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### Constraints faced by cotton growers in following pesticides use, care, and pest management practices

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#### Abstract

Cotton farming accounts for over 55% of India's pesticide use, causing environmental, health, and economic challenges. Despite a 53% reduction in pesticide use through Integrated Pest Management (IPM), adoption remains inconsistent. The present study was conducted in Warora and Bhadravati taluks of Chandrapur district of Maharashtra during the year 2023-24 with a sample size of 140 cotton growers. The objective to measure the 'Personal, Socio-economic and psychological characteristics of the Cotton Growers and constraints faced by Cotton growers in pesticides use, care and pest management practices and suggestions given by them'. An ex-post facto design of social research was used. From present study it was found that, most of the cotton growers were in the 36 - 53 years age group, most of them were educated up to higher secondary education, belonged to medium size of family, had medium level of farming experience, had marginal land holding, had medium income level, had medium level of source of information, had medium level of extension contact, had medium level of social participation, had medium scientific orientation. Cotton growers faced several challenges, including high costs of labor, pesticides, and equipment, along with inadequate training on improved cultivation practices. They struggled to distinguish between harmful and beneficial insects and faced limited availability of bio-pesticides, pheromone traps, and trichocards. Many were unaware of pesticide hazards, the importance of safety gear, and lacked knowledge of equipment usage, repair, and maintenance. Additionally, they had poor understanding of pesticide doses, chemical properties, and application methods. The investigation revealed respondents' suggestions for improving pesticide care practices among cotton growers. Key recommendations included timely provision of affordable plant protection appliances and inputs, training on advanced cultivation practices, and government support in identifying and conserving beneficial insects. Respondents highlighted the need for local availability of bio-pesticides, pheromone traps, and trichocards, along with education on pesticide hazards and the use of protective gear like masks and aprons. They also emphasized training on equipment usage, repair, maintenance, and guidance on selecting appropriate pesticides and their dosages. These measures aim to enhance safe and effective pesticide management.

**Keywords:** Pesticides use, care, pest management practices

#### Introduction

Cotton (*Gossypium* spp.) is a globally important fibre crop, valued for its versatility and economic significance. Its soft, absorbent fibres are widely used in textiles, including clothing, bedding, and household items. Cotton cultivation supports agricultural economies, providing livelihoods and contributing to rural development.

Cotton thrives in warm, tropical, and subtropical regions with temperatures of 21-30°C, ample sunlight, and moderate rainfall. A growing period of 150-200 frost-free days is ideal. Although drought-tolerant, cotton requires sufficient moisture during flowering and fruiting. It grows best in well-drained, fertile soils like loam or clay loam, rich in organic matter. Proper soil preparation, including tilling and fertilization, ensures optimal growth and yield.

The FAO reported that 40% of pesticide-related deaths occur in low- and middle-income countries, emphasizing the

need for improved safety protocols and training. Data from the National Crime Records Bureau (NCRB) indicates that in 2014, there were 7,365 cases of poisoning due to accidental intake of insecticides/pesticides across India. Reports suggest that between 2011-12 and 2017-18, Maharashtra experienced 18,108 occupational poisoning cases with 809 fatalities. In the 2017-18 period alone, there were 2,787 cases and 63 fatalities. Gujrat Maharashtra and Telangana are major cotton producing states which produce about 65 per cent of cotton production in country with Maharashtra contributing significantly. In Maharashtra state Chandrapur have the soil and climatic condition of Chandrapur district is most suitable for cotton cultivation. The production and productivity are good in this region. Data also reveals that majority of the farmers are cultivating cotton in the villages of Warora and Bhadravati tehsil. The excessive use of pesticides in cotton farming, which

accounts for over 55% of India's total pesticide consumption, has led to severe environmental, health, and economic concerns. Improper pesticide use, lack of safety awareness, and over-reliance on chemical methods have caused soil degradation, water pollution, and health risks. Studies highlight inconsistent adoption of sustainable practices like Integrated Pest Management (IPM), with many cotton growers lacking awareness or resources. For instance, in Maharashtra, where cotton is a major crop, Raut *et al.* (2019) <sup>[22]</sup> found that most cotton growers had moderate knowledge of insecticide application and limited adherence to recommended practices. Although awareness campaigns and IPM have shown positive results, such as a 53% reduction in pesticide use over the last decade, gaps in adoption persist, especially in resource-poor regions. In Yavatmal district of Maharashtra, Hundreds of cotton growers suffered from pesticide poisoning. According to Special Investigation Team (SIT) Nagpur, appointed by Government of Maharashtra had blamed the farmers and farm laborers for "their failure to follow safety measures." Keeping the above fact in the view, the present study entitled "Constraints faced by cotton growers in following pesticides use, care, and pest management practices" was undertaken with the following objectives.

