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Raut AS
Department of Extension Education, College of Agriculture, Nagpur, Maharashtra, India

MK Rathod
Professor and Head, Department of Extension Education, College of Agriculture, Nagpur, Maharashtra, India

G Sriker Reddy
Department of Extension Education, College of Agriculture, Nagpur, Maharashtra, India

Correspondence
Raut AS
Department of Extension Education, College of Agriculture, Nagpur, Maharashtra, India

Insecticide application behaviour of cotton growers in Yavatmal district

Raut AS, Dr. MK Rathod and G Sriker Reddy

Abstract
The present study on insecticide application behaviour of cotton growers was undertaken in Yavatmal district of Vidarbha region of Maharashtra State with sample size of 120 respondents from 12 villages. Data were collected on personal, socio-economic, situational, communicational and psychological profile of cotton growers towards insecticide application by using exploratory design of social research.
Majority of the selected cotton growers (74.17%) were having medium level of knowledge of insecticide application on cotton crop. High majority of respondent i.e. 73.34 per cent respondents have moderately favourable attitude towards insecticide application. 70.00 per cent of respondents have medium level of adoption of insecticide application practices.
In relational analysis, the selected variables like education, land holding, extension contact, social participation, mass media exposure. Economic motivation, innovativeness, risk orientation and scientific orientation were positive and significant with knowledge of insecticide application. Age and farming experience were negative and significantly correlated with knowledge. whereas, education, land holding, extension contact, social participation, mass media exposure, economic motivation, innovativeness, risk orientation, and scientific orientation were positive and significantly correlated with attitude towards insecticide application. In case of age, area under cotton cultivation and farming experience were found non-significant with attitude towards insecticide application. Regard to adoption, education, land holding, extension contact, social participation, mass media exposure, economic motivation, innovativeness, risk orientation and scientific orientation was positive and significant with insecticide application behaviour. Age and farming experience were found to be negative and significantly correlated with insecticide application behaviour. In case of area under cotton cultivation were found non-significant with insecticide application behaviour.

Keywords: Knowledge, attitude, adoption, relational analysis

Introduction
Cotton is one of the most important fiber crop of India and plays a dominant role in the industrial and agricultural economy of the country. Cotton is most important fiber crop not only of India, but of the entire world. It provides the basic raw material (Cotton fiber) to cotton textile industry. Livelihood of about 60 million people depends directly and indirectly on cotton cultivation, processing, trade and textiles. Textiles including raw cotton contribute 20.24 per cent of India's exports (Barik and Gautam, 2009) [1]. Production of cotton in India which was 142.3 lakh bales in 1996-97 had dropped to 86.24 lakh bales in 2002-03, but increased steeply to reach 258.06 lakh bales in 2007-08 (Advance estimates, as on 9 July 2008)1, thanks to wide scale adoption of genetically modified (GM) cotton in India. The higher yield has been achieved with a relatively higher use of chemical inputs particularly pesticides. Cotton cultivation in India which accounts for about 5 per cent of the total land under cultivation uses nearly 50 per cent of the pesticides produced in India (Shetty, 2004 and Barik, 2009) [1]. Continuous use of pesticides does irreversible damage to environment, health of human being and livestock besides increasing the cost of cultivation.
Cotton is the main cash crop for farmers of Vidarbha region of Maharashtra State. India rank second in cultivation of cotton crop. Vidarbha region covers more than 50 percent area under cotton out of total cotton cultivable area of Maharashtra. In this major area of cotton production near about 20-90 percent loss occurs due to continuous attack of insect on cotton crop. It is from the time of green revolution for minimizing the damage due to insects on the crop and for getting higher yield and income, farmer use large quantity of insecticide.

Methodology
The present study was conducted in Yavatmal district (Vidarbha region) of Maharashtra State. Ralegao, Ghatanji and Kelapur talukas were selected for the study. From each taluka, four villages were selected and from each village 10 farmers were selected. Thus a total of 12

villages and 120 cotton growers were selected. Exploratory research design was used for the study. And the study was based on the interview schedule especially designed for the purpose of respective study and it contained the questions on knowledge, attitude and adoption of insecticide application on cotton by the farmers. The data were tabulated, analyzed and the results were interpreted as on Table 1.

