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Response of upland cotton (*Gossypium hirsutum* L.) varieties to spacing and fertilizer levels under rainfed conditions of Rayalaseema region of Andhra Pradesh

D.LAKSHMI KALYANI*, A.SITHA RAMA SARMA AND Y.RAMA REDDY

Acharya N. G. Ranga Agricultural University, Regional Agricultural Research Station, Nandyal-518 502

**E-mail: plakshmikalyani@gmail.com*

ABSTRACT : An experiment was conducted at Regional Agricultural Research Station, Nandyal, Acharya N.G.Ranga Agricultural University during *kharif*, 2016 to work out the optimum spacing and fertilizer levels of NPK for two *hirsutum* varieties. The experiment was laid out in split-split plot design having 12 treatment combinations with three replications. Main plots consists of two spacings (90x45cm and 60x30 cm), Sub plots consists of three fertilizer levels (100 per cent RDF (90-45-45 NPK kg/ha), 125 per cent RDF(112.5-56.25-56.25 NPK kg/ha), 150 per cent RDF(135-67.5-67.5 NPK kg/ha), Sub sub plots consists of two hirsutum varieties (IH 11 and Sri Rama). Significantly 90 x 45 cm spacing (2367 kg/ ha) recorded higher seed cotton yield than 60 x 30 cm (2026 kg/ ha). Regarding fertilizer levels, higher seed cotton yield was observed with 150 per cent RDF(2280 kg/ ha) and is on par with 125per cent RDF (2230 kg/ ha) and lower seed cotton yield was observed with (100%) RDF (2080 kg /ha) . Among *hirsutum* varieties IH 11(2298 kg/ha) recorded higher seed cotton yield than Sri Rama ((2095 kg/ ha).

Key words: *Hirsutum* varieties, Nutrients, spacing

Cotton is an important cash crop to many developing countries supporting the livelihoods of millions of poor households. Among the countries in which cotton is an important contributor to rural livelihoods are China, India and Pakistan where millions of rural households are engaged in cotton production and more than two- thirds of the world's cotton is produced in the developing countries. In India, cotton occupied 118.7 lakh ha with production of 338 lakh bales and productivity is 484 kg lint/ha. Among states, Andhra Pradesh occupied with 6.6 lakh ha with production of 24 lakh bales and productivity is 613 kg/ha(CAB,2015-2016).

Among the cotton growing countries, India has the largest area under cotton production followed by China, United States and Pakistan. India is the largest producer of cotton followed by China and United states. Though China has just more than half of India's area, it produces twice the cotton compared to India. Australia has the highest yield in cotton (1991 kg/ha) followed by Brazil, Syria and China. While India (523 kg/ha) has one of the lowest yields in the world (CAB,2015-2016).

Cotton crop is being influenced by various environmental factors. Optimium planting density can contribute in achieving maximum yield of cotton and it varies widely according to cropping system, environmental conditions and cultivars(Halemani and Hallikri,2002).

Among the various agronomic factors

low plant population, indiscriminate use of fertilizers and use of low potential genotypes are primarily important and thus responsible for low yield of cotton in the country. Adequate plant population/unit area of cotton seedlings is crucial to achieve high productivity and yield even at global level. Plant spacing has a key role in influencing the growth and yield of the crop and contributes 22.0 to 32.7 per cent towards cotton yield. However, the optimum plant spacing depends on characteristics of genotype for example growth habit, height and plant architecture. Keeping these points in view, the present investigation was undertaken to find out the suitable plant population and optimum fertilizer level for promising *hirsutum* varieties.

An experiment was conducted at Regional Agricultural Research Station, Nandyal during *kharif,* 2016-2017. Soil of the experimental field was clay in texture, low in nitrogen, high in phosphorus and potassium .The experiment was laid out in split-split plot design having 12 treatment combinations with three replications. Main plots consists of two spacing's (90x45cm and 60x30 cm), Sub plots consists of three fertilizer levels (100% RDF (90-45-45 NPK kg/ha), 125 per cent RDF(112.5-56.25-56.25 NPK kg/ha), 150 per cent RDF(135-67.5-67.5 NPK kg/ha), Sub sub plots consists of two hirsutum varieties (IH 11 and Sri Rama).

IH 11 released from Cotton research station, Nanded. Sri Rama released from RARS, Nandyal during 2015. The plot size is 5.4x3.6m.The crop was sown on 06.07.2016. Full dose of phosphorus and potassium were applied as basal dose through SSP and MOP. Nitrogen was applied through urea in three equal splits at 30,60 and 90 DAS by pocketing method. A total of 810 mm rainfall was received in 40 rainy days during the crop growth period.