### Objective

1. To study Personal, Socio-economic and psychological characteristics of the Cotton Growers.
2. To study constraints faced by Cotton growers in pesticides use, care and pest management practices and suggestions given by them.

### Methodology

The study was conducted in Chandrapur district of Maharashtra state. An ex-post facto research design was used for the study. Warora and Bhadravati were the two tehsils were selected for the study from Chandrapur district. Ten villages from each tehsil were selected randomly. From each village, 7 respondents were selected. Thus, from twenty village, total 140 respondents were selected by random sampling method. A structured interview schedule was developed and used as a data collection tool. Data were collected by personal interview of cotton growers. Their responses were considered for the purpose of the study. The collected data were processed, tabulated, classified and analysed.

### Result and Discussion

#### 1. To study Personal, Socio-economic and psychological characteristics of the Cotton Growers.

##### Age

The data represented in table 1 revealed that majority of the respondents belongs to the middle age group *i.e.* age group of 36 to 53 years of age 65.00 per cent followed by 22.15 per cent belong to old age group and 12.85 per cent belonged to young age group.

The most of the cotton growers (65.00 per cent) were of middle age group *i.e.* 36 to 53 and they are bearing majority of family responsibility. Middle-aged farmers were more involved in cotton cultivation, likely due to their enthusiasm, energy, financial independence, and social activity. In contrast, younger farmers often relocate for

education or careers, while older farmers lack the energy for intensive work. The findings are in line with Kumbhani *et al.* (2017) <sup>[18]</sup>, Aglawe (2019) <sup>[2]</sup>, Ghuge (2019) <sup>[11]</sup> and Waywal (2019). <sup>[28]</sup>

##### Education

From the table 1 it is observed that 2.85 per cent of respondents were illiterate, 25.00 per cent respondents educated up to primary school, 40.00 per cent up to secondary school, 20.00 per cent of respondents were educated up to higher secondary, 12.15 per cent of respondents were educated up to graduation level.

The majority of respondents had secondary education, likely due to its affordability and accessibility in villages. However, higher education was limited by a lack of awareness and early involvement in agriculture to support families. Some had only primary education, hindered by financial constraints and limited rural opportunities, reflecting the socio-economic challenges in these areas. The findings are in line with Kirmirwar (2019) <sup>[16]</sup> and Aglawe (2019) <sup>[2]</sup>.

##### Size of family

According to the data given in the Table 1, it is revealed that 60.00 per cent of cotton growers belonged to medium family size (6 to 9 members) after that 28.57 per cent of cotton growers belonged to small family size and 11.43 per cent were of large family size.

The rising cost of living and the benefits of reduced expenses and comfort have led rural households to adopt medium-sized families, balancing labour and farming support. However, some joint families persist, influenced by the belief in "unity is strength" and the role of grandparents in discouraging separation. These findings are in line with the studies of Navya and Naika (2021) <sup>[20]</sup> and Wankhede (2020) <sup>[27]</sup>.

##### Farming experience

Table 1 shows that 60.71 per cent of the cotton growers are having medium farming experience ranging from 9 to 25 years after that 20.00 per cent of highly experienced farmers (26 and above years) rest of the cotton growers 19.29 per cent are with low farming experience *i.e.* up to 8 years.

It can be inferred from the foregoing discussion, that 60.71 per cent, of cotton growers, had medium experience. The fact that most cotton growers were in their middle age may have contributed to their average level of farm experience. This finding was more or less in conformity with the results of Kirmirwar (2019) <sup>[16]</sup>, Kadari (2022) <sup>[15]</sup>, Jakkawad (2019) <sup>[13]</sup> and Dukare (2022) <sup>[8]</sup>.

##### Land holding

From the Table 1 it is observed that 34.29 per cent of the respondents possessed marginal land holding (up to 1.00 ha), 22.85 per cent of the respondents has possessed small land holding (1.01 to 2.00 ha) whereas, 32.15 per cent of the respondents possessed semi medium land holding (2.01 to 4.00 ha), 10.71 per cent of the respondents possessed medium land holding (4.01 to 10.00 ha) which is large group of respondents and 0 per cent possessed a large land holding (10.01 to above ha).

