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Performance of cotton under high density planting with varied spacing and levels of nitrogen

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ABSTRACT

A field experiment was conducted during *kharif* 2016 - 17 to evaluate the optimum spacing and nitrogen in cotton under high density planting system. A closer spacing of 60 cm × 10 cm gave significantly higher seed cotton yield (1666 kg ha^{-1}) than other spacings tested and it was on par with 75 cm × 10 cm. The highest seed cotton yield was recorded with a nitrogen level of 150 kg N ha^{-1} (1620 kg ha^{-1}) than other nitrogen levels tested. Interactions were non significant.

Key words : *Cotton, nitrogen levels, spacing*

Cotton crop, the "King of Fibres" popularly known as "White Gold" is the most important commercial crop grown in vertisols under rainfed conditions of coastal Andhra Pradesh. It occupied an area of about 4.41 lakh hectares with an annual production of 13.1 lakh bales and productivity of 719 kg lint ha^{-1} (AICCIP, Annual Report, 2016-17). Cotton production is labour intensive in almost all the developing countries. A novel way to avoid labour problem is to go for mechanical harvesting. Cotton being indeterminate in nature, it is difficult to harvest the seed cotton in one time. But research results suggest that, by manipulating the crop geometry especially by providing closer spacing one time harvest is possible and the yield reduction may be compensated by increasing the plant population by way of High Density Planting Systems (HDPS). The high density planting system is now being conceived as an alternate production system having a potential for improving the productivity and profitability, increasing input use efficiency, reducing input costs and minimizing the risks associated with the current cotton production system in India. Fertilizer requirement is most likely to be higher under HDP (Jost and Cothren, 2000). Nitrogen is one of the most important element for crop production and cotton needs nitrogen for regular growth and development. It is required for all stages of plant growth and development because it is the essential element of both structural and non structural components of the plant (Majid *et al.,* 2011). Nitrogen requirement is most likely to be higher under high density planting. The present investigation was, therefore undertaken to study the growth and yield of cotton under high density planting and optimize nitrogen dose for high density planting of cotton.

MATERIAL AND METHODS

The experiment was carried out at Agricultural College Farm, Bapatla, Andhra Pradesh, during *kharif* 2016– 17. The soil of experimental field was clay in texture, slightly alkaline in reaction (7.62), low in organic carbon (0.2 %), low in available nitrogen (200.3 kg ha^{-1}), medium in available phosphorus(25 kg ha^{-1}), medium in available potassium (260 kg ha^{-1}). Gross plot size 9 m × 4.5 m and net plot size 7.2 m× 3.6 m. The experiment was laid out in split plot design and replicated thrice with sixteen treatments comprising of four spacings 60 cm × 10 cm (S_1), 75 cm × 10 cm (S_2), 90 cm × 10 cm (S_3), 90 cm × 45 cm (S_4) in main plots and four nitrogen levels 60 kg N ha^{-1} (N_1), 90 kg N ha^{-1} (N_2), 120 kg N ha^{-1} (N_3), 150 kg N ha^{-1} (N_4) in sub plots. Cotton variety Suraj was sown on 07-08-2016. Nitrogen was applied in the form of urea as per the treatments in 3 equal splits at 30 DAS,60 DAS, 90 DAS along with recommended dose of potassium and entire quantity of phosphorus was applied basally. Recommended cultural practices and plant protection measures were followed through out the crop growing season. Growth and yield parameters like plant height, dry matter accumulation, sympodial branches per plant, number of bolls per m^2, boll weight, seed cotton yield, stalk yield were recorded. The data were analysed statistically by adopting the standard procedures described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Growth parameters

Results revealed that growth parameters like plant height, dry matter accumulation and monopodial and sympodial branches per plant was significantly influenced by varied spacing and levels of nitrogen. spacing was significantly influenced the plant height. Taller plants (99.9 cm) were recorded with closer plant spacing 60 cm × 10 cm was significantly superior to that of other plant spacings tested due to the overcrowding and competition for solar radiation and increase in inter nodal length. Highest dry matter accumulation was recorded with closer spacing than other spacings tested, whereas the number of monopodial branches per plant were zero due to varietial character of Suraj and sympodial branches per plant was significantly superior with wider spacing of 90 cm × 45 cm due to reduced competition for resources.

Regarding nitrogen levels, plant height was significantly superior at 150 kg N ha^{-1} than other nitrogen levels tested due to more cell division and cell elongation as promoted by application of nitrogen. Highest drymatter accumulation was recorded at 150 kg N ha^{-1} due to the fact that nitrogen fertilization made the plants more efficient in photosynthetic activity by enhancing the carbohydrate metabolism resulting in increased dry matter accumulation and more number of sympodial branches per plant was recorded with application of 150 kg N ha^{-1} than other nitrogen levels due to the fact that nitrogen helps in cell division and cell elongation leads to increased number of lateral branches.

