agro-climatic Zone, effective weed management along with higher yield and net return in *rabi* direct seeded fennel can be achieved by pre-emergence application of pendimethalin 30 EC 900 g/ha followed by interculturing and hand weeding at 40 DAS.

(Department of Agronomy, CoA, JAU, Junagadh)

Soil test based fertilizers application for targeted yield of summer groundnut in Saurashtra region of Gujarat

The nutrients requirement for production of one quintal summer groundnut pod was estimated as 4.90, 0.90 and 1.73 kg; N, P_2O_5 and K_2O, respectively. The fertilizer prescription equations are as: for FN (4.14 T - 0.37 SN - 0.17 FYM), FP_2O_5 (3.04 T - 1.48 SP - 0.17 FYM) and FK_2O (6.53 T - 0.43 SK - 0.38 FYM) with FYM and for FN (5.10 T - 0.44 SN), FP_2O_5 (3.61 T - 1.70 SP) and FK_2O (7.70 T - 0.48 SK) without FYM. Targeted yield concept could be effectively adopted to bring in site specificity in fertilizer use and achieve high yields of summer groundnut in medium black calcareous soils of Saurashtra region of Gujarat.

(Dept. of Agril. Chem. & Soil Sci. CoA & Main Oilseed Research Station, JAU, Junagadh)

Establishment of critical limit of sulphur for soybean crop in medium black calcareous soils

For sulphur application to soybean grown on calcareous soils of Saurashtra, critical limit 11.0 ppm in soil and 0.31 per cent in soybean plant at 60 DAS could be considered.

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

Relative salinity tolerance of different castor varieties

It is the information for scientific community, especially for plant breeder that castor variety GCH-7 and GC-3 recorded different salt tolerance criteria *viz.*, higher mean salinity index (82.7 and 84.6), higher mean seed yield (275 and 260 g/plant), minimum yield decline (35.0 and 33.8 %) at 8.0 dSm^{-1} and 50 % yield reduction at EC 10.79 and 10.77 dSm^{-1}, respectively, as well as lower Na/K ratio in seed and stalk. Castor variety GCH-7 and GC-3 were found more salt tolerant as compared to GAUCH-1, GCH-2, GCH-4 and GCH-6 on the basis of salinity indices.

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

To study micronutrients and sulphur status in soils of Saurashtra region

The soils of Saurashra region were found in 'High' categories for available Mn and Cu, while it was 'Low' to 'Medium' status for S, Fe and Zn. Available Fe, Zn, and S were deficient and deficiency was observed in 18, 22 and 36 per cent soils of the Saurashra region.

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