HIGH DENSITY PLANTING BY NARROW PLANT SPACING ENSURES COTTON PRODUCTIVITY IN BT COTTON HYBRIDS (GOSSYPIUM HIRSUTUM L.)

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ABSTRACT
The manipulation of plant density and crop geometry is a time tested agronomic technique for achieving high crop yield. Several leading cotton producing countries like USA, Australia, Brazil, Uzbekistan and China have developed suitable plant types to accumulate plant densities varying from 1 lakh to 2.5 lakh plants/ha with using narrow and ultra narrow row spacing. This paper traces the transformation in the cotton production, development of early dwarf and compact hybrid genotypes. The paper also discusses the research initiatives on high density planting system using hybrid cotton in the Indian context, which provided 25 – 30% higher yield over recommended spacing on shallow to medium deep soils under rainfed conditions. Agronomic practices like nutrient management, weed control and canopy management to sustain high yields under HDPS are also discussed. The successful outcome of the demonstration of this technology in 8 districts of the rainfed cotton belt in Vidarbha (Maharashtra) on marginal soils is also summarized.

Keywords: Cotton, High density planting

INTRODUCTION
Cotton is an important fibre yielding crop of global importance, which is grown in tropical and subtropical regions of more than 80 countries the world over. Cotton refers to those species of the genus Gossypium which bears spinnable seed coat fibres. Cotton seed bears two types of fibres viz, long fibres known as lint which can be separated from the seed by the process of ginning; and short fibres known as fuzz or linters which remain on the seed even after ginning. The lint is used for spinning purpose. Thus those species of Gossypum which possess lint that can be spun into fine yarn are referred to as cotton.

There are about 50 species of the genus Gossypium out of which only four species, viz. Gossypium arboreum, G. herbaceum, G. hirsutum and G. barbadense are cultivated and rest are wild. The first two species are diploid (2n = 26) and are native of old world. Diploid cultivated species are also known as Deshi cotton cotton or Asiatic cottons because they are cultivated in Asian region. The last two of the above mentioned cultivated species are tetraploid (2n = 52) and are referred to as New world cottons. The G. hirsutum is also known as American cotton or upland cotton and G. barbadense is also referred to as Sea Island cotton or Egyptian cotton or Tangiush cotton. The G hirsutum is the predominant species which alone contributes about 90% to the global production.

The major cotton producing countries are China, USA, India, Pakistan, Uzbekistan, Egypt, Argentina, Australia, Greece, Brazil and Turkey. These countries contribute about 80% to the global production. In India, cotton crops is grown throughout the country. However, there are ten cotton producing states,
viz. Punjab, Haryana, Rajasthan, Madhy Pradesh, Maharashtra, Gujarat, Telengina, Andhera Pradesh, Karnataka and Tamil Nadu. These states contributes about 90% to the National cotton production. Based on cotton cultivation, India is divided into three major zones viz., north zone (Punjab, Haryana and Rajasthan), central zone (Madhy Pradesh, Maharashtra and Gujarat) and south zone (Telengina, Andhera Pradesh, Karnataka and Tamil Nadu). These zones differ in soil type, topography, irrigation facilities, species cultivated etc.

Perhaps, India is the only country in the world where all the four cultivated species are grown for commercial cultivation, besides hybrids. In India, about 50% area is covered by hybrids, 29% by upland varieties and 21% by diploid cultivars (ICAC, 1997). The Egyptian cotton is cultivated on a very little area (0.2%) in few pockets of Tamil Nadu and Andhera Pradesh. The G. herbaceum is confined to the states of Gujarat and Karnataka. Two species viz, G. hirsutum and G. arborium.

MATERIALS AND METHODS

The experimental material comprised twenty Bt cotton hybrids along with standard checks. This material was our own research material for doing experiment to develop Bt cotton hybrids suitable for high density planting. The experiment was conducted at Seed Breeding Farm, during kharif 2016. The climate of Khargaon is typically semi-hybrid and subtropical with severe winter and summer. Jabalpur traditionally comes under cotton chilly and maize crop zone of Madhya Pradesh and classified as “Narmida valley of agro-climate zone”.

