Knowledge Level of Farmers About Recommended Production Techniques of Bt Cotton in Punjab

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ABSTRACT

Cotton is an important fibre and cash crop of India and it plays a dominant role in industrial and agricultural economy of the country. Punjab has more than 90 per cent of total cotton area under Bt cotton. The present study was conducted in Muktsar district of Punjab to assess the knowledge level of farmers about the recommended production techniques of Bt cotton crop. Two villages from each of the four blocks of Muktsar district *viz.* Muktsar, Malout, Lambi and Kotbhai were selected for the study and the total sample size comprised of 160 farmers for the present study. Data were collected with the help of structured interview schedule based on Bt cotton production techniques recommended by PAU, Ludhiana. The study revealed that a majority of the respondents (90.63%) had knowledge about recommended varieties of Bt cotton. Only 10.00 per cent of the respondents had knowledge about the economic threshold level (ETL) of white fly, whereas 13.75 per cent of the respondents had knowledge about economic threshold level of cotton jassid. Majority of the respondents had knowledge about the recommended insecticides for the control of jassid and bollworms. It was found that 36.88 per cent of the respondents had knowledge about the purpose of refuge crop grown in Bt cotton whereas only 8.15 per cent possessed knowledge about the ratio of Bt cotton to Non-Bt to be grown as refuge lines. Over all mean knowledge score of the respondents was calculated to be 13.85 and majority of the respondents (60.00%) was found to have low knowledge level about the recommended production techniques in Bt Cotton.

Key words: Bt Cotton, knowledge, adoption, ETL, refuge lines, punjab.

INTRODUCTION

Cotton is an important fibre and cash crop of India and it plays a dominant role in industrial and agricultural economy of the country. Cotton crop is also known as 'white gold' and is mainly grown for fibre. Cotton fibre is used to make a number of textile products for the consumers from all classes and nations wearing and using cotton clothes. India is a major cotton producer in the world having the largest area under cotton and is also the second largest consumer of cotton. In India, most of the cotton is cultivated under rainfed conditions. Thus the yield realization is heavily dependent on the monsoon. Another major factor is infestation of pests, especially the American bollworm, which attacks cotton plants at various stages of its life cycle. This implies that farmers have to incur large expenditure on pesticides every year. Cotton consumes about 45 per cent of pesticides used in Indian agriculture. Indiscriminant use of pesticides resulted in development of resistance in many insect-pests of cotton crop and thus increasing the cost of cultivation (Guillaume *et. al.* 2008).

Being a major commercial crop, cotton occupies an important place in agricultural scenario of Punjab. It is the main kharif crop of south-western districts of the state *i.e* Bathinda,. Mansa, Fazilka (part of erstwhile Ferozepur), Muktsar, Faridkot, Barnala and Sangrur. Cotton is being cultivated under irrigated conditions in Punjab.

Genetic Engineering Approval Committee (GEAC) on 26 March, 2002 gave approval for Bt cotton in India for the Central zone (Gujarat, Maharashtra & Madhya Pradesh) and South zone states (Tamil Nadu, Andhra Pradesh & Karnataka). Commercial cultivation of Bt cotton for Northern Zone including Punjab state was approved in the kharif season of year 2005 (Anonymous 2013).

Bt cotton accounts for 93 per cent of total cotton grown in India (Anonymous 2015a). At present two types of Bt cotton seeds are available in the Punjab state namely bollgard I and bollgard II. Bollgard I (BG I) carries single gene known to provide resistance to American bollworms, spotted bollworms and pink bollworms

whereas Bollgard II (BG II) carries two genes known for providing resistance to tobacco caterpillar in addition to American bollworms, spotted bollworms and pink bollworms (Khadi 2015). Cotton crop was cultivated on an area 472 thousand hectares with average productivity of 1603 kg per hectare (Anonymous 2015c). The present study was taken to assess the knowledge level about the recommended production techniques of Bt cotton (Gossypium hirsutum L.) in Muktsar district of Punjab.

METHODOLOGY

The study was conducted in purposively selected Muktsar district of Punjab during the year 2013. All the four blocks of Muktsar were selected for the study. The list of villages having Bt. cotton cultivation was obtained from Department of Agriculture. Two villages from each block were selected randomly from the list. The list of Bt cotton growers in each village was analyzed and 20 farmers were selected from each village. Total 160 Bt cotton growers were selected for the study. A structured interview schedule was prepared to collect the data from the respondents. The interview schedule was pre-tested on 20 non-sampled farmers to find out any ambiguity and weakness in the items.

