The Andhra Agric. J 61(4):931-937, 2014

A Study on Knowledge Level of Farmers about BT Cotton Cultivation Technologies in Andhra Pradesh

B Mukunda Rao, M Suryamani and R Ratnakar
District Agricultural Advisory and Transfer of Technology Center, Ongole, Prakasam district

ABSTRACT

The study was conducted with 180 cotton farmers to assess the knowledge level on Bt cotton production technologies. The study revealed that majority (60.56%) of Bt cotton farmers had medium knowledge followed by high (20.00%) and low (19.44%) knowledge levels respectively on Bt cotton cultivation technologies. The study also indicated that the knowledge of farmers towards Bt cotton cultivation technologies was more or less same among large, medium and small farmers. Majority of the respondents were found to have knowledge on purpose of development of Bt cotton (92.22%), names of Bt cotton hybrids (86.67%), critical crop growth stages for irrigation (83.33%), days of protection of Bt technology against boll worms(83.33%).

Key words : Analysis of variance, Bt cotton, Content analysis

Cotton popularly known as 'White Gold' is an important premier commercial crop of India. During April, 2002, Genetic engineering approval committee approved three Bt cotton hybrids designated as MECH-12, MECH-162 and MECH-184 for commercial cultivation. Now Indian farmers have a choice of over 522 Bt cotton hybrids for commercial cultivation. Even after introduction of Bt cotton in Andhra Pradesh, the productivity has jumped from a meager 418 kg/ha in 2002 to touch 596 kg/ha during 2009-10 .Where as in China the average cotton lint yield was 1265 kg/ha and the world average was 785 kg/ha. So there is a need for overcoming the gap between the potential yield and realized yield. This could be possible only by understanding the trends of knowledge level of farmers regarding Bt cotton cultivation. So the present study was formulated to find out the knowledge level of farmers on Bt cotton cultivation technologies. Gahukar (2007) pointed that 29.00 per cent of the large farmers had adequate level of knowledge on cotton cultivation followed by small (19.30%) and marginal (8.70%) farmers.

An ex-post facto research design was used for conducting research. Three districts namely Guntur, Adilabad and Kurnool districts representing Andhra, Telangana and Rayalaseema regions of Andhra Pradesh respectively were selected. Two mandals from each district were selected by using random sampling technique. Thus, a total of 6 mandals were selected from all the three districts. A total of 18 villages at the rate of three villages from each mandal were selected randomly. From each village ten farmers comprising small (88), medium (49) and large (43) farmers were selected by following proportionate stratified random sampling method. Thus, a total number of 180 respondents were selected from 18 villages. 46 knowledge items were used to unearth the knowledge level of the respondents. Based on the knowledge score obtained, the respondents were grouped in to three categories with the help of mean and standard deviation. Content analysis was also carried out to find out the knowledge of farmers on different aspects of Bt cotton cultivation technologies. The knowledge test administered to the respondents contained 46 items on Bt cotton cultivation practices. These findings and discussion are presented in the following subsections.

1. Distribution of respondents based on their knowledge on the Bt cotton cultivation technologies.
2. Differences in knowledge level of farmers with respect to Bt cotton cultivation technologies.
3. Item analysis of knowledge of farmers on the knowledge level of farmers with

respect to Bt cotton cultivation technologies.

1. Distribution of respondents based on their knowledge on the Bt cotton cultivation technologies.

It is evident from table 1 that, 61.36 per cent of the small farmers had medium level of knowledge and 21.58 percent had low level of knowledge followed by high (17.06%). Among the medium farmers 61.22per cent of the respondents had medium knowledge followed by low (20.41%) and High (18.37%).

In case of the large farmers 58.13 per cent of the farmers had medium level of knowledge followed by high (27.90%) and low (13.95%). The results of the pooled sample indicated that majority (60.56%) of Bt cotton farmers had medium knowledge followed by high (20.00%) and low (19.44%) knowledge levels respectively on Bt cotton cultivation technologies.