The experiment was conducted in a randomized block design (RBD) with three replications. The spacing between plant to plant was kept in different two spacing i.e. 120x60 and 120x30 cm. Fertilizers dose of application maintain only 50% as per recommendations. The standard agronomic practices and plant protection measures were adopted for normal crop growth. Application of PGR (Growth Regulator) is to regulate plant growth for maintaining its productive growth and to control vegetative growth. Application of chemical compostation in 60 days old crop so as to regulate growth in proper stage.

Study yield contributing traits as below

Yield contributing traits

1. Days to 50% flowering
2. Plant height (cm)
3. Number of monopodia/Plant
4. Number of sympodia/Plant
5. Number of bolls/Plant (in 120 days)
6. Boll wt (g) (average 25 bolls/plot)
7. Number of plants/plot
8. Seed Yield (Kg/ha)

RESULT AND DISCUSSION

Genetic variability for days to 50% flowering ranging from 72.66 to 18.33 with mean value of 100.33 days. Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) estates observed for this trait were 11.21 and 11.27 of each 9% respectively. Range of variation observed for plant height was 79.20 to 11.40 with a mean value of 95.55 cm genotypic and phenotypic coefficient of variation were 8.74 and 8.84 respectively. Range of variation observed for number of tillers per plant 7.80 to 15.90 with mean value of 9.90. Genotypic coefficient of variaiton and phenotypic coefficient of variation were 19.41 and 19.52 respectively. Range of variation observed for primary tillers plant was 5.00 to 11.00 with a mean value of 7.72 genotypic and phenotypic.
coefficient of variation of this trait was 19.0019 and 19.5629% respectively. Range of variation observed for secondly tillers per plant was 1.10 to 4.90 with mean value of 2.52 genotypic and phenotypic coefficient of variation of this trait were 35.3346 and 39.4255% respectively and range of variation observed for bolls per plant was 0.00 to 6.50 with a mean value of 0.86 genotypic and phenotypic coefficient of variation for this trait were 167.0235 and 170.6719% respectively. Range of variation for productivity tillers was observed 7.33 to 13.20 with a mean value of 9.55 Genotypic and phenotypic coefficients of variations were 15.6249 and 15.7890% respectively variation in number of bolls per plant was observed between 17.85 to 26.12 with a mean value of 23.47 cm. Genotypic and phenotypic coefficients of variation estimates were observed 7.9872 and 8.2205 respectively. Range of variation for number of sympodia per plant is ranging from 26 to 41 with a mean value of 47.1.

Genotypic and phenotypic coefficients of variation of this trait were 12.1366 and 12.5884 respectively. Range of variation bolls per plant recovered from 8.2 to 9.9 with a mean value of 8.9. Genotypic and phenotypic coefficient of variation of this trait were 49949 and 5.0321% respectively.

CONCLUSION

The results obtained in respect of morphological and quantitative traits in the present investigation and considerable genetic variability and moderate to high genotypic and phenotypic coefficients of variation for all the characters studied. The Bt cotton hybrids were found to be the best hybrids they had a yield advantage of 20 to 30% or more over the commercial Agronomical practices applied. High density planting with boost up yield to increase population compare to spacing 120x60 cm. As we observed number of bolls per plant as in average in high density but to increase population benefited to increase productivity. As spacing 120x30 cm suitable for high density planting with as specific Bt cotton hybrids as develop by using different gene pool. Present study is of great importance to increase per acre yield by adopting high density planting to increase plant population per acre. The study will help in understanding of certain cotton plant type which is suitable for high density planting in Indian scenario. As research paper may be helpful to researcher who are closely related with cotton research to develop new genotypes/ hybrids fit for high density. As adopting high population by Indian farmer may helpful for weed management due to its spacing effect, no excess space to increase weed
infestation. In India tremendous use of in-organic fertilizers and nutrients, if farmer adopting high density planting use of such may be reduce due to its spacing effect only available nutrients applicable to the cotton plants only not for weed.

REFERENCES