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Knowledge and constraints in conservation of agricultural technology with special reference to growing of Bt. cotton in Haryana

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Abstract

Bt cotton technology was first developed and commercialized by the US company Monsanto in 1996. Bt technology has changed the landscape of cotton crop and has become the fastest adopted technology in the history of Indian agriculture. The study was conducted in Fatehabad district of Haryana state. Block Bhuna was selected from this district. From the selected block two villages namely Gorakhpur and Chobara were drawn, where more number of farmers was growing Bt. cotton. Chi – Square test used to find whether the two attributes are associated or not. This particular research was conducted with the specific objectives to know the nature and extent of adoption and examine the constraints faced by Bt. cotton growers. It was found that 20.00 per cent of the respondents had low level of adoption regarding Bt. cotton technology while 26.00 per cent and 74.00 per cent had it medium and high respectively. Main constraints reported by all the respondents were continued reduction in productivity of Bt. cotton and attack of white fly on their cash crop.

Keywords: Bt. cotton, technology, knowledge, socio-economic variables, constraints, adoption

Introduction

Cotton Cultivation Practices and Patterns across the States Cotton is cultivated in three agro ecological regions of India namely North, Central and South zones. The northern zone is completely irrigated whereas the percentage of irrigated area is much lower in central and southern zones. Northern zone comprises of Punjab, Haryana and parts of Rajasthan, which contributes 15.95% to national production. Central Zone comprises of States of Maharashtra, Gujarat and Madhya Pradesh. This region accounts for maximum area and production of Cotton in the country and contributes 58.14% to national production. Third zone is Southern Zone which comprises of Andhra Pradesh, Karnataka and Tamil Nadu which accounts for 24.64% to national production. 3.2.1 Area under Cotton Northern zone comprising of Punjab, Haryana and parts of Rajasthan where cotton is grown under irrigated conditions on alluvial and sandy soils. The region is known for growing *Gossypium hirsutum* and *Gossypium arboreum* type of cottons. After the introduction of Bt cotton, *Intrahirsutum* are being extensively cultivated. This zone has 11.67 % of total area under Bt cotton in India. Cotton-Wheat is the predominant cropping system. Main competitive crop coming up in Punjab is Basmati Rice. Many farmers have shifted from Cotton to Basmati Rice in districts of Mukatsar and Bhatinda owing to higher commodity prices of Basmati.

India is the largest producer of cotton in the world accounting for about 25% of the world cotton production and having the largest area under cotton cultivation, around 25% of the total world area under cotton. If we observe year wise area, production and productivity of cotton in India, Area has increased from 85.35 lakh hectares in 2000-01 to 129.94 lakh hectares in 2014-15 (as per third estimates by Directorate of Economics & Statistics, Department of Agriculture, Cooperation and Farmers Welfare).

Adoption and Growth of Bt Cotton over non Bt Cotton in India Bt cotton was approved by the Government of India for commercial cultivation in India in 2002 considering the positive report by Indian Council of Agricultural Research (ICAR) on trial of Bt cotton. In March 2002, the Genetic Engineering Appraisal Committee (GEAC), the regulatory body of the Government of India for transgenic crops approved the commercial cultivation of three Bt cotton hybrids: Bt MECH 12, Bt MECH 162 and MECH 184. These hybrids were developed by Monsanto in collaboration with its Indian partner Maharashtra Hybrids Seeds Company

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(MAHYCO). Bt technology has changed the landscape of cotton crop and has become the fastest adopted technology in the history of Indian agriculture. Within a decade after its commercialization in 2002, totally 1128 Bt hybrids have been developed and Bt cotton hybrid seed portfolio has evolved remarkably from single-trait monopoly situation to multi-traits monopolistic situation, giving farmers a wider choice for seeds and boosting the agri-biotech industry in the country. Consequently, Bt hybrids have replaced almost the entire area under non-Bt varieties in the country. However, in spite of almost universal adoption, there exists wide variation in cotton yield across cotton-growing states due to differences in climatic conditions, infrastructural developments and input utilization pattern. (Government of India, Final report 2016) [5].

