

**RESEARCH ACCOMPLISHMENTS
AND
RECOMMENDATIONS**

2004 & 2005



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2004

CROP IMPROVEMENT

Cotton

GSHH-1877 (G.Cot.Hy-12)

It is an intra hirsutum, early maturing hybrid with 25.9, 15.9 and 24.0 % yield advantage, respectively over G.Cot.Hy-6, G.Cot.Hy-8 and G.Cot.Hy-10 under rainfed conditions. The hybrid possesses bigger boll size and better fiber quality parameters. The performance of the hybrid was found better under rainfed conditions and therefore, it was approved for the rainfed areas.

AGRONOMY AND SOIL SCIENCE

Cropping system

Oil palm

The farmers of South Gujarat Heavy Rainfall Zone growing oil palm (9 m x 9 m) are advised to take banana (1.5 m x 1.5 m) as intercrop to obtain higher profit. The second option can be turmeric (30 cm x 15 cm). Intercrops should be fertilized with recommended dose of respective crop. Intercropping can be followed for first three years in new oil palm plantation which helps to improve vegetative growth of oil palm.

Cultural practices

Indian bean

The farmers of South Gujarat Heavy Rainfall Zone AES-III growing Indian bean after *khari* paddy under irrigated condition are advised to cultivate G.Wal-1 at a spacing of 60 cm x 15 cm. The sowing should be done preferably up to first

November. First irrigation should be given at sowing time and second at flowering stage (75 DAS).

Nutrient management

Greengram (s) - rice (k)

The farmers of South Gujarat Heavy Rainfall Zone (AES-III) following summer greengram-*kharif* rice cropping system should fertilize their summer greengram crop with 20 kg P/ha with PSB culture @ 30 g/kg seeds and succeeding *kharif* rice crop should be fertilized with 75 per cent of the recommended dose (75.0 kg N + 16.4 kg P/ha) so as to obtain higher yield and economic return as well as to sustain the soil fertility in long run.

Sugarcane

(i) The farmers of South Gujarat Heavy Rainfall Zone AES-III planting sugarcane (Nov.-March) are advised to follow either green manuring practice with sunhemp two months prior to sugarcane planting or FYM @ 10 t/ha + Castor cake @ 0.5 t/ha besides the recommended dose of inorganic fertilizers for securing economical higher production of plant and ratoon sugarcane (CoN 91132) as well as to maintain soil fertility.

(ii) Sugarcane growers of South Gujarat Heavy Rainfall Zone, AES-III are advised to apply 250 kg N/ha to sugarcane crop in four splits *i.e.* 15 % at basal (at the time of planting), 30 % at 45 DAP, 20 % at 90 DAP and 35 % at 150 DAP (at final earthing up) to obtain quality produce of sugarcane CoLK 8001.

Pigeonpea

The farmers of South Gujarat Heavy Rainfall Zone (AES-III) growing pigeonpea during *kharif* season are advised to apply FYM @ 10 t/ha or Gypsum 3 t/ha and to sow their crop on raised bed (providing 30 cm deep and 25 cm wide furrow after four rows of the crop) along with seed inoculation of *Rhizobium* for getting higher yield.

Cotton

Farmers of South Gujarat Zone-II growing rainfed cotton are advised to sow cotton var. G.Cot-23 at 120 cm x 90 cm spacing with application of 80 Kg N/ha in three equal splits *i.e.* first at 25-30 days after germination and subsequently twice at one month interval for getting higher yield and net return. Application of phosphorus was not found advantageous.

Water management

Drainage technology

For combating water logging and salinity problems in canal command areas of south Gujarat, farmers are advised to adopt drainage technology for getting economically viable crop production by maintaining average water table at about 60 cm below ground level and reducing salinity by about 65 per cent.

1. The close sub-surface drainage using corrugated PVC pipe should be laid out at a spacing of 45 m and depth of about 0.9 to 1.2 m. Considering the internal rate of return (58 %), benefit cost ratio (1:1.7) and pay back period of 2 years with sugarcane crop, this system is economically viable.
2. Similarly, resource poor farmers can adopt sub-surface drainage system at spacing of 60 m and average depth of 80 cm. With paddy crop this system is economically

viable as evident from internal rate of return (114 %), benefit cost ratio (1:2.93) and pay back period of 2 years.