2. Difference in knowledge level of farmers with respect to Bt cotton cultivation technologies.

The data regarding to the knowledge of different categories of farmers were analysed by applying analysis of variance test to find out the differences in their knowledge scores. The results are presented in table 2

Null hypothesis: There is no significant difference among the mean knowledge score of farmers in three groups.

Empirical hypothesis: There is significant difference among the mean knowledge score of farmers in three groups.

As could be seen from the table 2 reveals that calculated F value was less than the table value. Therefore, the null hypothesis was accepted and empirical hypothesis was rejected and concluded that means of three categories of farmers did not differ significantly. Therefore it could be concluded that the knowledge of farmers towards Bt cotton cultivation technologies was more or less same among all the sample farmers.

3. Content analysis of knowledge items on Bt cotton cultivation technologies.

To gain more insight on the knowledge of the respondents on Bt cotton cultivation technologies content analysis was carried out and the results are furnished in the table 3.

Results furnished in the Table 3 revealed that the respondent farmers had knowledge on the Bt cotton cultivation technologies in the following rank order. Purpose of development of Bt cotton (92.22%), names of Bt cotton hybrids cultivated in your area (86.67%), critical crop growth stages for irrigation (83.33%), days of protection of Bt technology against boll worms(83.33%),Bt cotton is not resistant to all pests of Bt cotton (80.56%), purpose of topping of branches in cotton at 18-20 sympodial branches stage (80.56%), Purpose of providing non Bt cotton seed along with Bt cotton seed(80.56%) ,recommended crop rotation (77.78%), trap crop for spodoptera (77.78%), recommended insecticides against sucking pests (75.56%), in Bt cotton magnesium deficiency symptoms are observed on older leaves (73.33%),chemicals recommended for boll rot in Bt cotton (72.78%), advantages of spraying of boron in Bt cotton cultivation (62.78%).recommended pheromone traps per acre (62.78%), recommended seed rate per acre (62.22%), differences between Bollgard I and Bollgard II (61.11%), trap crop for Helichoverpa (59.44%), recommended dosage of farm yard manure per acre (58.33%),purpose of erecting pheromone traps (58.33%), purpose of use of napthalic acetic acid in Bt cotton (55.56%),recommended insecticide against mealy bugs (55.00%), chemicals recommended for management of grey mildew in cotton (54.44%) recommended pre emergence herbicide for Bt cotton (53.89%), recommended dosage of urea for foliar application (51.67%), causes for purple leaf of cotton (49.44%), recommended boarder crop (48.33%), recommended spacing (46.67%), recommended intercropping (45.00%), recommended dose of nitrogen per acre (43.89%), recommended dose of potash fertilizer (38.89%), causes for appearance of silvery white patches on the lower side of leaves (36.67%), paraquat is a herbicide (35.00%), recommended dose of phosphatic fertilizers (33.33%),recommended chemicals for the management of bacterial leaf spot (33.33%),neem products are highly effective against mealy bugs(33.33%),appropriate time for application of phosphate fertilizers for Bt cotton (31.66%), first genetically modified crop introduced for commercial cultivation in India (30.56%), purpose of refuge crop (26.11%), year of

Table 1. Distribution of the respondents according to their knowledge on Bt cotton cultivation .

S.No	Category	Small farmers (n=88)		Medium farmers (n=49)		Large farmers (n=43)		Total (n=180)	
		F	%	F	%	F	%	F	%
1	Low	19	21.58	10	20.41	6	13.95	35	19.44
2	Medium	54	61.36	30	61.22	25	58.13	109	60.56
3	High	15	17.06	9	18.37	12	27.90	36	20.00
Mean		22.53		22.77		25.34			
SD		8.53		7.90		8.42			

Table 2. Differences in knowledge scores of farmers in respect of Bt cotton cultivation technologies.

Source of variation	D.F	Sum of squares	Mean sum of squares	F .Cal value	F. Tab value
Between samples	2	245.465	122.7326	1.764 NS	3.40
Within samples	177	12314.1957	69.571		

NS: Non- significant

introduction of Bt cotton in Andhra Pradesh (24.44%), recommended ratio of imidacloprid and water for stem application (24.44%),percentage of area to be allocated for growing non- Bt cotton (20.56%), purpose of stem application (18.33%), purpose of keeping yellow sticky traps (17.22%), economic threshold levels for Jassid (12.22%), recommended bio fertilizers (8.33%) and recommended schedule of stem application (7.22%).

