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Assessing the Extent of Adoption of Improved Bt. Cotton Cultivation Practices by the Bt. Cotton Growers in Akola District

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ABSTRACT

Adoption of the improved technologies by the farmers is the prime aim of the social scientists for enhancing the production and income of the farmers. The present study highlighted the adoption level of Bt.Cotton growers about the improved Bt.cotton cultivation practices in Akola district of Maharashtra. About 120 Bt.Cotton growers were selected from 10 villages of Akola taluka through simple random sampling technique. The Ex-post facto research design was used in the present investigation and data were collected through face-to-face interview with the help of a structured interview schedule. The findings of the study revealed that majority of the respondents (57.50%) were having medium level of adoption regarding various improved cultivation practices of Bt.Cotton. Considering practise wise adoption of recommended technologies, it was found that majority of the respondents fully adopted major land preparation activities, proper sowing time of the seeds, various sowing operations, improved varieties and harvesting practices. On the contrary majority of the respondents shown completely non-adoption behaviour regarding various inter-cultivation practices, proper irrigation practices, Inter cropping, soil testing and planting of refugia. Study also revealed that the adoption of improved Bt.Cotton cultivation practices was positively influenced by different factors like; education, land holding, farming experience, annual income, sources of information, area under Bt.Cotton, irrigation facility, innovativeness, risk preference, knowledge of the Bt.Cotton grower.

Key words: *Adoption, Bt. Cotton, Improved cultivation practices, Correlation, Akola district.*

INTRODUCTION

Adoption is a mental process. In the modern era, new things are being invented by agricultural scientists but all the innovations are not being adopted by many of the members of social system. Adoption of an innovation depends on many factors *viz.*, awareness, knowledge, innovativeness of adopters and characteristics of innovations. It is generally assumed that if an individual has more knowledge about different aspects of technologies, he is likely to adopt the innovations with higher speed[6].

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Cotton (*Gossypium sp*.) the 'king of fibre crops', plays a very vital role in the Indian economy. It is named as a major cash crop of India. It is the major input to the Indian cotton textile industry. It generates employment to millions of people from cotton background engaged in various operations like; harvesting, plucking, and marketing, ginning and pressing of cotton. Cotton is one of the leading crops since it is labour-intensive, it needs season-long plant protection measures and also it is harvested not once, as in the case of most other crops, but four of five times in a season. It also contributes significantly to the country's foreign trade. More importantly, it is the highest earner of net foreign exchange, contributing over 30% from textile industry, which is fully dependent on Indian raw cotton. India ranks first in the world accounting for 20% of the total area under cotton plantation. However, even with highest area under cotton which is 9 million hectares; India occupies third position with only 13% of global production share. In Indian national scenario; though Maharashtra tops in total area under cotton cultivation which is 38.27 lakh hectares but trails Gujarat in both total production as well as in productivity[8]. Although enough viable and adoptive technologies have been developed in Bt. Cotton cultivation but many of these have not reached to the growers till today. There is significant yield gap existed in Bt. Cotton crop in Maharashtra. It is due to several reasons including the technological as well social aspects. Keeping this in view, it was felt necessary to undertake the study with the following objectives:

1) To assess the extent of adoption of improved Bt. Cotton cultivation practices by the Bt. Cotton growers.
2) To study the factors associated with the extent of adoption of improved Bt. Cotton cultivation practices.

The findings of the study would be useful for the administrators, policy makers, extension workers and scientists which may help them to accelerate the adoption of improved cultivation practices by Bt. Cotton growers.

MATERIAL AND METHODS

Present study was conducted in Akola taluka of Akola district in Vidarbha region of Maharashtra state. Akola taluka was purposively selected for the present investigation due to its highest production of Bt. Cotton in Vidharbha region. Total 10 villages were selected from Akola taluka and twelve respondents were selected from each village randomly .Thus, in total 120 Bt. Cotton growers considered as the sample respondents for the current study. An Ex-post Facto design of social research was used for the present investigation and the respondents were being interviewed with a structured interview schedule. The adoption of Bt. Cotton growers with respect to improved cultivation practices of Bt. Cotton was studied by computing adoption score. The responses were rated on three point continuum namely as complete adoption, partial adoption and non-adoption. A numerical score of 2 was assigned for full adoption, a score 1 was assigned for partial adoption and a zero was assigned for no adoption. The score of all identified practices were then summed up. This sum total indicates the adoption score of that particular individual respondent. The scores of all the practices earned by each individual were added together to work out the adoption score of an individual. The raw scores then were converted into adoption index as mentioned below.

$$\text{Adoption Index} = \frac{\text{Adoption score actually obtained}}{\text{Maximum obtainable Adoption score}} \times 100$$

The data collected were tabulated and analyzed by using descriptive statistics (frequency and per centage) and analytical statistics.