The most of the farmers have marginal land holding *i.e.* less than 1 ha, The most likely reason for each farmer's reduced

land holding size is may be due to the division of land and splitting of land from generation to generation. The similar findings reported by Kirmirwar (2019) [16].

**Annual income**

From Table 1, it can be seen that 70.71 per cent of cotton growers had a medium level of income, after that 15.00 per cent of high-income cotton growers and 14.29 per cent of low-income cotton growers.

Most of the farmers have medium annual income this may be due to most of the farmers are belonged to the marginal and semi medium size of land holding. The findings of this analysis are more or less in consistent with the findings of Kadari (2022) [15], Jadhav *et al.* (2020) [12] and Dukare (2022) [8].

**Area under cotton**

According to the data given in Table 1 majority 67.86 per cent of cotton growers are had medium area under cotton crop, after that 17.86 per cent of cotton growers had a high area under cotton and 14.28 per cent of cotton growers had low area under cotton.

The most of the farmers having the medium size of land under cotton cultivation i.e. 0.5065 to 2.88646 is may be due to farmers already have low land holding so that they can grow cotton on available land along with other crops. The results are similar to the findings of Kirmirwar (2019) [16], Gaikwad (2019) [10] and Waghmare (2020) [26].

**Source of information**

From the Table 1 it is observed that 62.14 per cent of respondents had medium level of sources of information, whereas 20.71 per cent of the respondents had low level of sources of information and 17.14 per cent of the respondents had high level of sources of information.

As observed in the study that majority of the cotton growers were having secondary to higher secondary level of education and hence, the cotton growers might be properly motivated to participate in various activities. Similar findings were reported by Kirmirwar (2019) [16], Gaikwad (2019) [10], Rane (2019) [21] and Waywal (2019) [28].

**Extension contact**

The data from table 1 indicates that majority (61.43 per cent) of the cotton growers had medium level of extension contact followed by had high level of extension contact (26.43 per cent) and while 12.14 per cent had low level of extension contact.

The most likely explanation is that the most of the cotton growers were influenced by the activity of owner of Krishi Seva Kendra and agents of private company. Similar findings were reported by Jambhule (2022) [14], Ghuge (2019) [11], Waywal (2019) [28] and Agham (2021) [1].

**Social participation**

From table 1 it is concluded that 60.71 per cent of respondents had medium level of social participation, while, 21.43 per cent of respondents had high social participation and 17.86 per cent of them had high level social participation.

Farmers exhibit medium levels of social participation primarily due to their engagement in agricultural activities,

which occupy a significant portion of their time and limit their involvement in social or community organizations. Additionally, factors such as limited awareness about the importance of social participation, lack of proper platforms for active engagement, and financial constraints further restrict their involvement. This finding is consistent with the finding of Kirmirwar (2019) [16].

**Scientific orientation**

The data presented in Table 1 indicate that majority 52.86 per cent of the cotton growers had medium scientific orientation, followed by 26.43 per cent of respondents had high and 20.71 per cent low scientific orientation, respectively.

It can be thus inferred that a vast majority 79.29 per cent of the cotton growers had medium to high scientific orientation. This might be due to good social participation, extension contact, utilization of information sources and literacy level. This finding is in conformity with the findings reported by Kirmirwar (2019) [16], Rane (2019) [21] and Chowdary (2021) [6].

