Adoption of Bt Cotton Production Technology by the Growers in Haryana

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ABSTRACT

Cotton is a major fiber crop and used for textile purpose by about 75 percent of world's population .Cotton plays a key role in the National economy in terms of direct and indirect employment and income generation in the agricultural and industrial sectors. Textiles and related exports of which cotton alone comprised nearly 65 per cent and accounts for nearly 33 per cent of the total foreign exchange earnings of our country which at present is around 12 billion dollars. In India, Bt cotton since its release in 2002 by Genetic Engineering Approval Committee replaced more and more conventional cotton area. There was an exponential increase in Bt cotton area accounting for a staggering 92 per cent of the total cotton area in India. The production increased 31.20 million bales during 2010-11 (Anon., 2014). In Haryana cotton is grown during Kharif season. Cotton accounts for an area of 610 thousand ha in Haryana with total production of 24,000 thousand bales and yield of lint is 664.50 kg / ha (Anonymous 2014). Cotton is attacked by several insect pests reducing the crop yield to a greater extent. The insect pests that attack cotton crop may be classified into sap sucking insects (aphids, Jassids and white fly) or chewing insects (bollworms, leaf eating caterpillars etc.) of the total pesticides used in Indian Agriculture, about 45 per cent is sprayed on cotton crop alone. To reduce pesticide usage in cotton, several strategies like use of Genetic Resistance to insect pests, Integrated Pest Management (IPM), Insecticide Resistance Management (IRM) etc. are advocated. In recent times, Bt cotton technology is found to be one of the best strategies to manage bollworms, the most important pest of cotton. The present study was conducted during 2014-2015 in Haryana. Two districts Hisar and Sirsa were purposely selected for the study because they have largest area of production under Bt cotton. The present study was conducted in purposely selected districts of Hisar and Sirsa of the native state Haryana. Because they have largest area and production under Bt-cotton . In this study, adoption of Bt-cotton growers were assessed from 160 respondents selected from 20 villages. The study revealed that medium level of adoption was observed for agronomic practices, micronutrient application, manure and fertilizer application, pest and diseases management and post harvest techniques of Bt-cotton production technology.

***Key words**: Adoption; Bt cotton production technology;*

Cotton plays a key role in the National economy in terms of direct and indirect employment and income generation in the agricultural and industrial sectors. Textiles and related exports of which cotton alone comprised nearly 65 per cent and accounts for nearly 33 per cent of the total foreign exchange earnings of our country which at present is around 12 billion dollars with a potential for a significant increase in the coming year. Cotton is cultivated in three distinct agro-ecological regions (north, central and south) of the country (*Anonymous, 2014*). In Haryana cotton is grown during *Kharif* season. Cotton accounts for an area of 610 thousand ha in Haryana with total production of 24,000 thousand bales and yield of lint is 664.50 kg / ha (*Anonymous 2014*). Cotton is attacked by several insect pests reducing the crop yield to a greater extent. The insect pests that attack cotton crop may be classified into sap sucking insects (aphids, jassids and white fly)

or chewing insects (bollworms, leaf eating caterpillars etc.) of the total pesticides used in Indian Agriculture, about 45 per cent is sprayed on cotton crop alone. To reduce pesticide usage in cotton, several strategies like use of Genetic Resistance to insect pests, Integrated Pest Management (IPM), Insecticide Resistance Management (IRM) etc. are advocated. In recent times, *Bt* cotton technology is found to be one of the best strategies to manage bollworms, the most important pest of cotton. The desperate situation faced by many cotton farmers (suicides among cotton farmers have become a commonplace occurrence) has led to a search for solutions. Research in biotechnology has led to the development of genetically modified crops like Bt cotton, with a gene from *Bacillus thuringiensis* transferred to selected host cotton hybrids. A few Bt hybrids have been released in India as well. The seed companies claim that the Bt hybrids have inbuilt resistance to the bollworms. The transgenic hybrids were developed by Maharashtra Hybrid Seed Company Limited in collaboration with Monsanto. Presently, 1340 Bt cotton hybrids have been released and recommended for cultivation in India (*Bharud, 2014*), which has created a confusing situation for the farmers for choosing the appropriate hybrid.

