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High Density Planting (HDP) in Cotton – 'Sow More, Harvest Much More'

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Abstract: ***Cotton plays an important role in Indian farming and industrial economy of the country. Prior to the introduction of Bt technology, the cotton productivity was severely hampered due to wide spread and economically significant infestation of bollworms on fruiting bodies. Ever since the introduction of Bt cotton, the average cotton productivity and the national cotton output has increased by three folds. Effective control of bollworms by Bt technology in the elite genetic background coupled with adoptions of good crop management practices have lead to l this quantum jump in the productivity levels. However, off late farmers are started witnessing yield platueing (= no significant increase in yields over previous year). Though every year 'better' hybrids are getting added to the portfolio of commercial Bt hybrids, the yield differences that these new hybrids bring in over the current hybrids appeared to be marginal. Even if some new hybrids do yield significantly higher than the existing one, adaptability of such hybrids is limited to certain regions and conditions. The farmers already having adopted best bollworm control technology and cultivating the best germplasm available in the market place, any further increment in yields over the existing levels warranted for something beyond the technology and germplasm. This has led to the conceptualization of HDP, i.e., increasing plant population/ acre over the existing population/acre being practiced by farmer. The rationale was that by increasing plant number/ unit area one could increase total number of bolls/unit area that might translate in to a few quintals of additional yield/ac. Through this extensive study successfully demonstrate the significant benefits of HDP in cotton production.***

Keywords: Bt. Cotton, HDP, Bt. Yield, bollworms

1. Introduction

In India, cotton is cultivated in an area of 10.5 million hectares with a production of 32.1 million bales of seed cotton (170 kg per bale) during 2016 - 17 (Anon, 2017). The average productivity of cotton in India is 520 kg lint per hectare, which is low when compared to world average (765 kg lint per ha).

The cotton farmer's expectation on productivity during pre-Bt cotton era was very low. Due to the severe damages caused by bollworms, and failure of various management practices including chemicals sprays resulted in poor yields. However, the introduction of Bt cotton has completely changed the perceptions and expectations of farmers on cotton crop and its productivity. Efficient control of bollworms by the Bt technology made Bt cotton popular among farmers. It also spurred the competition among companies selling cotton seeds to bring out better and better hybrids. Encouraged by the results (productivity) according their efforts, farmers followed better crop management practices, took interest to choose and grow the best yielding hybrids available in the market. Thus cotton which hitherto was considered a bread winner as now attained the status of money spinner. As farmers have been cultivating Bt cotton and following better crop management practices from past few years, of late any increment in productivity levels ceased. With management practices remaining un altered, any further increase in yields directly depended on new germplasm. The yield difference between new and exsisting hybrids have been observed to be marginal at 5-8%. This made us to think beyond the germplasm to sustain and further increase the yields.

Thinking in a new direction has led to conceptualization of High Density Planting (HDP) or close spacing. HDP in simple terms means planting cotton more densely or closely than what is being practiced. The reason is that when farmers were growing non Bt cotton, the b/w plant and b/w row spacing used to be more. Because of flaring and shedding up of squares due to bollworm damage triggering the plant to put up excessive vegetative growth than the normal growth attained when all the developed fruiting bodies are intact. Farmers also had to spray very intensively to control bollworms during post blooming crop stage; wider plant spacing facilitated un hindered movement in the field while spraying. Bt cotton plant retains most of the squares that the plant put forth resulting in restricting un wanted additional vegetative plant growth. Farmers adopted the Bt technology and improved management practices but continued to plant at the same spacings as was done with non Bt. With the restricted vegetative growth in Bt cotton there appeared to be some excessive vacant space b/w the plants than what was actually required. Through HDP it was tried to fill this vacant space by planting more plants to increase the yields with the logic that more number (optimum) of plants would bear more number of bolls/unit area; which might translates into more yield/unit area than what is currently being harvested. As this was mere a concept on paper, we made our efforts to understand the performance of this concept in the field and demonstrated the benefits to the farmers.