It is one of the most nutritive menu for human and tone up his energy and vigour, because it happens to be valuable source of carbohydrates, proteins, vitamins and minerals. The edible 100 g bottle gourd fruit contains 96.3 per cent moisture, 2.9 per cent carbohydrate, 0.2 per cent protein, 0.1 per cent fat an varieties and hybrid technology in combination with superior crop management skills. Varieties and hybrid technology in combination with superior crop management skills. Substantial increase in productivity Substantial increase in productivity d 0.5 per cent mineral matter. The mineral matter reported to be present in fair amount of calcium, phosphorus, iron, potassium, sodium and iodine.

Table 1: Distribution of the respondents according to their knowledge and adoption of insecticide application practices

Sr. no.	Practices for use of insecticide	Knowledge			Adoption		
		CK	PK	NK	FA	PA	NA
I.	**While Purchasing**						
1	Purchase insecticide only from Registered insecticide dealers having valid License	61 (50.83)	46 (38.33)	13 (10.84)	39 (32.50)	46 (38.33)	35 (29.17)
2	Purchase only just required quantity of insecticide for single operation in a specified area	66 (55.00)	37 (30.83)	17 (14.17)	43 (35.83)	53 (44.17)	24 (20.00)
3	See approved labels on the containers/packets of insecticide	62 (51.66)	37 (30.83)	21 (17.51)	37 (30.84)	47(39.16)	36 (30.00)
4	See Batch No., Registration Number, Date of Manufacture/ Expiry on the labels	64 (53.33)	43 (35.83)	13 (10.84)	43 (35.84)	52 (43.33)	25 (20.83)
5	Purchase insecticide well packed in containers	84 (70.00)	15 (12.50)	21 (17.50)	71 (59.17)	26 (21.66)	23 (19.17)
II.	**During Storage**						
1	Store the insecticide away from house premises	47 (39.16)	57 (47.50)	16 (13.34)	22 (18.33)	71 (59.17)	27 (22.50)
2	Keep insecticide in original containers	40 (33.34)	61 (50.83)	19 (15.83)	17 (14.16)	54 (45.00)	49 (40.84)
3	insecticide be stored away from the reach of the children and live stocks	71 (59.17)	33 (27.50)	16 (13.33)	50 (41.67)	45 (37.50)	25 (20.83)
4	Storage place should be well protected from direct sunlight and rain	36 (30.00)	20 (16.67)	64 (53.33)	12 (10.00)	34 (28.33)	74 (61.67)
III.	**While Handling**						
1	Keep insecticide separate during transportation.	16 (13.34)	41 (34.16)	63 (52.50)	6 (5.00)	35 (29.17)	79 (65.83)
2	Bulk insecticide should be carried tactfully to the site of application	29 (24.17)	24 (20.00)	67 (55.83)	20 (16.66)	28 (23.34)	72 (60.00)
IV.	**While Preparing spray solution**						
1	Always use clean water	63 (52.50)	45 (37.50)	12 (10.00)	57 (47.50)	46 (38.33)	17 (14.17)
2	Use protective clothing viz., hand gloves, face masks, cap, apron, full trouser, etc. to cover whole body	53 (44.16)	33 (27.50)	34 (28.34)	37 (30.84)	36 (30.00)	47 (39.16)
3	Always protect your nose, eyes, ears, hands, etc. from spill of spray solution	48 (40.00)	39 (32.5)	33 (27.5)	33 (27.50)	42 (35.00)	45 (37.50)
4	Read instructions on insecticide container label carefully before use	30 (25.00)	49 (40.83)	41 (34.17)	16 (13.34)	50 (41.66)	54 (45.00)
5	Prepare the solution as per requirement	40 (33.33)	60 (50.00)	20 (16.67)	19 (15.83)	66 (55.00)	35 (29.17)
6	Granular insecticide should be used as such	33 (27.5)	39 (32.5)	48 (40.00)	16 (13.34)	33 (27.50)	71 (59.16)
7	Avoid spilling of insecticide solutions while filling the spray tank	68 (56.66)	34 (28.34)	18 (15.00)	57 (47.50)	28 (23.33)	35 (29.17)
8	Always use recommended dosage of insecticide	44 (36.67)	38 (31.67)	38 (31.66)	19 (15.84)	43 (35.83)	58 (48.33)
V.	**Selection of Equipments**						
1	Select right kind of equipments. Select right sized nozzles	8 (6.67)	42 (35.00)	70m(58.33)	5 (4.16)	18 (15.00)	97 (80.34)
2	Use separate sprayer for insecticides and weedicides	11 (9.16)	34 (28.34)	75 (62.50)	5 (4.16)	23 (19.17)	92 (76.67)
VI.	**While applying spray solutions**						
1	Spray operation should be conducted on cool and calm day	19 (15.84)	79 (65.83)	22 (18.33)	15 (12.50)	59 (49.16)	46 (38.34)
2	Use recommended sprayer for each spray	28 (23.33)	52 (43.34)	40 (33.33)	11 (9.17)	41(34.16)	68 (56.67)
3	Spray operation should be conducted in the wind direction	78 (65.00)	32 (26.66)	10 (8.34)	70 (58.33)	32 (26.67)	18 (15.00)
4	After spray operation, sprayer and buckets should be washed with clean water using detergent/soap	60 (50.00)	33 (27.50)	27 (22.50)	47 (39.16)	40 (33.34)	33 (27.50)
5	Avoid the entry of animals/workers in the field immediately after spray	26 (21.66)	67 (55.84)	57 (47.50)	17 (14.17)	38 (31.66)	65 (54.17)
VII.	**After Spray Operation**						
1	The used/empty containers should be crushed with stone/stick and buried deep in soil away from water sources	10 (8.33)	24 (20.00)	86 (71.67)	6 (5.00)	19 (15.83)	95 (79.17)
2	Wash hands and face with clean water and soap before eating/smoking	57 (47.50)	50 (41.67)	13 (10.83)	50 (41.67)	56 (46.67)	14 (11.66)
3	On observing poisoning symptoms give the first aid and show the patient to doctor. Also show the empty container to doctor	78 (65.00)	28 (23.33)	14 (11.67)	53 (44.16)	51 (42.50)	16 (13.34)