METHODOLOGY

The study was carried out in two districts of Haryana state, namey, Hisar and Sirsa were purposely selected for the study because they have largest area of production under Bt cotton. Two blocks from each district were selected randomly. A village-wise list of Bt cotton growers was prepared and from that list A random sample of 20 Bt cotton growers as respondents from eight randomly selected villages were chosen from the selected districts. Thus, total number of 160 farmers constituted the sample for the purpose of the study. Adoption refers to a decision for full scale continued use of an innovation over a period of time. It is a mental process through which an individual passes from first hearing about an innovation to its final adoption. In the present study, an effort was made to ascertain the level of adoption of Bt cotton growers on the farm practices recommended for Bt cotton cultivation in Haryana state. The level of adoption was measured by calculating the adoption index (AI) which is expressed as the ratio in percentage of the actual extent of use of different component of technology in relation to the potential of use of those recommended technology. The said index was worked out both respondent-wise as well as component-wise by using the following formula:

$$AI = \frac{E}{P} \times 100$$

Where,

AI = Adoption index

E = Extent of adoption, expressed in term of summation of obtained adoption scores

P = Potential of adoption expressed in terms of possible maximum obtainable adoption score

To ascertain the adoption level, the farmers were asked about the actual use of each recommendation. Some recommendations were such, which a farmer adopted in full or did not adopt. There was no mid-way. The full adoption was awarded a scores of three, partially adopted two and non-adoption was given one score. Hence, the recommendations were assigned numerals to quantify the extent of adoption by the respondents.

RESULTS AND DISCUSSION

Adoption level of Bt cotton production technology *aspects by the growers :* The data in Table 1 was analyzed to assess the farmer's adoption level of the different recommended practices of Bt cotton production technology and they were accordingly categorized. According to the Table 1 the adoption level of the agronomic practices, the maximum percentage (39.37%) of the respondents fall in the category of medium level of adoption followed by high level of adoption (36.25%) and low (24.38%) level of adoption, respectively. In case of nutrient management which was studied in terms of micronutrient and manure & fertilizers, shows that only 6.25 per cent adopted at high level to the application of micronutrient in Bt cotton production, whereas 20 per cent respondents had medium level of adoption. Majority of the respondents (73.75%) were having low level of adoption regarding micronutrient management practices. In case of Manures and fertilizer application in Bt cotton production, only 25 per cent of the respondents had high level of adoption 21.25 per cent respondents having low level of adoption. Majority respondents (53.75%) were having medium level of adoption. It was further observed that 16.88 per cent respondents had low level of adoption about pest and diseases management and 25.62 per cent were in high adoption category. However, a majority of 57.50

per cent adopted it at medium level. It can be seen from the Table 1 that 33.13 per cent respondents had high level of adoption of recommended technology about picking of cotton and 40.32 per cent had medium level of adoption, 33.13 per cent of the respondents falls under low level of adoption about Bt cotton picking technology. In case of post harvest techniques of Bt cotton production, only 8.75 per cent of the respondents had high level of adoption, 49.38 per cent respondents were having medium level of adoption and 41.87 per cent respondents fallen in low level of adoption. *Bairwa and Singh (2013)* also reported that respondents had low adoption level about application of micronutrient in Bt cotton production, twenty percent respondents had high level of adoption regarding application of micronutrient *Janaki and Raja (2009)* were also found similar findings. Slightly more than half of the respondents had medium adoption level of manure and fertilizer application in production of Bt cotton, twenty five per cent respondents had high level of adoption about recommended manure and fertilizer application. These finding is in line with the finding of B*an et al. (2010)* whereas it was reported that medium level of adoption by the respondents about pest and disease management followed by high level of adoption was reported.

Table 1. Adoption level of Bt cotton production technology aspects by the growers (N=160)

Variables	Score range	No.	%
Agronomic practices	Low (less than 10)	58	36.25
	Medium (10-20)	63	39.37
	High (more than 20)	39	24.38
Nutrient management			
(a)Application of micronutrient	Low (less than 3)	118	73.75
	Medium (3-6)	32	20.00
	High (more than 6)	10	6.25
(b)Manures and fertilizer application	Low (less than 3)	34	21.25
	Medium (3-6)	86	53.75
	High (more than 6)	40	25.00
Pest and disease management	Low (less than 6)	27	16.88
	Medium (6-12)	92	57.50
	High (more than 12)	41	25.62
Picking of cotton	Low (less than 5)	53	33.13
	Medium (5-10)	65	40.62
	High (more than 10)	42	26.25
Post harvest techniques	Low (less than 3)	67	41.87
	Medium (3-6)	79	49.38
	High (more than 6)	14	8.75

According to data shown in Table 2, it can be ascertained that a majority (53.12%) of the respondents had medium level of overall adoption of Bt cotton