RESULTS AND DISCUSSION

The results in Table 1 revealed that the Bt cotton farmers seem to have medium level of knowledge about Bt cotton technologies. Most of the small and medium farmers were found to have medium level followed by low level of knowledge in the order. It is quite interesting to observe from the results that the knowledge level of large farmers was medium to high. This might be due to their involvement and interest in acquiring the needed technical matters to run the farm effectively for getting more economic returns. In addition to that their higher economic status results in better accessibility to mass media sources like newspapers, journals, television. Higher level of education, more social participation , high scientific orientation were the other factors might be influence the farmers to have medium level of knowledge on Bt cotton cultivation practices.

The results in Table 2 also revealed that there is no significant difference between knowledge level among small, medium and large farmers. This is interesting finding that the Bt cotton technologies were well versed by all the categories of farmers irrespective of their farm size. This also proved that technology input is neutral to farm size.

Some of the reasons that could be possibly attributed for medium knowledge were irregular visit of extension functionaries due to unmanageable area to be covered and due to lack of upto date knowledge about Bt cotton cultivation practices. However, the ATMA, could able to answer the problems to some extent since there is able

mechanism for systematic transfer of technology through organization of farmers –scientists interaction programmes, need based exposure visits and on farm trials. The findings were in conformity with the findings of Saurab Sharma et. al. (2001), Satpal singh et.al.(2003), Reddy *et.al.,* (2007) and Shakya et.al. (2008).

The findings in the Table 3 reveal that above 75 per cent of the respondents had knowledge on simple agronomic aspects like purpose of development of Bt cotton, names of Bt cotton hybrids cultivated in your area, days of protection of Bt technology against boll worms, critical crop growth stages for irrigation, Bt cotton is not resistant to all pests of Bt cotton, purpose of topping of branches in cotton at 18-20 sympodial branches stage, Purpose of providing non Bt cotton seed along with Bt cotton seed, recommended crop rotation, trap crop for spodoptera and recommended insecticides against jassides. Generally farmers have more knowledge on technologies which are being adopted by them. That's why respondents have more knowledge on these aspects. In addition to that effective extension strategies adopted by input dealers, ANGRAU and department of agriculture has created more awareness on the above items. The performance of Bt cotton in the farmers fields may also be created more interest in the respondents to know more information about Bt cotton cultivation aspects.

It could be understood from the Table 3 that fifty to less than seventy five per cent of the respondents had knowledge on symptoms of magnesium deficiency ,chemicals recommended for boll rot ,advantages of spraying of boron in Bt cotton cultivation, recommended pheromone traps per acre, recommended seed rate per acre, differences between Bollgard I and Bollgard II , trap crop for Helichoverpa , recommended dosage of FYM per acre ,purpose of erecting pheromone traps, purpose of use of napthalic acetic acid in Bt cotton ,recommended insecticide against mealy bugs, recommended pre emergence herbicide for Bt cotton and recommended dosage of urea for foliar application, which needs practical experience in Bt cotton cultivation and enthusiasm, interest and critical observation on the part of the farmers for acquiring knowledge about the above technologies. So the extension functionaries should organize training programmes, demonstrations to further enhancement of knowledge of the farmers on the above Bt cotton cultivation practices.

While 25 to less than fifty per cent of the respondents were having knowledge on the causes for purple leaf of cotton, recommended border crop, recommended spacing, recommended inter cropping, recommended dose of nitrogen per acre, recommended dose of potash fertilizer, causes for appearance of silvery white patches on the lower side of leaves, paraquat a herbicide, recommended dose of phosphatic fertilizers, neem products are highly effective against mealybugs, recommended chemicals for the management of bacterial leaf spot,appropriate time for application of phosphate fertilizers for Bt cotton, first genetically modified crop introduced for commercial cultivation in India, and purpose of refuge crop. The above practices involve technical skills, expertise and comprehensive awareness to understand. Knowledge of the respondents on the above areas can be improved by organizing training programmes, screening video cassettes and arranging study tours to get first hand information about the Bt cotton cultivation aspects under their natural settings.