RESULTS AND DISCUSSION

1. Extent of Practice wise Adoption:

The results obtained after analysis of data about adoption of improved package of

practices by the Bt.Cotton growers are presented in the Table-1.

A. Land preparation: It was observed that, 94.16 per cent and 100.00 per cent of the Bt.Cotton growers completely adopted the suitable soil for Bt. Cotton cultivation and major land preparation practices like tillage, harrowing or hoeing respectively. Because the soil of Akola taluka is mostly black cotton soil and farmers are well aware of various primary cultivation practices. In case of FYM (Farm Yard Manure) application 45.83 per cent and 50.00 per cent of the respondents did not adopt the recommended doses of FYM and the recommended time for application of FYM respectively. It is due to the unavailability of required quantity of FYM in those village areas.

B. Period of sowing: Regarding period of sowing majority of the Bt.Cotton growers (76.67%) followed complete adoption for recommended time of sowing both for irrigated and rain fed condition. The reason is that majority of the growers get proper information regarding sowing from the progressive farmers, friends, radio, various input dealers.

C. Sowing operations: It was found that majority of the Bt.Cotton growers (75.83%) completely adopted the improved sowing method, little less than two-third (65.83%) of the respondents completely adopted proper sowing depth of seeds, and also more than two-third of the respondents (70.00%), fully adopted recommended number of seeds per hill basis .

D. Variety selection: It was observed that all of the Bt.Cotton growers (100.00%) adopted the varietal recommendations of Bt.Cotton for that particular area. It is due to most of the private companies like Monsato, Bayer, Nuziveedu seeds are very active in those villages to aware the growers regarding improved varieties of Bt.Cotton like Ajit-155, Rashi-II, Swarna, Mallika BG-II etc.

E. Seed rate & Spacing: Around 45 per cent of the Bt.Cotton growers completely adopted the recommended seed rate for sowing both in rain fed as well as irrigated condition. Most of the farmers opined that Bt.Cotton seeds are being sold at a very high market price, resulting them to adopt lower seed rate rather than recommended seed rate. 45.83 per cent of the respondents partially adopted the recommended spacing for Bt. Cotton.

F. Inter-cultivation Practices: It was observed that majority of the Bt.Cotton growers (80.83%) had complete adoption in gap filling operation, followed by nearly half (47.50%) of the growers adopted the hand weeding operation. On the other side 49.17 per cent and 52.50 per cent of the growers neither used any weedicide for chemical control of the weeds, nor did they adopt the recommended dose of the weedicide. They had the perception; if they used weedicide it would have altered the lint colour of cotton. Among the Bt.Cotton growers 52.50 per cent did not adopt the application of NAA due to lack of proper knowledge regarding its use in preventing square and boll drop. While, 51.67 per cent of the Bt.Cotton growers adopted the spraying of 1% $MgSO_4$ to control reddening. It was found that more than half (54.17%) of growers did not adopted the foliar spraying of planofix as a growth inducer. Further, it was found that half of the respondents (50.83%) and 45.83 per cent of the respondents adopted the spraying of 2% Urea at flowering stage and 2%DAP at boll development stage respectively.

G. Water Management: The study revealed that majority of the respondents i.e. 45.00 per cent had non adoption behavior about recommended number of irrigations to be given at proper growth stages of Bt.Cotton. Most of the farmers are well aware about different critical stages of irrigation for Bt.Cotton crop but due to lack of proper irrigation facilities they were unable to follow proper irrigation schedule.

H. Inter Cropping: Majority of the Bt.Cotton growers (43.33%) did not adopt the Inter cropping practices, followed by 30.83 per cent of the Bt.Cotton growers who followed intercropping with Bt.Cotton. Basically the growers were unaware about yield enhancing benefit of inter crop along with the additional returns.

I. Integrated Nutrient Management: In case of Integrated Nutrient Management, majority of the Bt.Cotton growers (60.00%) did not adopt soil testing. They stated that soil testing laboratories were far away from their cotton fields and carrying the soil samples to the laboratory was very much tiring for them and the concerned authorities were sluggish in issuing soil health cards. Further it was observed that 48.33 per cent of the respondents properly used recommended fertilizer dose in the cotton field and other respondents were ignorant of split dose fertilizer application. Now for the management of the deficiency of various micro nutrients like Mg, Zn & Br, it was found that more than half of the respondents (57.50%) followed the spraying of $ZnSO_4$, $MgSO_4$ and Borax respectively along with recommended doses.