Keeping in view fluctuation in the production of Bt. cotton, the study was planned with the following objectives-

- To know the nature and extent of knowledge of Bt. cotton.
- To examine the constraints faced by Bt.cotton growers

Methodology

The study was conducted in Fatehabad district of Haryana state. Block Bhuna was selected from this district. From the selected block two villages namely Gorakhpur and Chobara were drawn, where more number of farmers was growing Bt. cotton. From the selected villages 120 farmers were selected. Interview Schedule was prepared to collect the data of the experiment. Data were analyzed and tabulated to draw the inferences.

Results

Bt. cotton hybrids

It was reported (Fig 1) that main Bt. cotton hybrids grown were Rasi-602, Rasi-650, Rasi-773, Rasi-776 and Rasi-791, it is estimated to grow more than fifty percent of (51%) these

hybrids collectively by cotton growers while Bio-6488, Bio-6588, Bunty and Bio-105 hybrids were grown by one third of the respondents (31%). Rest eighteen percent of the farmers reported miscellaneous varieties of Bt. cotton seed.

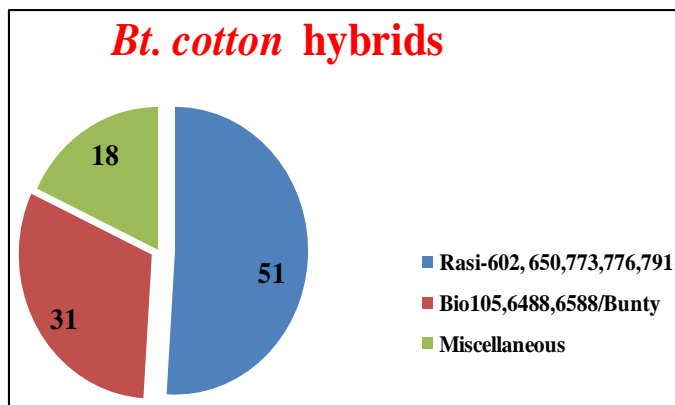


Fig 1: Bt.Cotton hybrids

In general three fourth of the respondents had used 2 packets containing 900 gms of hybrid seeds/acre and rest 25 percent used upto 900-1200 gms/acre. On the other hand quantity used for desi/non- Bt.cotton seed reported by large majority of farmers (66.66%) was 3-4 kg/acre and rest 38.33 per cent reported quantity required for desi/non-Bt. cotton was 4.1-5 kg/acre.

Yield of seed cotton as per area (n=120)

On an average estimates by farmers (Fig 2) it was indicated that a very low yield of seed cotton was obtained. It was reported only 4-6 quintal per hectare by 66.66 per cent of the Bt.cotton growers while rest 16.67 per cent each of the farmers gained it between 6.1-8 quintal per hectare and above 8 quintal per hectare.