Wheat

The farmers of AES-IV of South Gujarat Heavy Rainfall Zone growing wheat (Lok-1 or GW-273 or GW-173) are advised to irrigate their crop at sowing, CRI, tillering, boot leaf, flowering, grain filling and dough stages to secure higher yield and net profit.

Under the constraints of irrigation water, farmers are advised to select either Lok-1 or GW-273 variety and give five irrigations *i.e.* at sowing, CRI, tillering, boot leaf and flowering for getting economical grain yield. This will give higher net profit along with saving in irrigation water to the tune of 30 per cent.

Okra

Under the coastal salt affected soil conditions (AES-IV) of South Gujarat Heavy Rainfall Zone, growing okra (Parbhani Kranti) during summer season was found economically viable. For realizing higher yield and net income, farmers are advised to irrigate their crop at 1.00 IW/CPE ratio, with 60 mm depth of irrigation and mulching with black plastic (50 micron) and fertilizing @ 125 kg N/ha. The first irrigation should be given at the time of sowing, second and third at 18-20 days interval and remaining 4 irrigations at 10-12 days interval.

Brinjal

(i) The farmers of hilly areas of south Gujarat having kitchen garden are advised to irrigate brinjal crop through low cost drip system in about 25 to 35 m² area using 35 lit of water per day for realizing a net profit of about Rs. 300 to 350. The crop should be planted in paired rows (0.6 m x 0.6 m x 1.2 m)

with row length of 4.8 m. Such 4 sets of pair rows can be made in the available area. The lateral should be placed in between two rows and micro tube (7.5 cm length) should be placed at 60 cm apart *i.e.* each micro tube (1.2 mm) cover two plants. The system should be operated on alternate day.

(ii) The farmers of AES-I of South Gujarat Zone-II growing brinjal (*Surati ravaiya*) during *rabi*/summer are advised to adopt drip irrigation (0.6 PEF) and fertigate the crop with 80 kg N/ha. By doing so, farmers can get 11 % higher yield and 5 % higher net profit along with saving of 36 % water and 20 % of fertilizer N. The crop should be planted in paired row (60 cm x 60 cm x 120 cm). The lateral should be placed at a spacing of 1.8 m and dripper spacing of 0.6 m using dripper of 4 lph capacity. The system should be operated at 1.2 kg/cm² on alternate day for 1.5 hrs during December to February, 2.5 hrs during March and April and 3.0 hrs there after up to harvesting.

Weed management

Groundnut

The farmers of South Gujarat Heavy Rainfall Zone AES-III are advised to follow two hand weedings + IC at 25 and 45 DAS for effective weed control in summer groundnut. Under paucity of labours, pre-emergence application of pendimethalin @ 0.75 lit/ha or oxyfluorfen 0.15 lit/ha dissolved in 500 lit of water along with one hand weeding at 45 DAS can be followed to keep the crop weed free and to obtain higher yield of summer groundnut.

Sugarcane

(i) Sugarcane growers of South Gujarat Heavy Rainfall Zone, AES-III are advised to keep their sugarcane field weed free from 30 to 150 DAP or for first 90 DAP.

(ii) Sugarcane growers of South Gujarat Heavy Rainfall Zone (AES-III) are advised to control the weeds population by three hand weeding at 30, 60 and 90 DAP. Under paucity of labours, the herbicides recommended are :

- a) Atrazine @ 2.0 kg/ha (PE) + 2,4-D @ 1 kg/ha at 60 DAP
or
- b) Metribuzin @ 1.0 kg/ha (PE) + one hand weeding at 60 DAP or
- c) Pendimethalin @ 1.0 kg/ha (PE) + one hand weeding at 60 DAP or
- d) Glyphosate 1 lit a.i./ha as blanket spray at 20 DAP + one hand weeding at 60 DAP

HORTICULTURE AND AGRO-FORESTRY

Fruit crops

Mango

The farmers of South Gujarat Heavy Rainfall Zone-I, AES-II, growing mango cv. Kesar willing to go for high density plantation through hedge row system are advised for 10 m x 5 m plantation for realizing the highest fruit yield as well as highest net profit per unit area.