CK – complete knowledge PK – Partial knowledge NK – No knowledge

FA- Full adoption PA- Partial adoption NA-No adoption

Results and Discussion

The results of the study had been presented under the following headings.

Knowledge of cotton growers about insecticide application practices

It is observed from the Table 1 that the majority of respondents had complete knowledge of all five practices under the insecticide purchasing i.e. purchase insecticide well packed in containers (70.00%). Under the selection of equipments the majority of the respondents 62.50 per cent of the respondents had no knowledge about use separate sprayer for insecticide and weedicide. Half of the cotton growers (58.33%) had no knowledge about selection of right kind of equipment and selection of right size nozzles.

Under the application of spray solution more than half percentage of respondents had partial knowledge about spray operation should be conducted on cool and calm day (65.83%), more than half of the respondents (65.00%) completely known about spray operation should be conducted in the wind direction. After the spray operation, majority of the respondents (71.67%) had no knowledge about the used/empty containers should be crushed with stone/stick and buried deep in soil away from water sources. 65.00 per cent of respondents had complete knowledge about on observing poisoning symptoms, give the first aid and show the patient to doctor. Also show the empty container to doctor.

Adoption of insecticide application practices by the cotton growers

The data presented in Table 21 revealed that Majority of the respondents (61.67%) had not adopted the instruction that storage place should be well protected from direct sunlight and rain. More than half of the respondents (59.17%) had partial adoption of storing the insecticide away from house premises. At the time of handling of insecticide, the majority of the respondents (65.83%) were not following the instructions of keep insecticide separate during transportation. Similarly, more than half of the respondents (60.00%) was not adopted the practice of bulk insecticide should be carried tactfully to the site of application.

Results regarding selection of equipment great percentage of cotton growers (80.34%) were not following selection of right kind of equipment and right sized nozzles. Then use of separate sprayer for insecticide and weedicide was not adopted by 76.67 per cent of respondents. From the study it was observed that after spray operation the used/empty containers should be crushed with stone/stick and buried deep in soil away from water sources was not followed by the high percentage of the respondents (79.17%).

Table 2: Distribution of respondents according to their level of overall knowledge and overall adoption of insecticide application practices.