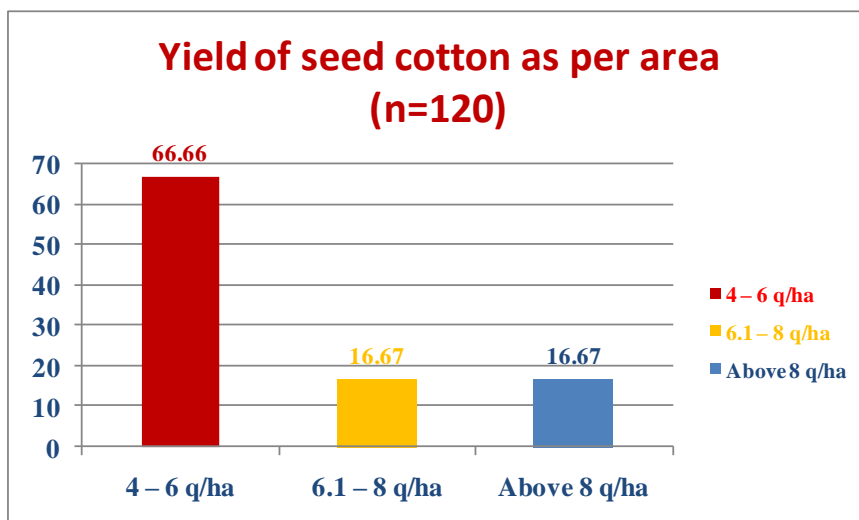


Fig 2: Yield of seed cotton as per area

Adoption level of respondents growing Bt. cotton

It was found that 20.00 per cent of the respondents had low level of adoption regarding Bt. cotton technology while 26.00 per cent and 74.00 per cent had it medium and high respectively. Significant association was found between age

and family type with adoption level of the farmers. On the other hand adoption level of the respondents about Bt. cotton was found non-significantly associated with caste, land holding, and mass media exposure.

Table 1: Association between Level of knowledge and socio-economic variables of the respondents growing Bt. *Cotton* (n=120)

Age (yrs.)	Level of knowledge			Total
	Low	Medium	High	
Young (upto 30)	9 (23.68)	12 (31.59)	17 (44.73)	38 (31.66)
Medium (30.1-50)	18 (29.50)	30 (49.18)	13 (21.32)	61 (50.84)
Old (Above 50)	15 (71.43)	4 (19.04)	2 (9.53)	21 (17.50)
Total	42 (35.00)	46 (38.30)	32 (26.70)	120 (100)
$\chi^2_{cal} = 21.86^*$				
Family size (members)				
Small (upto 4)	22 (51.10)	15 (34.90)	6 (14.00)	43 (35.80)
Medium (5-6)	7 (21.21)	11 (33.33)	15(45.46)	33 (27.50)
Large (above 6)	13 (29.50)	20 (45.50)	11 (25.00)	44 (36.70)
$\chi^2_{cal} = 13.32^*$				
Size of Land holding (acre)				
marginal (upto2.5 acre)	29 (82.90)	4 (11.40)	2 (5.70)	35 (29.20)
Small (2.5-5 acre)	10 (17.90)	36 (64.30)	10(17.80)	56 (46.70)
Semi-medium (5 – 10 acre)	3 (14.30)	4 (19.00)	14 (66.70)	21 (17.50)
Medium (above 10.0)	0	2 (25.00)	6 (75.00)	8 (6.60)
$\chi^2_{cal} = 78.83^*$				
Social participation				
Nil	35 (57.40)	21 (34.40)	5 (8.20)	61 (50.80)
Low (1)	4 (11.10)	19 (52.80)	13 (36.10)	36 (30.00)
Medium (2)	3 (13.00)	6 (26.10)	14 (60.90)	23 (19.20)
$\chi^2_{cal} = 39.96^*$				
Mass media exposure				
Low (upto 4)	37 (56.90)	23 (35.40)	5 (7.70)	65 (54.20)
Medium (5-8)	3 (8.60)	19 (54.30)	13 (37.10)	35 (29.20)
High (above 8)	2 (10.00)	4 (20.00)	14 (70.00)	20 (16.70)
$\chi^2_{cal} = 48.06^*$				

Figure in parenthesis denote percentage

*significant at 5 per cent level

Regarding the knowledge about Bt. *cotton*, maximum number of farmers had medium level of knowledge (38.30%) followed by low (35%) and rest 26.70 percent had it high.

All the respondents had favourable attitude towards Bt. *cotton* cultivation. Multiple socio-economic factors were found affecting the level of knowledge of farmers (Table 1). Association between age of the farmers and level of knowledge was found significantly associated. It was observed as the age increases level of knowledge decreases. Data revealed about three fourth of the respondents (71.43%) in old age had low level of knowledge while only 9.53 percent had it high. Family size was also found significantly associated with knowledge level of farmers. The study is accordance with the study of James (2008), Kumar *et al.* (2013) [12], Kranti, K. R., (2012) [10] and Kranti, K. R., (2014) [11].