**Table 1:** Personal, Socio-economic and psychological characteristics of the Cotton Growers.

Sr. No.	Variable	Category	Frequency	Percentage
1.	Age	Young (up to 35)	18	12.85
		Middle (36 to 53)	91	65.00
		Old (54 and above)	31	22.15
2.	Education	Illiterate (no education)	4	2.85
		Primary (Up to 4 <sup>th</sup> std.)	35	25.00
		Secondary (Up to std. 10 <sup>th</sup> )	56	40.00
		Higher secondary (Up to 12 <sup>th</sup> std)	28	20.00
		Graduation	17	12.15
3.	Size of family	Small (up to 5)	40	28.57
		Medium (6 to 8)	84	60.00
		Large (9 and above)	16	11.43
4.	Farming experience	Low (Up to 8 years)	27	19.29
		Medium (9 to 25)	85	60.71
		High (26 and above)	28	20.00
5.	Land holding	Marginal (Up to 1ha)	48	34.29
		Small (1.01 to 2 ha)	32	22.85
		Semi-medium (2.01 to 4 ha)	45	32.15
		Medium (4.01 to 10 ha)	15	10.71
		Large (10.01 ha and above)	0	0.00
6.	Annual income	Low (up to 1,05,788/-)	20	14.29
		Medium (1,05,789/- to 3,43,639/-)	99	70.71
		High (above 3,43,640/-)	21	15.00
7.	Area under cotton	Low (up to 0.5064)	20	14.28
		Medium (0.5065 to 2.88646)	95	67.86
		High (above 2.88647)	25	17.86
8.	Source of information	Low (up to 12 score)	29	20.71
		Medium (13 to 17 score)	87	62.15
		High (18 and above score)	24	17.14
9.	Extension contact	Low (up to 30)	37	26.43
		Medium (31 to 45)	86	61.43
		High (above 46)	17	12.14
10.	Social participation	Low (up to 3)	25	17.86
		Medium (4 to 10)	85	60.71

		High (11 and above)	30	21.43
11.	Scientific orientation	Low (up to 14)	29	20.71
		Medium (15 to 21)	74	52.86
		High (22 and above)	37	26.43

**2. Constraints faced by Cotton growers in Pesticides use, care and pest management practices and suggestions given by them**

**Constraints**

To study the constraints faced by the respondents in pesticides use, care and pest management practices was one of the major objectives of present study. The constraints are the circumstances or causes that prohibit and restraints the farmer in adoption of recommended technology. There are some farmers who are always ahead in use of certain innovations while others do not. The thrust of present investigation was what are the constraints that those prohibiting them use of mitigation practices is presented in Table 4.43

The data presented in Table 2 revealed that respondents faced constraints of high costs of labour, pesticides, and other equipment (87.14 per cent), Lack of demonstration and training of improved cultivation practices (77.85 per cent), difficulties in distinguishing between harmful and beneficial insects (65.71 per cent), bio-pesticides, pheromone traps, trichocards are not available (61.42 per cent), unaware about the hazards of excessive pesticide use (56.42 per cent), unaware about use of safety instruments like mask, apron etc (52.85 per cent), lack of knowledge about usage, repair and maintenance of plant protection equipment (27.14 per cent), poor knowledge about doses, nature of chemicals and application details (5.71 per cent).

The constraints faced by cotton growers are mainly due to high costs of labor, pesticides, and equipment, limited access to affordable alternatives, and inadequate training on improved cultivation practices. The difficulty in distinguishing between harmful and beneficial insects reflects a knowledge gap in pest management, while the unavailability of eco-friendly pest control tools points to supply issues. Additionally, many farmers lack awareness of pesticide hazards and safety measures, and insufficient technical training hinders the proper use and maintenance of plant protection equipment. These challenges highlight the need for better education, resources, and support for farmers.

The constraints faced by cotton growers stem from several factors: high costs of labor, pesticides, and equipment are due to inflation and limited availability in rural areas. Lack of training on improved practices results from insufficient extension services and outreach. Difficulty in pest identification is due to limited pest management education, while unavailability of eco-friendly tools is linked to financial constraints and poor supply access. Unawareness of pesticide hazards and safety measures stems from limited awareness programs, and inadequate technical support leads to poor knowledge of equipment use and maintenance. These issues highlight the need for better training, resources, and access to sustainable farming practices.

These findings are in partially similar to the findings reported by Mohammad (2018)<sup>[19]</sup>, Aglawe (2019)<sup>[2]</sup>, Rane (2019)<sup>[21]</sup>, Ghuge (2019)<sup>[11]</sup>, Sardhara (2020)<sup>[24]</sup>, Agham (2021)<sup>[1]</sup> and Bhandarwar (2022)<sup>[4]</sup>.

**Table 2:** Constraints faced by cotton growers

Sr. No.	Constraints	Frequency (N=140)	Percent	Rank
1.	High costs of labour, pesticides, and other equipment.	122	87.14	I
2.	Lack of demonstration and training of improved cultivation practices.	109	77.85	II
3.	Difficulties in distinguishing between harmful and beneficial insects.	92	65.71	III
4.	Bio-pesticides, pheromone traps, trichocards are not available	86	61.42	IV
5.	Unaware about the hazards of excessive pesticide use.	79	56.42	V
6.	Unaware about use of safety instruments like mask, apron etc	74	52.85	VI
7.	Lack of knowledge about usage, repair and maintenance of plant protection equipment.	38	27.14	VII
8.	Poor knowledge about doses, nature of chemicals and application details	10	7.14	VIII
9.	Lack of knowledge about incidence of pest	8	5.71	IX