2. Material & Methods

Selection of Hybrids: Fourteen popular BGII hybrids with different plant types such as open erect, open semi erect, bushy belonging to major cotton seed companies viz.,

Mahyco, Rasi, Kaveri, Nuziveedu, Ankur, Ajeet, and Krishidhan which together holds 75% market share.

Planting geometry: the spacing was not predetermined; it was based on the existing farmers practice at the respective locations. The existing spacing followed by farmer was taken as normal and compared that with the correspondingly reduced spacing. At all the sites only between plant spacing was altered and the between row spacing was retained as such to not to interfere with the inter cultivation operations. For example where the farmer current spacing practice was 120x90 cm, the close spacing was 120x45 cm; when it was 90x90cm, the close spacing was 90x60cm; when it was 150x75cm the close spacing decided was 150x38cm.

Crop management: The crop management practices including sprayings, weeding and nutrient applications were uniform b/w both normal and close spacing plots. The common practices were adopted to quantify the additional yield that the grower would get by only increasing plant density, by keeping all other things constant.

Field layout: the layout was kept simple to facilitate good field demonstrations. Each plot (per spacing per hybrid) had ten rows of 20 meters each. On one hand side it was planted in normal spacing and on other side in close spacing so that a person standing in the middle can observe and compare the plants in different spacing on either of his side.

Experimental sites: in kharif 2015-16, the trials were laid out across five locations in Maratwada, five locations in Vidharba and 4 locations in Khandesh regions of Maharashtra spread across varied soil and agro climatic conditions.

3. Results & Discussion

a) Field trials showed a significantly higher yields in close spacing as compared to normal spacing plots (paired 't' test; α= 0.05) across all study sites.
b) In Khandesh on an average additional 262.40 kg/ac seed cotton lint was obtained in close spacing plots over normal spacing. This translated to an increase of 25.54 % in yields over normal spacing
c) In Maratwada an additional yield 335.29 kg/ac (=21.83 % increase over normal spacing) and in Vidharba an increase of 308.48 kg/ac (= 21.17%) was noticed, this was in agreement with Bhalerao et. al. (2008).
d) Boll numbers were significantly low (around 8-14 bolls less at an average boll load of 60 to 90 bolls/plant) on plants in close spacing as compared to normal spacing (paired 't' test; α= 0.05)
e) There was no significant difference in boll weight among close and normal spacings (paired 't' test; α= 0.01)
f) Incremental yields in close spacing were noticed across all hybrids irrespective of 'plant type'
g) Yield advantages in close spacing was observed at all soil types (light, medium and heavy soil) and agro climatic conditions:

4. Summary & Conclusion

The additional yield from HDP translated to Rs. 10000 to 12000 of additional income from an acre. HDP is not only helping the farmers in sustaining the yields, but also helping the farmers to further enhance the yields within limited size of land holdings. Further, it provides an opportunity for breeders to develop hybrids more specific to HDP so that the yields can be increased beyond the levels realized today. Taking cue from the adoptability and popularity of this concept, 'HDP cum complementary growth regulator' studies has been initiated to stretch the yield levels further. In Indian cotton production the HDP concept will go long way in complementing the sustenance of incremental yields through future technologies in cotton production.

References

[1] **Anonymous (2017)** Status paper on cotton, Directorate of Cotton development, Government of India.
[2] **Bhalerao, P.D.; Gawande, P.P.; Ghatol, P.U. ; Patil B.R.(2008)**Performance of Bt cotton hybrids for various spacing under rain fed condition. **Agric. Sci. Digest.,** 28 (1), 54 – 56.
[3] S.**L.Korekar; Gowatham prakash and Sandeep Mankare (2018):** Estimation of heterosis in BT cotton *(Gossypium hirsutum L.)* for yield and fiber quality traits. *Science Park research Journal*: Special Issue.10-14.
[4] **Gowatam prakash and Korekar S.L.** (2017): Assessment of heterosis in Bt Cotton (*Gossipium hirsutum L.*) hybrid under contrasting planting densities: *Journal of Global Biosciences*; 6(8), 5193-5200