It is also clear from the table 3 that less than 25 per cent of the farmers had knowledge on year of introduction of Bt cotton in Andhra Pradesh , recommended ratio of imidacloprid and water for stem application, chemicals recommended for management of grey mildew in cotton ,percentage of area to be allocated for growing non- Bt cotton , purpose of stem application , purpose of keeping yellow sticky traps , economic threshold levels for Jassid, recommended bio fertilizers and recommended schedule of stem application. Farmers perceived that the above technologies are complex to understand and difficult to adopt.

Majority of the respondents had knowledge on most of the practices of Bt cotton cultivation. On the other hand, majority of the respondents had less knowledge on integrated pest management components.

The less knowledge in some of the technologies mentioned above may be because of low and no education and poor extension contact by the farmers in the study area. Since knowledge was a prerequisite for the adoption of any innovation, the medium level of knowledge possessed by the

Table 3. Content analysis of knowledge items on Bt cotton cultivation technologies .

S.No	Knowledge items	N=180				Rank
		Correct knowledge		Incorrect knowledge		
		Frequency	Per centage	Frequency	Per centage	
1	Cotton is the first Genetically modified crop that was introduced for commercial cultivation in India.	55	30.56	125	69.44	37
2	Difference between Bollgard I and Bollgard II cotton	110	61.11	70	38.89	16
3	Year of introduction of commercial cultivation of Bt cotton in Andhra Pradesh.	44	24.44	136	75.56	39
4	Names of Bt cotton hybrids cultivated in your area.	156	86.67	24	13.33	2
5	The recommended quantity of seed per acre for sowing Bt cotton.	112	62.22	68	37.78	15
6	The recommended spacing for sowing Bt cotton crop in your area.	84	46.67	96	53.33	27
7	Recommended dose of farm yard manure per acre	105	58.33	75	41.67	18
8	The percentage of area that is to be allocated for growing Non Bt cotton around the Bt cotton fields	37	20.56	143	79.44	41
9	The recommended dose of Nitrogen fertilizer per acre of Bt cotton.	79	43.89	101	56.11	29
10	The recommended dose of phosphate fertilizer per acre of Bt cotton.	60	33.33	120	66.67	33
11	The recommended dose of potassic fertilizer per acre of Bt cotton.	70	38.89	110	61.11	30
12	The appropriate time for application of phosphate fertilizer for Bt cotton.	57	31.66	123	68.33	36
13	The recommended bio fertilizers for Bt cotton	15	8.333	165	91.67	45
14	The recommended fungicides for management of Grey mildew in Bt cotton	98	54.44	82	45.56	22
15	Pendemethalin is a pre-emergence herbicide recommended for Bt cotton	97	53.89	83	46.11	23
16	The stages that are critical for irrigation in Bt cotton are boll formation and boll development.	150	83.33	30	16.67	3
17	The recommended dosage of urea for foliar application in Bt cotton.	93	51.67	87	48.33	24
18	The causes for Purple leaf of cotton in Bt cotton	89	49.44	91	50.56	25
19	In cotton Mg deficiency symptoms are observed on older leaves	132	73.33	48	26.67	11
20	Advantages of spraying boron in Bt cotton	113	62.78	67	37.22	13
21	Advantages of spraying Napthalic acetic acid for Bt cotton	100	55.56	80	44.44	20

Table 3. Cont.....