Figure 1. Adoption level of Bt cotton production aspects by the growers

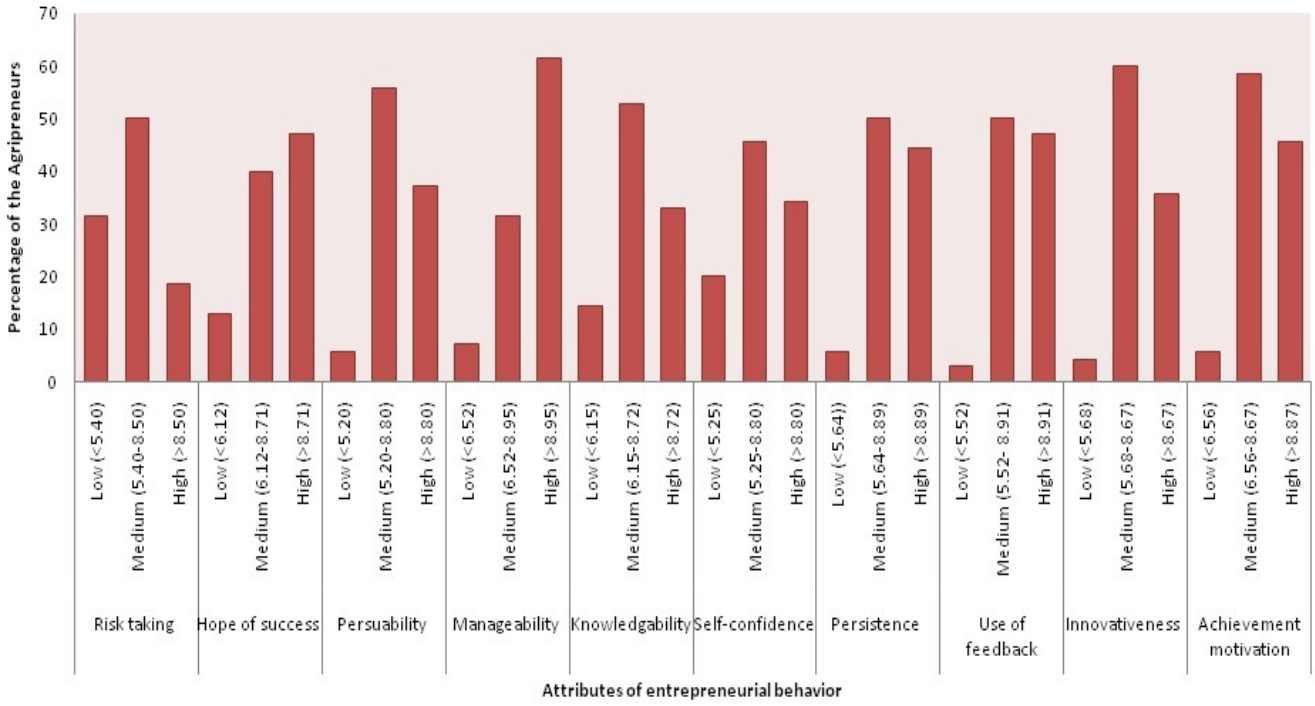

Table 2. Overall adoption level of Bt Cotton production technology by growers (N=160)

Category	Score range	No.	%
Low	Less than 36	43	26.87
Medium	36-72	85	53.13
High	More than 72	32	20.00

Table 3. Correlation of adoption with socio economic variables of Bt cotton growers.

Socio-economic variables	'r' value
Age	0.129
Education	0.563*
Socio-economic status	0.148
Irrigation facilities	0.247*
Mass media exposure	0.153
Risk orientation	0.107
Extension contact	0.339*
Economic motivation	0.497*
Scientific orientation	0.169

* Significant at 0.05 level of probability

production technology followed by 26.87 per cent of the respondents falls under the low category of overall adoption and 20 per cent respondents comes under high category of overall adoption, which suggest that farmers should be motivated to adopt the recommended practices of Bt cotton production technology through all possible extension methods. Similar type of study was conducted by *Sivanarayana et al. (2008), Ban et al. (2010) and Finger et al. (2011).*

Correlation of socio economic variables with adoption of Bt cotton on growers : In order to find out the influence of socio-economic variables on the adoption of Bt cotton by farmers, correlation coefficients were computed. As deduced from Table 3 age and socio-economic status of Bt cotton farmers were not significantly correlated but showed positive relation with the adoption of Bt Cotton. The table further shows that education played significant role to increase adoption level of Bt cotton production technology as it was found significant and positively correlated with a value of 0.563. Further, it was found that extension contact, irrigation facilities and economic motivation were having a positive and significant correlation with the adoption level of farmers with their respective 'r' values of 0.339, 0.247 and 0.497, respectively. This means that Bt cotton growers having higher level of education were having higher level of adoption of the Bt cotton production technology.

CONCLUSION

This study concluded that nearly half of the respondents having medium level of adoption about agronomic practices and one fourth respondents having high level of adoption about agronomic practices of Bt cotton production technology. The findings of this study suggest that farmers should be motivated to adopt the recommended practices of Bt cotton production technology through all possible extension methods.

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