Yield attributing characters

The number of bolls per m^2 was significantly superior with closer spacing of 60 cm × 10 cm and it was at par with 75 cm × 10 cm due to more no.of plants accommodated per unit area. The similar results were observed by Venugopalan *et al.*(2011). Significantly superior boll weight (3.43g) was recorded at wider spacing of 90 cm × 45 cm. than boll weight recorded with 60 cm × 10 cm and 75 cm × 10 cm was on par. Bolls tend to be larger in higher plant spacing due to the availability of more nutrients and ample space.

Regarding nitrogen levels, more number of bolls per m^2 was recorded at 150 kg N ha^{-1} due to excessive vegetative growth and boll weight was significantly higher with application of 150 kg N ha^{-1} due to increase in the availability of nitrogen might have increased the dry matter accumulation of plants, it acted as a source to supply nutrients to reproductive parts *i.e.* squares, and bolls. Likewise, heavier boll weight at higher nitrogen levels could be due to a better source-sink relationship established with sufficient quantity of nitrogen.

Yield

Seed cotton yield was significantly higher with closer spacing of 60 cm × 10 cm than other spacings tested due to more number of bolls per unit area and stalk yield also significantly higher with 60 cm × 10 cm due to more dry matter accumulation, similar results was obtained by Venugopalan *et al*.(2014). Regarding nitrogen, significantly superior seed cotton yield was recorded at 150 kg N ha^{-1} than other levels of nitrogen tested, due to its favorable effect on plant growth and development, which resulted in increased dry matter accumulation and associated betterment in yield attributing characters. Highest Stalk yield was recorded at 150 kg N ha^{-1}. Similar result was obtained by Munir *et al*.(2015).

It can be concluded that highest growth parameters and yield attributes and seed cotton yield was recorded with closer spacing of 60 cm × 10 m and application of 150 kg N ha^{-1} under high density planting system.

LITERATURE CITED

AICCIP, 2016 All India Coordinated Cotton Improvement Project, Annual Report, Central Institute for Cotton Research, Nagpur.

Gomez A K and Gomez A A 1984 Statistical procedures for Agricultural Research. International Rice Research Institute Book. International Science Publication. John Wiley and Sons, Singapore.

Jost P H and Cothren,J T 2000 Growth and yield comparisons of cotton planted in conventional and Ultra narrow row spacings. *Crop Science*. 40 : 430 – 435.

Majid R, Mohsen S and Mohammad G 2011 Response of yield and yield components and fibre properties of cotton to different application rates of nitrogen and boron.

Table 1. Growth, yield attributes of cotton as influenced by varied spacing and levels of nitrogen

Treatments	Plant height (cm)	Drymatter accumulation (kg ha^{-1})	Monopodia/ lant	Sympodia/ plant	No.of bolls m^2	Boll weight (g)	Seed cotton Yield(kg ha^{-1})	Stalk yield (kg ha^{-1})
Spacing (cm)								
S_1-60 × 10	116.0	9031	0	9.7	61.3	3.02	1666	7118
S_2-75 × 10	107.6	8556	0	10.7	58.8	3.04	1550	6551
S_3 -90 × 10	99.1	7534	0	11.8	51.8	3.23	1356	5914
S_4 -90 × 45	91.9	7092	0	12.9	46.4	3.43	1173	5454
SEm±	1.9	127.4	-	0.2	0.8	0.05	50.2	170.3
CD (P=0.05)	6.8	440.9	-	0.9	2.9	0.18	174.0	420.6
Nitrogen level (kg N ha^{-1})								
N_1 – 60	95.0	6643	0	10.2	48.5	2.97	1253	5107
N_2 – 90	100.4	7590	0	11.0	53.8	3.11	1372	5674
N_3 – 120	106.6	8421	0	11.6	56.5	3.25	1500	6632
N_4 – 150	112.8	9608	0	12.3	59.6	3.40	1620	7632
SEm±	1.7	138.7	-	0.1	0.7	0.04	38.2	105.2
CD (P=0.05)	5.1	404.9	-	0.5	2.0	0.13	111.5	310.7

American – Eurasian Journal of Agriculture and Environmental Science. 10(4): 525 – 531.

Venugopalan M V, Prakash A H, Kranthi K R, Rachana Deshmukh, Yadav M S and Tandulkar N R 2011 Evaluation of cotton genotypes for high density planting system on rainfed vertisols of Central India. World Cotton Research Conference on technologies Prosperity.

Venugopalan M V, Kranthi K R, Blaise D, Shubhangi lakde and Sankaranarayana K 2014 High density Planting Syatem in Cotton – The Brazil experience and Indian initiatives. *Cotton Research Journal*. 5(2) : 172 – 185.

Munir M K, Tahir M, Saleem M F and Yaseen M 2015 Growth, yield and earliness response of cotton to row spacing and nitrogen management. *The Journal of Animal and Plant Science*. 25(3) : 729 – 738.

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