S.No	Knowledge items	N =180				Rank
		Correct knowledge		Incorrect knowledge		
		Frequency	Per centage	Frequency	Per centage	
22	Bt cotton protects the crop against boll worms during cotton crop growth period of 90-100 days.	150	83.33	30	16.67	4
23	Purpose of maintenance of Refuge crop in Bt cotton cultivation.	47	26.11	133	73.89	38
24	Bt cotton is resistant to all the pests of cotton	145	80.56	35	19.44	5
25	Bt cotton was developed for the management of boll worms in cotton	166	92.22	14	7.778	1
26	Inter cropping with pulses reduces the incidence of sucking pests.	81	45.00	99	55.00	28
27	Boarder crop around Bt cotton crop with jowar builds up the predators	87	48.33	93	51.67	26
28	Crop rotation with jowar/ soybean/korra reduces the pest population	140	77.78	40	22.22	8
29	Number of pheromone traps are required per one acre.	113	62.78	67	37.22	14
30	Castor is a trap crop for spodoptera	140	77.78	40	22.22	9
31	Marry gold is a trap crop for Helicoverpa	107	59.44	73	40.56	17
32	The ETL for jassid in Bt cotton.	22	12.22	158	87.78	44
33	Purpose of topping of branches in Bt cotton at 18-20 sympodial branches stage	145	80.56	35	19.44	6
34	Pheremone traps help in pest control by attracting male moths	105	58.33	75	41.67	19
35	Appearance of silvery white patches on the lower side of leaves are the symptoms of damage of jassid in cotton	66	36.67	114	63.33	31
36	Purpose of providing Non- Bt cotton along with Bt cotton seed	145	80.56	35	19.44	7
37	Neem products are highly affective against mealy bugs in Bt cotton	60	33.33	120	66.67	35
38	Stem application of Monocrotophos is effective up to 50 days for control of sucking pests in Bt cotton.	13	7.222	167	92.78	46
39	The recommended ratio of imidacloprid and water for stem application for Bt cotton.	44	24.44	136	75.56	40
40	Purpose of use of yellow sticky traps in Bt cotton	31	17.22	149	82.78	43
41	Paraquat is a herbicide	63	35	117	65.00	32
42	The chemicals that are recommended for the management of boll rot in Bt cotton	131	72.78	49	27.22	12
43	The chemicals that are recommended for the management of Bacterial leaf spot in Bt cotton.	60	33.33	120	66.67	34
44	The insecticide recommended for the control of mealy bug on Bt cotton.	99	55.00	81	45.00	21
45	The recommended insecticides against sucking pests of Bt cotton.	136	75.56	44	24.44	10
46	Stem application in Bt cotton with monocrotophos is recommended for the control of sucking pests in Bt cotton.	33	18.33	147	81.67	42

farmers should be motivated to acquire more knowledge in which they are lacking. So there is a need to organise demonstrations on integrated nutrient management and integrated pest management for showing the efficiency of the technologies in the farmer's fields. Farmers are utilizing natural resources indiscriminately and also causing air, water and soil pollution by using pesticides and fertilizers indiscriminately. Therefore non- economic benefits like environment and health benefits of IPM and INM and bio safety measures such as growing refuge crop should be given adequate attention in the media coverage. So that farmers knowledge on eco-friendly technologies of Bt cotton cultivation could be enhanced. This finding is in accordance with the findings of Vasantha and BuchaReddy (2007) and Reddy *et.al.,* (2007)

LITERATURE CITED

Gahukar R T 2007 A base line survey of Knowledge, perception and experience of cotton growers in Maharashtra.*Journalof Indian society of cotton improvement,* 193-200

Reddy P T S, Prabhakar K and Gidda Reddy P 2007 Analysis of influence of selected independent variables on knowledge of rice farmers on Eco- friendly technologies. *Journal of Research. ANGRAU,* 35 (2) 31-37

Satpalsingh V K, Makhija V K, Jogindar S, Malik and Subhash chandar 2003 Farmers knowledge and correlates of sunflower production technology, *Indian Journal of Extension Education,* 39(1&2): 115-117

Saurab Sharma,Tyagi B D, Sharma G C and Singh S P 2001 Constraints in adoption of improved rice production technology Agricultural Extension Review Vol. 13(2):17-22

Shakya M S, Patel M M and Singh V B 2008 Knowledge level of chick pea growers about chick pea production technology, *Indian Researah Journal of Extension Education,* 8 (2&3);65-68.

Vasantha R and Buchareddy 2007 Critical analysis of Knowledge possessed by cotton farmers on IPM Practices. *Journal of Research ANGRAU,* 35 (2) 43-51.

(Received on 21.11.2012 and revised on 20.02.2013)