



# Adoption of Integrated Pest Management Technologies in Controlling Pink Bollworm by Cotton Growers in Nagpur District of Maharashtra, India

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

## Article Information

DOI: 10.9734/AJAEES/2023/v41i71965

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/100553>

**Original Research Article**

**Received: 18/03/2023**  
**Accepted: 22/05/2023**  
**Published: 24/05/2023**

## ABSTRACT

The present study was conducted in Nagpur district of Vidarbha region of Maharashtra state. The study was taken up in Umred and Nagpur rural talukas of Nagpur district. 10 respondents were selected from 12 villages of these talukas which constitutes total number of 120 respondents. The findings of the research revealed the adoption level of Integrated Pest Management (IPM) technologies in controlling pink bollworm by cotton growers. Most of cotton growers i.e., 60.84 per cent of cotton growers had medium level of adoption of IPM technology. Socio economic characteristics like Education, land holding, area under cotton cultivation, source of irrigation,

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annual income, source of information, extension contact, economic motivation and risk orientation were positively and significantly related with adoption of IPM for controlling pink bollworm. Whereas, age and farming experience were negatively significant with adoption of IPM for controlling pink bollworm and occupation was positively non-significant with adoption of IPM for controlling pink bollworm.

**Keywords:** Adoption; IPM; knowledge; pink bollworm.

## 1. INTRODUCTION

A source of intrigue is cotton, a significant cash crop that is referred to as the "King of Fibre" globally. Cotton provides the world with an important natural fabric material. It is a significant fibre crop that is grown throughout the world and is a member of the genus *Gossypium* of *Malvaceae* family.

"India is having 1st place in the world with estimated production of 362.18 lakh bales (6.16 million Metric Tonnes during cotton season 2021-22 i.e., 23% of world cotton production of 1555 lakh bales (26.44 million Metric Tonnes). India is also the 2nd largest consumer of cotton in the world with estimated consumption of 338 lakh bales (5.75 million Metric Tonnes i.e., 22% of world cotton consumption of 1507 lakh bales (25.63 million Metric Tonnes)" [1].

"The pink bollworm was a serious concern for cotton in India about 30 years ago. There were very few reports of any major damage by pink bollworm to cotton since 1982 in the country. But all that has changed now. *Pectinophora gossypiella* (Saunders) is the most destructive pest of cotton in later stages of the crop growth. During 2014 severe damage to bolls by pink bollworm and yield-losses were observed in Bt-cotton in many regions of Gujarat and some parts of AP, Telangana and Maharashtra. More concerning is the fact that the worm is happily chewing up Bollgard-II-Bt-cotton which contains two genes (cry1Ac+cry2Ab) that were supposed to be highly effective in controlling the pest" [2].

"Pink bollworm has now emerged as a major pest of cotton in all cotton growing areas in India. The pest mainly fed on seeds causing economic loss. Infestation occurs in mid and late stages of the crop remains undetected due to feeding behavior and causes loss of yield quality. An indiscriminate use of chemical pesticides for the control of major pests on cotton resulted in development of resistance to the pesticides in targeted insects and having adverse effects on their natural enemies and non-targeted pests,

disturbance in balance of nature, resurgence of minor pests, pollution in crop ecosystem, hazards to health and economy" [3]. All above problems demand new way of thinking of non-toxic, cost effective and indigenous traditional methods of plant protection which include cultural, mechanical and biological practices. However modern chemicals invaded on these traditional practices and the use of indigenous technical knowledge started declining. There is a new approach of managing the insect pests commonly known as "Integrated Pest Management" (IPM).

"Integrated Pest Management (IPM) is an eco-friendly approach which aims at keeping pest population at below economic threshold levels by employing all available alternate pest control methods and techniques such as cultural, mechanical and biological with emphasis on use of bio-pesticides and pesticides of plant-origin like neem formulations. IPM is based on the principle that it is not necessary to eliminate all the pests but to suppress the pest population to a level at which these pests do not cause significant losses through the combination of biological, cultural, mechanical and chemical tool in such a way that it minimizes economic, health and environment risks" [4].

"Maharashtra is an important cotton producing state in India but the average yield of cotton is very low. The reason of this situation is the high occurrence of pest attacks in cotton crop. Chemicals available market to control these pests is costly and toxic in nature causing lower fertility of soil. There is a need to adopt a balanced use of plant protection measures but, there are several factors which are responsible for non-adoption of these practices" [5]. Therefore, this research aims to investigate about the knowledge and adoption of Integrated Pest Management Technologies in Controlling Pink Bollworm by Cotton Growers in Nagpur District of Maharashtra. The investigation was carried out in Vidarbha region of Maharashtra during the year 2022-2023.