**Suggestions**

It was observed from table 3 that in present investigation 87.14 per cent of respondents suggest that low-cost plant protection appliances and other inputs should be provided should be provided in time, 77.85 per cent respondents suggested that Demonstration and training of improved cultivation practices should be imparted, 65.71 per cent of respondents suggested that information should be provided by government agencies to identify, conserve and use of natural beneficial insects, 61.42 per cent of respondents suggested that bio-pesticides, pheromone traps, trichocards should be available at local places, 56.42 per cent of respondents suggested that knowledge about harmful effect of pesticides and care should followed by farmer should be provided by authentic source, 52.85 per cent of respondents suggested that protective equipment like mask, apron, gloves etc should be provided while buying pesticides 27.14 per cent of respondents suggested that knowledge about

usage, repair and maintenance of plant protection equipment's should be provided, 7.14 per cent of respondents suggested that knowledge about selection of the correct pesticides and its recommended dose as per label claim should be provide timely.

The findings reflect farmers' need for affordable, accessible plant protection tools and timely inputs due to financial constraints. The demand for training and demonstrations highlights the desire for hands-on learning to adopt improved cultivation practices. The need for information on identifying and using beneficial insects indicates awareness of sustainable pest management but a lack of resources. Farmers also seek more accessible bio-pesticides and pest control tools, along with knowledge on the harmful effects of pesticides and safety measures. The need for protective equipment suggests awareness of health risks, while the request for training on equipment maintenance and correct pesticide usage shows gaps in knowledge and technical



support. These results underscore the need for better resources, training, and guidance for sustainable and safe farming practices.

These findings are in partially similar to the findings

reported by Mohammad (2018) [19], Aglawe (2019) [2], Rane (2019) [21], Ghuge (2019) [11], Sardhara (2020) [24], Agham (2021) [1] and Bhandarwar (2022) [4].

**Table 3:** Suggestions given by cotton growers

Sr. No	Suggestions	Frequency (N=140)	Percent	Rank
1.	Low-cost plant protection appliances and other inputs should be provided should be provided in time	122	87.14	I
2.	Demonstration and training of improved cultivation practices should be imparted	109	77.85	II
3.	Information should be provided by government agencies to identify, conserve and use of natural beneficial insects.	92	65.71	III
4.	Bio-pesticides, pheromone traps, trichocards should be available at local places	86	61.42	IV
5.	Knowledge about harmful effect of pesticides and care should followed by farmer should be provided by authentic source	79	56.42	V
6.	Protective equipment like mask, apron, gloves etc should be provided while buying pesticides.	74	52.85	VI
7.	Knowledge about usage, repair and maintenance of plant protection equipment's should be provided.	38	27.14	VII
8.	Knowledge about selection of the correct pesticides and its recommended dose as per label claim should be provide timely.	10	7.14	VIII

**Conclusion**

From the current study it was concluded that, most of the cotton growers were in the 36 - 53 years age group, most of them were educated up to higher secondary education, belonged to medium size of family, had medium level of farming experience, had marginal land holding, had medium income level, had medium level of source of information, had medium level of extension contact, had medium level of social participation, had medium scientific orientation.

It was observed that cotton growers faced several constraints, including high costs of labour, pesticides, and equipment. They also lacked demonstration and training on improved cultivation practices and had difficulties distinguishing between harmful and beneficial insects. The unavailability of bio-pesticides, pheromone traps, and trichocards was another issue. Many were unaware of the hazards of excessive pesticide use and the importance of safety instruments like masks and aprons. There was also a lack of knowledge about the usage, repair, and maintenance of plant protection equipment, as well as poor understanding of pesticide doses, chemical nature, and application details.

In the present investigation, respondents suggested several improvements. They emphasized the need for timely provision of low-cost plant protection appliances and inputs, as well as demonstration and training on improved cultivation practices. They also recommended that government agencies provide information on identifying and conserving beneficial insects. The availability of bio-pesticides, pheromone traps, and trichocards at local places was highlighted. Additionally, respondents called for education on the harmful effects of pesticides and the importance of using protective equipment like masks and aprons. They also suggested providing knowledge on the usage, repair, and maintenance of plant protection equipment, as well as guidance on selecting the correct pesticides and their recommended doses.

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