Banana

The farmers of South Gujarat Heavy Rainfall Zone, growing banana cv. Basrai in clay loam soils under high density plantation with paired row planting method, are recommended

to apply 150 g nitrogen and potassium each in form of urea and muriate of potash, respectively through drip in six equal splits at 15 days interval after three months of planting. It gives higher yield of banana fruits (106.01 t/ha) with CBR, 1:2.55. The phosphorus @ 90 g/plant should be applied in pit at the time of planting.

PLANT PROTECTION

Agricultural entomology

Paddy

The paddy growing farmers of South Gujarat zone are advised to apply chlorpyrifos 0.05 % (CBR 1:11.91) or imidacloprid 0.005 % (CBR 1:11.86) or acetamiprid 0.004 % (CBR 1:7.82) for the effective control of gundhi bug (*Leptocorisa acuta*) after appearance of the pest on earheads.

AGRICULTURAL ENGINEERING

It is recommended that the developed manually operated 6-row paddy transplanter can transplant 0.38 ha area in one day using mat type seedlings. The farmers can save 60 per cent transplanting cost.

In heavy soils of South Gujarat and clay content having more than 40 per cent, use of envelope is not necessary for closed subsurface drainage system.

2005

CROP IMPROVEMENT

Sugarcane

Co 03131 (Gujarat Sugarcane-4)

This variety showed 36.22 and 31.53 % yield advantage under fresh planting (155.63 t/ha) and 23.47 and 28.21 % yield advantage under ratoon condition (129.27 t/ha) over CoC 671 and CoN 95132, respectively. It is early maturing, non-lodging, high sugared variety, moderately resistant to wilt and red rot diseases with negligible incidence of insect pests. The variety is recommended for south Gujarat region.

AGRONOMY AND SOIL SCIENCE

Nutrient management

Paddy

The farmers of South Gujarat Heavy Rainfall Zone growing drilled paddy (GR-8) are advised to apply the mixture of 65 kg urea + 300 kg neem cake + 65 kg soil as basal and 65 kg urea/ha as top dressing at 30 days after emergence (DAE) or 65 kg urea + 300 kg FYM + 65 kg soil as basal and 65 kg urea/ha as top dressing at 30 DAE for getting higher yield and net income. The mixture should be prepared one day before its application.

Pigeonpea

The farmers of South Gujarat Heavy Rainfall Zone (AES-III) growing irrigated *rabi* pigeonpea (Cv. BDN-2) are advised to fertilize the crop @ 18-40-20-20 NPKS kg/ha with sodium molybdate @ 2 kg/ha for realizing higher net profit.

Nagli

The farmers of South Gujarat Heavy Rainfall Zone (AES-I) growing nagli (GN-3) are advised to apply N @ 40 kg/ha along with soil application of bio-fertilizers @ 4.0 kg/ha (Azospirillum + Phosphobacteria or Azospirillum alone or Phosphobacteria alone) for getting about 45 per cent more net income than application of N alone.

Cultural practices

Paddy

The farmers of South Gujarat Heavy Rainfall Zone (AES-III) growing summer paddy are advised not to seed nursery after 15th December.

Cotton

The farmers of AES-V of South Gujarat Agro-climatic Zone-II growing *kharif* cotton on black soils are advised to open 22.5 cm deep furrow after either four or two rows of cotton sown at a row spacing of 120 cm. This results in 83 % more income than flat bed sowing.

Water Management

Onion

The farmers of South Gujarat Heavy Rainfall Zone (AES-III) are advised to adopt mini sprinkler system of irrigation along with fertigation for their onion crop to get 23 per cent higher net income along with saving of 20 per cent in fertilizer and 42 per cent in water over surface method. The 50 per cent N as urea should be applied at the time of planting and remaining 50 per cent in three equal splits at 30, 45 and 60 DATP through mini sprinkler.

The mini sprinkler should be laid out at the spacing of 2.5 x 2.5 m and system should be operated at 0.6 IW/CPE with a pressure of 1.5 kg/cm² for 8 hrs for getting 50 mm depth of irrigation.

PLANT PHYSIOLOGY AND BIOCHEMISTRY

Tomato

The farmers of South Gujarat Agro-climatic Zone cultivating hybrid tomato are advised to use tissue culture raised planting material during summer cultivation under Agronet (50 % shade and green colour) to get earlier and higher fruit yield along with more economic gain with higher CBR (2.63).