## 2. METHODOLOGY

For the study, the research design adopted was descriptive in nature since the phenomenon was already occurred. Nagpur district of Vidarbha region of Maharashtra was selected by purposive sampling for the present study, because most of the farmer are growing cotton crop and most of the area affected by pink bollworm. There are 14 talukas of Nagpur districts out of which two talukas namely Umred and Nagpur rural were selected through purposive sampling methods on the basis of maximum area under cotton cultivation. From two selected talukas twelve villages (six from each taluka) namely Amboli, Bela, Amgaon, Aptur, Belpeth, Amghat, Ashta, Alagondi, Banwadi, Bharatwada, Chicholi and Deoli were selected by because the area having highest number of IPM cotton growers in these villages. With the help of taluka agriculture officer list of cotton growers were prepared of selected villages. From that list 120 respondents were selected randomly for the present study. The primary data was collected with help of structured interview schedule and secondary data were collected from library, journal and other material. The entire data was further tabulated and analyzed through appropriate statistical tools.

## 3. RESULTS AND DISCUSSION

From Table 1 it was reported that among cultural methods 56.16 per cent of respondents had partially adopted, 32.50 per cent had fully adopted and 13.34 per cent had not adopted the method of Deep ploughing during summer; 60.00 per cent, 28.34 per cent and 11.66 per cent of

respondents partially adopted, fully adopted and not adopted respectively to timely sowing method; 55.83 per cent, 22.50 per cent and 21.66 per cent of respondents partially adopted, not adopted and fully adopted respectively the method of Selection of recommended variety with early medium maturity; 42.50 per cent, 32.50 per cent and 25.00 per cent of respondents fully adopted, partially adopted and not adopted respectively the method of Allowing cattle grazing on the leftover green bolls of the plant at the end of crop season.

Among mechanical method of IPM 56.66 per cent of respondents had partially adopted, 27.50 per cent had fully adopted and 15.84 per cent had not adopted the method of Hand picking and destruction of larvae; 46.66 per cent, 32.50 per cent and 10.83 per cent of respondents partially adopted, fully adopted and not adopted respectively the method of Destruction of cotton stubbles immediately after the harvest; 48.34 per cent, 27.50 per cent and 24.16 per cent of respondents partially adopted, not adopted and fully adopted respectively the method of Use of pheromone traps (2-3 pheromone traps/acer) for monitoring.

Among biological method of IPM 56.66 per cent of respondents had partially adopted, 25.00 per cent had fully adopted and 18.33 per cent had not adopted the method of Spraying of Neem Seed Kernel Extract (N.S.K.E.) 5% during flowering stage; 56.66 per cent, 22.50 per cent and 20.83 per cent of respondents not adopted, partially adopted and full adopted respectively the Use of Trichocards (3cards/acre) i.e. for 7-8 times after the initiation of flowers at an interval 8-10 days.

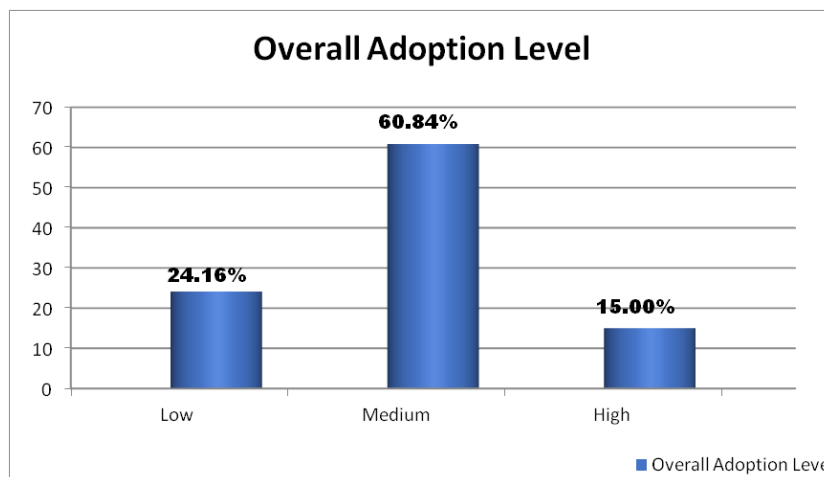


Fig. 1. Distribution of cotton growers according to their overall adoption level

Table 1. Practice wise adoption of the IPM technologies in controlling pink bollworms