On the basis of experience gained and information obtained through pre-testing, necessary modifications were made so as to make it easy for recording of data and to remove ambiguity. The data were collected personally by the researcher, visiting the study area and interviewing the respondents. The data were analyzed with the help of appropriate statistical tools.

RESULTS AND DISCUSSION

Cultural practices in cotton crop

Ankur 3028, MRC 7017 (Nikki), MRC 7031 (Rubi), NCS 855 (Raghav) are the BG II varieties of Bt cotton recommended by Punjab Agricultural University Ludhiana and a majority of the respondents *i.e.* 90.63 per cent had knowledge about recommended variety.

About one third *i.e.* 32.5 per cent of the respondents knew the correct advantage of deep ploughing before sowing Bt Cotton crop and 35.62 per cent of the respondents knew the recommended date of sowing. Only 11.25 per cent of the respondents knew the recommended seed rate of Bt cotton. Majority of the respondent i.e. 75.63 and 65.62 per cent knew the recommended row to row and plant to plant spacing. (Table 1)

Table 1: Distribution of respondents according to their knowledge of respondents about cultural practices of Bt cotton crop

Cultural practices	Frequency	%age
Recommended varieties of Bt cotton (Ankur 3028, MRC 7017, MRC 7031, NCS 855)	143	90.63
Deep ploughing before sowing Bt cotton improves yield	52	32.50
Recommended date of sowing	57	35.62
Recommended seed rate of Bt cotton	18	11.25
Spacing		
Row to row	121	75.63
Plant to plant	105	65.62
Irrigation at flowering and fruiting stage is critical	160	100
Crops like bhindi, moong and arhar should not be grown in Bt cotton	40	25.00

All of the respondents had the knowledge that irrigation should be given at flowering and fruiting stage. Only 25 per cent of the respondents had the knowledge that okra, grogram (moong) and pigeonpea should not be grown in or around Bt cotton crop.

Fertilizer practices in Bt Cotton crop: Table 2 showed that only 11.88 per cent of the respondents knew the recommended dose of nitrogen required for Bt cotton whereas recommended dose of phosphorous was known by only 19.38 per cent of the respondents.

Table 2: Distribution of respondents according to Knowledge about fertilizer practices in Bt cotton

Fertilizers	Frequency	% age
Recommended dosage		
Nitrogen	19	11.88
Phosphorous	31	19.38
Recommended time and method of application		
Nitrogen	89	55.62
Phosphorous	120	75.00

Majority of the respondents *i.e.* 75 per cent of the respondents had knowledge regarding the recommended time and method of application phosphorous fertilizers whereas 55.62 per cent of the respondents had knowledge about the recommended time and method of application of nitrogenous fertilizers.

Biological practices/ activities: Spider, green lacewing and wasp are the commonly occurring natural enemies of cotton pests. Respondents were asked to name any two of them. Only 15.62 per cent of the respondents had knowledge about natural enemies. (Table 3).

Table 3: Distribution of respondents according to their knowledge about biological practices/ activities of Bt Cotton

Biological practices	Frequency	% age
Natural enemies	25	15.62
Economic threshold level (ETL) of		
White fly *(Bemisia tabaci)*	16	10.00
Cotton jassid *(Amrasca biguttula)*	22	13.75

Transmission of cotton leaf curl through whitefly	25	15.63
Alternative host of leaf curl virus	5	3.13
Names of sucking pest of cotton	130	81.25
Cause of *"Tirak"* disease	7	4.38
Identification of common weeds	160	100
Identification of Zinc Deficiency known	51	31.88
"Para wilt" disease is caused due to excess irrigation	6	3.75
Causal organism of Root rot of Bt cotton	13	8.13

Only 10 per cent of the respondents had knowledge about the economic threshold level of white fly (*Bemisia tabaci*), whereas 13.75 per cent of the respondents had knowledge about economic threshold level of jassid (*Amrasca biguttula*). Cotton leaf curl is an important disease of cotton crop transmitted by white fly. Majority of respondents had no knowledge about transmission of cotton leaf curl disease whereas 15.63 per cent of the respondents reported white fly for the transmission of cotton leaf curl. Only 3.13 per cent of the respondents were aware about the alternative host of leaf curl virus.

Jassid, Aphid, White fly, Mealy bug etc. are the sucking pests of cotton. Majority of the respondents (81.25%) had knowledge about the sucking pests of cotton. Nutritional deficiency and lack of water management in Bt Cotton results in disease known as "Tirak". Only 4.38 per cent of the respondents had knowledge for the occurrence of Tirak disease in *Bt Cotton* crop. All of the respondents had knowledge about the common weeds of Bt cotton crop.