J. Integrated pest and Disease management: While studying the various integrated pest and disease management practices, it was found that 51.67 per cent and 40.00 per cent of the Bt.Cotton growers completely adopted the use of various chemicals for insect control and disease control of Bt.Cotton respectively. Further it was observed that 45.83 per cent and 47.50 per cent of the respondents did not adopt the recommendations about planting Refugia and spraying of 5% neem kernel extract respectively because most of the growers didn't have proper knowledge regarding the benefits of planting Refugia, which acts as trap crop, preventing the insect attack and the use of bio-pesticides which help to maintain environmental sustainability.

K. Harvesting: Regarding harvesting practices, it was found that 61.67 per cent of the growers completely adopted the harvesting practice at correct stage and 40.00 per cent of the growers followed the recommended numbers of picking for Bt.Cotton. Most of the growers faced the labour crisis due to which most of them were unable to follow proper harvesting practices.

2. Extent of overall adoption:

The data with regards to the extent of overall level of adoption of improved Bt.Cotton cultivation practices by Bt.Cotton growers, furnished in Table 2, indicates that majority of the Bt.Cotton growers (57.50 %) had medium level of adoption of improved cultivation practices, whereas 28.33 per cent Bt.Cotton growers had high level of adoption and only 14.16 per cent Bt.Cotton growers had low level of adoption of improved cultivation practices of Bt.Cotton. Similar findings were also reported by Girhe[2] where majority of the cotton growers (63.33%) were found in medium level of adoption regarding integrated nutrient management practices.

2. Factors associated with the extent of adoption of improved Bt.Cotton cultivation practices:

Efforts were made to find out the relationship of the selected personal, socio-economic, communication, situational and psychological characteristics of growers with their extent of adoption of improved cultivation practices of Bt.Cotton. The coefficients of correlation were worked out and have been presented in Table-3. It could be seen that the variable age was found negatively and significantly correlated with adoption at 0.01 level of probability which showed that, the tendency of adopting the new technologies by the farmers decreased with the increase in age. However, land holding, area under Bt.Cotton cultivation and risk preference of the respondents were found positively and significantly correlated with adoption at 0.05 level of probability. This indicates that the farmers who had wide range of cultivated land area, along with higher proportion of area under Bt.Cotton cultivation and those who took more chances in using new technologies had more adoption level. Other variables like education, farming experience in Bt.Cotton cultivation, annual income, source of information, innovativeness, knowledge, irrigation facility had positively-significant relation with extent of adoption at 0.01 level of probability.

Table 1: Distribution of Bt.Cotton growers according to their extent of practice wise adoption of recommended package of practices for cultivation of Bt.Cotton

Sl. No.	Cultivation practices	Adoption (n=120)		
		Complete Adoption	**Partial Adoption**	**Non Adoption**
		Freq. (%)	**Freq. (%)**	**Freq. (%)**
A.	**Land preparation**			
i)	Type of soil used for cultivation of Bt. Cotton (Medium to heavy black cotton soil)	**113 (94.16)**	0 (0.00)	7 (05.83)
ii)	Any two major land preparation operation before sowing the seeds (Ploughing, harrowing, etc.)	**120 (100.00)**	0 (0.00)	0 (0.00)
iii)	Recommended dose of FYM/ha for Bt. Cotton cultivation (5 to 6 tonnes /acre)	22 (18.33)	43 (35.84)	**55 (45.83)**
iv)	Proper timings of FYM application (2 to 3 weeks before sowing)	26 (21.67)	34 (28.33)	**60 (50.00)**
B.	**Period of sowing**			
i)	Recommended time of sowing for Bt.Cotton seeds (In irrigated condition–within May, In rainfed condition-up to 15 July.)	**92 (76.67)**	6 (05.00)	22 (18.33)
C.	**Sowing operations**			
i)	The best suited method of sowing the seeds of Bt.Cotton.(Dibbling method)	**91 (75.83)**	9 (07.50)	20 (16.67)
ii)	The proper sowing depth for sowing Bt. Cotton seeds (3-5cm)	**79 (65.83)**	30 (25.00)	11 (09.17)
iii)	Number of seeds require per hill basis (2 seeds per hill)	**84 (70.00)**	12 (10.00)	24 (20.00)
D.	**Variety selection**			
i)	The recommended varieties of Bt. Cotton in your area (Ajit-155, Rashi-II, Swarna, Mallika BG-II, Denim, First class, Saroja etc.)	**120 (100.00)**	0 (0.00)	0 (0.00)
E.	**Seed rate and spacing**			
i)	The recommended seed rate of Bt. Cotton (For rain fed condition :2.5-3 kg/ha. For irrigated condition: 1.5-2.2 kg/ha)	**54 (45.00)**	40 (33.33)	26 (21.67)
ii)	The recommended spacing required for Bt.Cotton. (Rain fed -90 X 45-60 cm. For irrigated-120 X 45-60 cm)	40 (33.33)	**55 (45.83)**	25 (20.84)
F.	**Intercultivation Practices**			
i)	Gap filling (Gap filling for maintaining the proper plant population)	**97 (80.83)**	8 (06.67)	15 (12.50)
ii)	Hand weeding (hand weeding for manual weed control)	**57 (47.50)**	26 (21.67)	37 (30.83)