Data presented in the Table 1 depicted that plant population per net plot varied significantly with different spacings with higher population being recorded in 60x30 cm (66) and was lower in 90x45 cm (20). However, no significant difference was observed with different fertilizer levels and varieties with respect to plant population. All parameters like plant height (cm), monopodia, sympodia, boll weight (g) were found to be non significant with respect to spacings, fertilizer levels and varieties. Similar results were also obtained reported by Nehra and Yadav(2012).

Number of bolls/sm differs significantly among different spacings. Higher number of bolls/sm (56.4) was observed in 90 × 45 cm than 60 × 30 cm(51.5). The macronutrient (NPK) play important role during vegetative as well as repr oductive growth stages of cotton and also increase the sympodial branches, bolls and seed cotton weight/boll by encouraging process of photosynthesis. Ultimately, product of photosynthesis accumulated in economic part of cotton *i.e.* bolls and hence, increased final yield of cotton (Solanke *et al.,* 2001 and Wankhade *et al.,* 2001).

There was significant effect of different fertilizers levels on bolls/sm. Higher bolls/sm (55.6) was observed in 150 per cent RDF and is *on par* with 125 per cent RDF (53.5). Significantly lower bolls/sm (52.6) was observed with 100 per cent RDF(Table 1). Higher bolls/sm (55.9) was observed in IH 11 than Sri Rama (51.8).

Significantly higher seed cotton yield (2367 kg/ha) was recorded with wider spacing of 90 x 45 cm than closer spacing of 60 x 30

Table1. Effect of spacing and fertilizer levels on growth and yield parameters of *hirsutum* varieties

Treatments	Final plant population (No/net plot)	Plant height(cm)	Monopodia/ plant	Sympodia/ plant	Bolls/ m^2	Boll weight (g)	*Kapas* yield (kg/ha)
Spacing							
S_1- 90x45 cm	20	100	1.3	16.5	56.4	4.26	2367
S_2 – 60x30 cm	66	105	1.2	16.2	51.5	4.04	2026
SEm ±	0.45	2.1	0.05	0.6	0.7	0.07	21
CD (p=0.05)	2.7	NS	NS	NS	4.3	NS	130
Fertilizer levles							
F_1- RDF (100%) (90-45-45 NPK kg/ha)	43	104	1.3	16.5	52.6	4.26	2080
F_2- RDF (125%) (112.5-56.25-56.25 NPK kg/ha)	43	103	1.2	16.2	53.5	4.21	2230
F_3- RDF (150%) (135-67.5-67.5NPK kg/ha)	42	101	1.2	16.3	55.6	3.98	2280
SEm ±	1.0	2.3	0.07	0.5	0.7	0.12	45
CD (p=0.05)	NS	NS	NS	NS	2.3	NS	148
Varieties							
V1-IH-11	43	102	1.2	16.1	55.9	4.19	2298
V2- Sri Rama	43	103	1.2	16.6	51.8	4.11	2095
SEm ±	0.7	2.1	0.04	0.4	1.3	0.14	59
CD (p=0.05)	NS	NS	NS	NS	4.0	NS	183
Interaction	NS	NS	NS	NS	NS	NS	NS
CV (%)	7	9	13	11	10	14	11

cm(2026 kg/ha). This might be due to better aeration and adequate interception of light as well as lesser competition for nutrients due to low plant population/unit area. Beneficial effects of wider spacing in cotton was also reported by Narkhede *et al.,* (2000).There was significant effect of different fertilizers levels on seed cotton yield. Higher seed cotton yield (2280 kg/ ha) was observed in 150 per cent RDF and is *on par* with 125 per cent RDF (2230 kg/ ha) and lower seed cotton yield (2080 kg/ ha) was observed in 100 per cent RDF(Table 1) . Increased level of fertilizer increased the bolls/sm, which ultimately increased the seed cotton yield. Mool Chand *et al.,* (1997) also reported the favourable effect of higher fertilizer doses on number of bolls and seed cotton yield/ plant.Among the varieties, higher seed cotton yield was observed in *hirsutum* variety of IH 11 (2298 kg/ ha) than Sri Rama (2095 kg/ ha) .

Interaction effect between genotypes, spacings and fertilizer levels were found non significant.

CONCLUSION

Based on the present investigation , it can be concluded that *hirsutum* variety of IH-11 significantly recorded higher seed cotton yield with spacing of 90x60 cm along with 125 per cent RDF (112.5-56.25-56.25 NPK kg/ha) in three equal splits of urea at 30,60,90 DAS for getting

higher yields.

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