Zinc deficiency is seen over younger leaves in which the leaves remains small and the intervenial region turns yellow in colour. Very few of the respondents *i.e.* 31.88 per cent had knowledge about the zinc deficiency symptoms. Para wilt is a physiological disorder and no pathogen is involved. It occurs when crop is irrigated or after heavy rains. Only 3.75 per cent of the respondents had knowledge about exact cause of the occurrence of parawilt. Root rot is a fungal disease caused due to *Rhizoctonia solani* and *Rhizocotonia bataticola.* The main symptom is sudden and complete wilting of plants and the disease spread in field in round patches. Only 8.13 per cent of the respondents were aware about the causal organism of root root.

Knowledge about chemical practices : A little less than one fourth (24.38 %) of the respondents were not aware that all the insecticides did not belong to the same group. When the respondents were asked about the latest insecticides for control of bollworm, majority of respondents (93.75%) had knowledge about the latest insecticides.

Table 4: Distribution of respondents according to their knowledge about chemical practices of Bt cotton

Chemical practices	Frequency	% age
All the insecticides belong to same group	39	24.38
Latest insecticides for bollworm management	150	93.75
Recommended insecticides for control of jassid	159	99.37
Recommended non selective herbicides	159	99.37
Recommended insecticides for control of mealy bug	82	51.25
Sensitivity of Bt cotton to 2,4-D chemical	138	86.25

Confidor, Actara and Ulala are the recommended insecticides for the control of jassid. Majority of respondents (99.37%) had knowledge about the recommended insecticides for the control of jassid management. Gramoxone, Round Up and Excel Mera are the recommended non selective herbicides for the control of unwanted weeds.

Majority of the respondents (99.37%) had knowledge about the recommended herbicides. Larvin, Sevin, Curacron, Ekalux, Applaud, etc. are the recommended insecticides for the control of Mealy bug. Majority of the respondents (51.25%) had knowledge about the recommended insecticides for the control of mealy bug. Bt Cotton is highly sensitive to herbicide 2,4-D. A majority of the respondents (86.25%) had knowledge about the sensitivity of Bt Cotton towards 2,4-D herbicide.

Knowledge about Refuge crop : Non- Bt cotton is grown as refuge on the periphery of Bt cotton to prevent development of resistance against Bt in bollworms. If 20 per cent area is under refuge then it should be protected against bollworms but if refuge crop occupies only 5 per cent area then it should not be protected.

Table 5: Distribution of respondents according to knowledge about Refuge crop grown in Bt cotton

Practices	Frequency	% age
Purpose of refuge crop grown in Bt cotton crop	59	36.88
Ratio of Bt cotton to non Bt cotton to be grown as refuge	13	8.15
Use of chemical control measures for refuge crop	33	20.63

About 36.88 per cent of the respondents had knowledge about the purpose of refuge crop grown in Bt cotton whereas 8.15 per cent of the respondents had knowledge about the Bt to Non-Bt to be grown and only 20.63 per cent of the respondents had knowledge about the use of chemical control over refuge crop.

Over all knowledge level of Bt cotton growers

The knowledge test described in research methodology had 35 items. A differential weightage was

given to different test items. On the basis of observed scores, three categories were devised by using range method. The data in the table 6 show the overall knowledge level of the farmers. Majority of the respondents (60.00%) had low knowledge level. About 36 per cent of the respondents had medium knowledge level whereas 4.38 per cent of the respondents had high knowledge level. Over all mean knowledge score of the respondents was 13.85. Similar findings were also reported by Peshin (2005), Singh and Kaur (2004).

Table 6: Distribution of respondents according to over all knowledge level of Bt cotton growers

Knowledge level	Frequency	%age
Low (0-15)	96	60.00
Medium (15-30)	57	35.62
High (>30)	7	4.38

Mean knowledge score   = 13.85

CONCLUSION

Knowledge about recommended production techniques for Bt cotton is a pre-requisite for realization of its potential yield. The study indicated that the farmers had low knowledge about the various production techniques of Bt cotton *viz.* growing refuge, seed rate, dosage of nitrogen and phosphorous fertilizers, ETL level, *etc*. The findings of the study also suggest that farmers training should be intensified in the light of changing Bt cotton scenario and farmers should be educated regarding the proper selection of Bt cotton hybrid, the importance of refuge and judicious as well as need based use of pesticides.

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