iii)	Weedicides to control pre and post emergence weeds in Bt.Cotton (In case of Pre. emergence : STOMP, In case of Post. emergence : TARGASOPHAR)	35 (29.16)	26 (21.67)	**59 (49.17)**
iv)	Recommended dose of weedicides for chemical control of weeds in Bt.Cotton (stomp:15ml/10lt,Targasophar: 2ml/ lt of water)	25 (20.83)	32 (26.67)	**63 (52.50)**
v)	Practices to control square and boll drop (Topping, application of NAA(100ml/ac)	36 (30.00)	21 (17.50)	**63 (52.50)**
vi)	Spraying of Bt.Cotton with 1% $MgSO_4$ (10 gm of $MgSO_4$ in 1 lit. of water at 45 and 75 days after sowing to control reddening)	**62 (51.67)**	18 (15.00)	40 (33.33)
vii)	In case growth of the plants is stopped , use foliar sprays of Planofix @ 0.25ml/lit of water	30 (25.00)	25 (20.83)	**65 (54.17)**
ix)	Spraying of 2% urea at the time of flowering (200 gms + 10 lt water, to ensure proper flowering)	**61 (50.83)**	23 (19.17)	36 (30.00)
x)	Spraying of 2% DAP (200 gms + 10 lts. of water, to ensure proper boll development)	**55 (45.83)**	22 (18.33)	43 (35.83)
G.	**Water management**			
i)	Total no. of irrigations to be given for all critical stages in Bt. Cotton cultivation.(4 to 6 irrigations)	27 (22.50)	39 (32.50)	**54 (45.00)**
H.	**Inter cropping**			
i)	Inter cropping in Bt. Cotton (Cotton + Green gram / Black gram, Cotton + Sorghum + pigeon Pea + Sorghum, cotton + marigold etc)	37 (30.83)	31 (25.84)	**52 (43.33)**
I.	**Integrated Nutrient Management**			
i)	Soil testing (To know the soil nutrient status)	20 (16.67)	28 (23.33)	**72 (60.00)**
ii)	The application of recommended fertilizer doses for Bt. Cotton (For irrigated condition N:P:K- 80:40:40,For rain fed condition N:P:K– 60:30:30)	**58 (48.33)**	40 (33.33)	22 (18.33)
iii)	The split doses of Fertilizer application (Under rain fed-apply 50% N, entire dose of P_2O_5 and K_2O as basal dose at the time of sowing and top dress remaining 50% N at 60 DAS. Irrigated conditions, apply 50% N & K_2O and entire P_2O_5 as basal at sowing and top dress 25 % N & K_2O at 30 DAS and remaining 25% N & K_2O at 60 DAS in 2 split doses)	33 (27.50)	**49 (40.83)**	38 (31.67)
iv)	Spraying of Bt.Cotton crop with $ZnSO_4$ - 2 gm in 1lt of water, with 1% $MgSO_4$- 10 gm in 1lt of water, with Borax- 1.5 gm in 1 lt of water (To manage the deficiency of micro nutrient Mg, Zn & Boron)	**69 (57.50)**	18 (15.00)	33 (27.50)
J.	**Integrated pest and Disease management**			
i)	Chemicals to control the pests in Bt.Cotton (Imidachloprid, Thiomethoxom, Phipronil, Triazophos or profenophos)	**62 (51.67)**	26 (21.67)	32 (26.66)
ii)	Chemicals to control the diseases of Bt.Cotton (Copper	**48**	29 (24.17)	43 (35.83)