Furcraea

Furcraea is a ornamental plant widely grown, even in harsh condition. The foliage is green. A variant has been developed using callus culture. The new variant has white margin variegated leaves having greater height, circumference, number of foliage and overall aesthetic value.

The recommendation is as under.

"A new variant with white margin is developed from green *Furcraea* foliage ornamental plant".

PLANT PROTECTION

Agricultural Entomology

Paddy

(i) The paddy growing farmers of South Gujarat are advised to carry out spray of dichlorvos 76 EC @ 0.036 % (CBR 1:12.33) or profenophos 40 % + cypermethrin 4 %

(Polytrin-C 44 EC) @ 0.044 % (CBR 1:9.05) or endosulfan 35 EC @ 0.07 % (CBR 1:5.85) or acephate 75 SP @ 0.075 % (CBR 1:3.46) at the economic threshold level (2 damaged leaves per hill) for the control of paddy leaf folders.

(ii) The paddy growing farmers of South Gujarat are advised to apply neem cake powder @ 75 kg/1000 sq.m in basal and triazophos 35 % + deltamethrin 1 % (Spark 36 EC) @ 0.036 % at 15 days after nursery sowing (CBR 1:11.75) or carbofuran 3G @ 10 kg/1000 sq.m. (CBR 1:8.60) at 15 days of seeding for effective control of insect pest complex in nursery and transplanted field up to 45 days.

Pigeonpea

For effective control of pod borer (*H. armigera*) and pod fly (*M. obtusa*) and getting higher yield, the pigeonpea cultivators of South Gujarat (Medium rainfall AES-V) are advised to spray any of the following insecticides viz. triazophos 35 % + deltamethrin 1 % (Spark 36 EC) @ 0.036 % (CBR 1:7.68); profenophos 50 EC @ 0.04 % (CBR 1:6.81); chlorpyrifos 50 % + cypermethrin 5 % (Nurelle-D₅₀₅ 55 EC) @ 0.055 % (CBR 1:6.19) or profenophos 40 % + cypermethrin 4 % (Polytrin-C 44 EC) @ 0.044 % (CBR 1:5.77) whenever pod borers cross the ETL (at flowering stage 20 larvae/20 plants and at pod formation stage 10 larvae/20 plants).

Cotton

For the effective and economic control of cotton pink bollworm in hybrid cotton, G.Cot.Hy-10 application of spinosad 45 SC @ 50 g a.i./ha (100 ml/ha), CBR 1:3.58; or deltamethrin tablet 25 % @ 10 g a.i./ha (20 tablet/ha each of 2 g weight), CBR 1:10.38; or betacyfluthrin 2.5 SC @ 18 g a.i./ha (720 ml/ha), CBR 1:6.10, at 10 days interval starting from incidence

of pink bollworm, are recommended under South Gujarat Agro-climatic condition (Zone-II).

Mango

For the control of important insect pest of mango viz., hopper, thrips, leaf gall midge and blossom midge, the mango orchardists of South Gujarat are advised to apply thiamethoxam 25 WG (0.0084 % *i.e.* 3.4 g in 10 liters of water) (CBR 1:36.63) or imidacloprid 17.8 SL (0.005 % *i.e.* 2.8 ml in 10 liters of water) (CBR 1:30.96) commencing from bud burst stage followed by subsequent sprays on need basis.

Plant Pathology

Bio-fertilizer

Gram

Farmers of South Gujarat Agro-climatic Zone-II growing gram cv. GG-2 are advised to inoculate seeds with phosphate solubilizing culture (*Bacillus* sp. Navsari isolate) PBN-1 (CBR 1:475) @ 30 g culture/kg seed containing 10^8 viable cells/g before sowing to save 40 kg P_2O_5 /ha and to get higher yield.

Indian bean

Farmers of South Gujarat Agro-climatic Zone-II growing Indian bean cv. G.Wal-1 are advised to inoculate the seeds with phosphate solubilizing culture (*Bacillus* sp Navsari isolate) PBN-2 (CBR 1:357) @ 30 g culture/kg seeds containing 10^8 viable cell/g before sowing to save 40 kg P_2O_5 /ha and to get higher yield.