Data revealed that respondents with semi medium and medium land holding had high level of knowledge i.e. 66.70 percent and 75 percent. On the other hand overwhelming majority of marginal and two-third of the small farmers had low and medium level of knowledge i.e. 82.90 percent and 64.30 percent, respectively. It was found as the size of land increases, knowledge level increases significantly. Similarly significant association was found between mass media exposure and knowledge level of respondents growing Bt.

cotton. About three fourth of the respondents with high mass media exposure had high level of knowledge (70%). Contrary to that more than fifty percent of the farmers each having low and medium mass media exposure had low and medium level of knowledge i.e. 56.90 percent and 54.30 percent respectively. The study is accordance with the study of Iyengar and Lalitha (2002) [13], Kiresur, V. R. and Ichangi, (2011) [8], Kouser, S. and Qaim, M., (2011) [9], Stone, G. D., (2011) [16] and Kumar, A., *et al.* (2013) [12].

Non-significant association was found between caste, education level and knowledge level of respondents growing Bt. *cotton*.

Reasons for growing Bt. *cotton*

Table: 2 shows many reasons for growing Bt. *cotton* even after a drastic reduction in production of the crop were reported by large majority of respondents like considering more productivity in previous years (79.16%), hope for higher income (68.33%) for next season. Near about two-third of the respondents were still in the favour of big boll size and ease in picking of Bt. *cotton* (62.50%) and rest 33.33% reported Bt. *cotton* was free from boll worm. The findings are accordance with the study of Acharya, K. (2006) [1] and Dev. (2008) [4] and Kathage, J. and Qaim, M., (2012) [7].

Table 2: Reasons for growing Bt. *cotton* (n=120)

Sr. No.	Reasons	Frequency	Percentage
1.	More productivity in previous years	95	79.16
2.	Hope for higher income	82	68.33
3.	Big boll size and ease in picking	75	62.50
4.	Free from bollworm(sundi)	40	33.33

Responses were multiple

Constraints in growing Bt. cotton

Many constraints were faced by Bt. cotton growers during the year. Main constraints reported by all the respondents shown in Table 3 were continued reduction in productivity of Bt. cotton and attack of white fly on their cash crop. About two third of the respondents (66.66%) reported more expensive seed of Bt. cotton than desi/non - Bt. cotton and it was found

expensive to grow Bt. cotton by 65 percent of the respondents. Binola/non Bt. cotton seed was also reported well for animals (41.66%). These findings are accordance with the study of Bennett *et al.* (2006) [3] and report of RFSTE (2002) [15] and Subramanian, A. and Qaim, M., (2011) [9] and Herring, R. J (2013) [6].

Table 3: Constraints in growing Bt. Cotton (n=120)

Sr. No	Reasons	Frequency	Percentage
1.	Continued reduction in productivity of Bt. cotton	120	100
2.	More attack of whitefly on Bt. cotton	120	100
3.	Less expensive seed of Desi/non. Bt	80	66.66
4.	More expenditure on Bt. cotton growing	78	65.00
5.	Binola/non Bt.cotton seed good for animals	50	41.66

Responses were multiple

Conclusion

It is concluded that significant association was found between age and family type with adoption level of the farmers. On the other hand adoption level of the respondents about Bt. cotton was found non-significantly associated with caste, land holding, and mass media exposure. All the respondents had favourable attitude towards Bt. cotton cultivation. Multiple socio-economic factors were found affecting the level of knowledge of farmers. Non-significant association was found between caste, education level and knowledge level of respondents growing Bt. cotton. Many constraints were faced by Bt. cotton growers during the year. Main constraints reported by all the respondents were continued reduction in productivity of Bt. cotton and attack of white fly on their cash crop.

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