	Oxychloride, Streptocycline, Bavistin, Carbendazim)	**(40.00)**		
iii)	Planting of Refugia (Planting non-Bt cotton in border rows of Bt.Cotton to prevent pest attack into main field)	35 (29.17)	30 (25.00)	**55 (45.83)**
iv)	Spraying of 5% neem kernel extract (to control sucking pests, bollworms etc)	38 (31.67)	25 (20.83)	**57 (47.50)**
K.	**Harvesting**			
i)	Appropriate time of picking for Bt.Cotton (165-175 DAS or within 5-7 days of boll bursting)	**74 (61.67)**	20 (16.67)	26 (21.66)
ii)	Total No. of picking recommended for Bt.Cotton (2-3 pickings)	**48 (40.00)**	31 (25.83)	41 (34.17)

Table 2: Distribution of Bt.Cotton growers according to their extent of overall adoption level about improved cultivation practices of Bt.Cotton

Sl. No.	Extent of Adoption	Respondents (n=120)	
		Frequency	Percentage
1	Low	17	14.16
2	Medium	**69**	**57.50**
3	High	34	28.33
	Total	**120**	**100**

Table 3: Relationship between selected characteristics of respondents with their extent of adoption of improved Bt.Cotton cultivation

Sl. No.	Characteristics	Adoption (`r' value)
1	Age	-0.22158**
2	Education	0.2317**
3	Land holding	0.15465*
4	Occupation	-0.04660^{NS}
5	Farming experience in Bt.Cotton	0.23958**
6	Annual Income	0.23931**
7	Sources of information	0.48894**
8	Area under Bt.Cotton	0.19329*
9	Irrigation facility	0.354715**
10	Innovativeness	0.35221**
11	Risk preference	0.1663*
12	Knowledge	0.83007**

* Significant at 0.05 level of probability
** Significant at 0.01 level of probability
NS Non Significant

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CONCLUSION

On the basis of the above discussion, it is can be concluded that majority of the Bt.Cotton growers had medium level adoption of improved Bt.Cotton cultivation practices. Higher adoption level was observed in land preparation, planting related practices, nutrient management practices, harvesting practices; whereas lower adoption was observed in inter cropping, irrigation and FYM, micro nutrient, weedicide, bio pesticide application. Different factors viz. education, land holding, farming experience in Bt.Cotton cultivation, annual income, sources of information, area under Bt.Cotton, irrigation facility, innovativeness, risk preference, knowledge was found positively correlated with the extent of adoption, while age was found negatively correlated. In view of the above findings, the study recommends that efforts should be made by extension agencies through their various programmes to highlight the economic benefits of improved Bt.Cotton cultivation practices to promote awareness among the Bt.Cotton growers. Study tours, exposure visits, participation in fairs and exhibitions could be the ideal methods.

REFERENCES

1. Arora, A. and Bansal, S., Diffusion of Bt. Cotton in India: Impact of Seed Prices and Technological Development. JNU, India (2011).
2. Girhe, A. V., Adoption of integrated nutrient management practices by cotton growers. M.Sc. (Agri). Thesis (unpub.), Dr. PDKV, Akola (2011).
3. Kadam, S. S., Thombre, B. M. and Mande, J. V., Technological gap in sugarcane. *J. of Maha. Agril. Univ.* **35(3):** 424-427(2010).
4. Maraddi, G.N., Hirevenkanagoudar, L.V., Angadi, J.G., Extent of Adoption of Selected Sustainable Cultivation Practices by Sugarcane Growers, *Karnataka J. Agric. Sci.,* **20(3):** 560-563 (2006).
5. Mayee, C.D., Singh, P., Dongre, A.B. and Rao, M.R.K., Transgenic Bt. Cotton. CICR Technical Bulletin NO: 22, Central Institute for Cotton Research, Nagpur. (2014).
6. Patel K.S., Adoption of Recommended Mustard Cultivation Practices by the Mustard Growers. *International Journal of Agriculture Sciences*, **8(21):** 1387-1388 (2016).
7. Singh, P. K., Barman, K. K. and Varshney, J. G., Adoption behavior of vegetable growers towards improved technologies. *Indian Res. J. Extn. Edu.,* **11(1):** 62-65(2011).
8. www.cotcorp.gov.in. The Cotton Corporation of India (CCI).