Sr. No.	Statement	Response					
		Fully Adopted		Partially Adopted		Not Adopted	
		f	%	f	%	f	%
<b>A</b>	<b>Cultural method</b>						
1.	Deep ploughing during summer (March -April)	39	32.50	65	54.16	16	13.34
2.	Timely sowing (Avoid pre monsoon sowing) (June) first week	34	28.34	72	60.00	14	11.66
3.	Selection of recommended variety with early medium maturity. (140 to 160 days duration and resistance to sucking pest)	26	21.66	67	55.83	27	22.50
4.	Allowing cattle grazing on the leftover green bolls of the plant at the end of crop season. (Jan-Feb)	51	42.50	39	32.50	30	25.00
<b>B</b>	<b>Mechanical method</b>						
5.	Hand picking and destruction of larvae (August)	33	27.50	68	56.66	19	15.84
6.	Destruction of cotton stubbles immediately after the harvest (Jan-Feb)	39	32.50	56	46.66	13	10.83
7.	Use of pheromone traps (2-3 pheromone traps/acer) for monitoring. August (at the time of flowering)	29	24.16	58	48.34	33	27.50
<b>C</b>	<b>Biological Method</b>						
8.	Method of Spraying of Neem Seed Kernel Extract (N.S.K.E.) 5% during flowering stage. (July end-August)	30	25.00	68	56.66	22	18.33
9.	Use of Trichocards (3cards/acre) i.e. for 7-8 times after the initiation of flowers at an interval 8-10 days.	25	20.83	27	22.50	68	56.66
<b>D</b>	<b>Chemical Method</b>						
10	Application of Chloropyriphos 20 ml/10lit. / Quinolphos 20ml/10lit / Profenophos 20 ml/10 lit / Thiodicarb 20 gm/10lit at initial stage of ETL. July-August	27	22.50	80	66.64	13	10.83
11	Avoid mixing of agrochemicals. (Monocrotophos + Acephate)	21	17.50	75	62.50	24	20.00
12	Use of synthetic Pyrethroides (Cypermetherium 10 ml/10 lit and Fenvelrate 8 ml/10lit) and combination product (During boll formation stage) Nov.-Dec.	18	15.00	72	60.00	30	25.00

**Table 2. Distribution of cotton growers according to their overall adoption level**

Sr. No.	Category	Frequency	Percentage
1.	Low	29	24.16
2.	Medium	73	60.84
3.	High	18	15.00
	<b>Total</b>	<b>120</b>	<b>100.00</b>

**Table 3. Relationship between profiles of cotton growers with adoption**

Sr. No.	Independent variable	Correlation coefficient (r)
1.	Age	-0.234*
2.	Education	0.256*
3.	Occupation	0.143
4.	Land holding	0.314*
5.	Area under Cotton Cultivation	0.345*
6.	Farming experience (in years)	-0.259*
7.	Source of irrigation	0.212*
8.	Annual income	0.240*
9.	Source of information	0.459**
10.	Extension Contact	0.513**
11.	Economic motivation	0.578**
12.	Risk orientation	0.456**

\* Significant at 0.05 per cent level of probability

\*\* Significant at 0.01 per cent level of probability

Among chemical method of IPM 66.64 per cent of respondents had partially adopted, 22.50 per cent had fully adopted and 10.83 per cent had not adopted the method of Application of Chloropyriphos 20 ml/10lit. / Quinolphos 20ml/10lit / Profenophos 20 ml/10 lit / Thiodicarb 20 gm/10lit at initial stage of ETL; 62.50 per cent, 20.00 per cent and 17.50 per cent of respondents partially adopted, not adopted and fully adopted respectively the method of Avoid mixing of agrochemicals (Monocrotophos + Acephate); 60.00 per cent, 25.00 per cent and 15.00 per cent of respondents partially adopted, not adopted and fully adopted respectively the method of Use of synthetic Pyrethroides (Cypermetherium 10 ml/10 lit and Fenvelrate 8 ml/10lit) and combination product.

It is elucidated from Table 2 that majority (60.84%) respondents had medium level of adoption of IPM technologies in controlling pink bollworm followed by 24.16 per cent respondents had low level of adoption and 15.00 per cent had high level of adoption. Similar findings were reported by Neethi and Sailaja [6].

It was observed from Table 3 that education, land holding, area under cotton cultivation, source of irrigation, annual income, source of information, extension contact, economic motivation and risk orientation were positively and significantly related with adoption of IPM for

controlling pink bollworm. Whereas, age and farming experience were negatively significant with adoption of IPM for controlling pink bollworm and occupation was positively non- significant with adoption of IPM for controlling pink bollworm [7-13].

#### 4. CONCLUSION

It was concluded that to control the major pests like pink bollworm in cotton crop an eco-friendly approach needs to be adopted. Therefore, the farmers adopted Integrated Pest Management (IPM) in cotton crop. Socio economic characteristics like Education, land holding, area under cotton cultivation, source of irrigation, annual income, source of information, extension contact, economic motivation and risk orientation were positively and significantly related with adoption of IPM for controlling pink bollworm. Whereas, age and farming experience were negatively significant with adoption of IPM for controlling pink bollworm and occupation was positively non- significant with adoption of IPM for controlling pink bollworm.

#### CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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