Sl. No.	Index Level	Knowledge		Adoption	
		Frequency	Percentage	Frequency	Percentage
1.	Low (Up to 33.33)	6	05.00	31	25.83
2.	Medium (33.34 to 66.66)	89	74.17	84	70.00
3.	High (66.67 and above)	25	20.83	5	4.17
	Total	120	100.00	120	100.00
	Mean	54.94		43.31	

Overall knowledge and adoption level

It was observed from Table 3 that nearly three fourth of the cotton growers (74.17%) had medium level of knowledge about techniques of insecticide application on cotton crops. Where 20.83 per cent of the cotton growers had high level of knowledge followed by 5.00 per cent of cotton growers had low level of knowledge about technique of insecticide application on cotton crop. Similar findings were reported by Reddy (2013) [8], Sarada and Kumar (2013) [9] and Kantheti (2018) [5]. Table 3 also indicated that 70.00 per cent of cotton growers have medium level of adoption of recommended insecticide application practices on cotton crop. It was followed by 25.83 per cent of the cotton growers had low level of adoption of insecticide application, only 4.17 per cent of cotton growers having high level of adoption of insecticide application practices on cotton crop. These findings are in line with the findings of Sarada and Kumar (2013) [9], Kantheti (2018) [5].

Table 3: Distribution of the respondents according to their attitude towards insecticide and its safe use

Sr. no.	Statements	SA	A	UD	DA	SD
1	The insecticide is effectively control the pest population	1 (0.83)	50 (41.67)	8 (6.66)	56 (46.67)	5 (4.17)
2	Protective clothing is effective to reduce health hazards regarding exposure to insecticide	9 (7.50)	70 (58.34)	33 (27.50)	8 (6.66)	0 (0)
3	insecticide application is harmful to human health	8 (6.66)	79 (65.83)	14 (11.67)	19 (15.84)	0 (0)
4	insecticide causes decrease biodiversity	0 (0)	45 (37.50)	60 (50.00)	15 (12.50)	0 (0)
5	Harmful side effects on non-target organisms (birds, animals, earthworms)	2 (1.66)	73 (60.84)	32 (26.66)	13 (10.84)	0 (0)
6	Soil, air and water bodies can easily be contaminated with insecticide	7 (5.83)	50 (41.67)	50 (41.67)	13 (10.83)	0 (0)
7	Eating, drinking can cause the health hazards at the time of spraying	12 (10.00)	68 (56.67)	27 (22.50)	10 (8.33)	3 (2.50)
8	Label claim is important while using insecticide	12 (10.00)	64 (53.33)	28 (23.33)	16 (13.34)	0 (0)
9	Contamination of plant environment by insecticide	6 (5.00)	62 (51.67)	25 (20.83)	27 (22.50)	0 (0)
10	Un-judicious use of insecticide develops resistance in large no. of pest	13 (10.84)	49 (40.83)	41 (34.17)	17 (14.16)	0 (0)
11	Using wood-based to mix the insecticide is safety than using hand	21 (17.50)	67,(55.84)	16 (13.33)	14 (11.67)	2 (1.66)
12	Follow insecticides label recommendation is necessary	6 (5.00)	55 (45.83)	32 (26.66)	26 (21.67)	1 (0.84)
13	Using of extra amount of insecticide is the only route to get rid of pest	11 (9.16)	66 (55.00)	16 (13.34)	15 (12.5)	12 (10.00)
14	Can enter the farm area immediate after spraying	6 (5.00)	35 (29.17)	32 (26.67)	37 (30.83)	10 (8.33)
15	Short duration training will increase the efficiency of insecticide application	11 (9.16)	53 (44.17)	22 (18.34)	34 (28.33)	0 (0)

SA-Strongly agree A- Agree UD-Undecided D-Disagree SD-Strongly disagree

Attitude towards insecticide application and its safe use

It is observed from Table 2 that 58.34 per cent of the respondents agree that protective clothing is effective to reduce health hazards regarding exposure to insecticide. Regarding insecticide application, it is harmful to human health, 65.83 per cent respondents noted their agreement to this. 50.00 per cent of the respondents undecided about insecticide causes decrease biodiversity.

Majority of respondents i.e. 60.84 per cent found agree to state that harmful side effects on non-target organisms (Birds, animals, earthworms). Regarding eating, drinking can cause the health hazards at the time of spraying, 56.67 per cent respondents noted that their agreement to this. Half of the respondents (51.67%) were agreed that there could be contamination of plant environment with insecticide.

Table 4: Distribution of the respondents according to their level of attitude

Sr. no.	Attitude	Respondents (n=120)	
		Number	Percentage
1	Unfavourable	0	0
2	Less favourable	11	9.16
3	Moderately favourable	88	73.34
4	Highly favourable	21	17.5
	Total	120	100.00

Table 20 shows that, high majority of cotton growers (73.34 %) belonged to moderately favourable attitude, followed by 17.5 per cent and 9.16 per cent of the respondents were found to have high favourable and less favourable attitude towards insecticide application on cotton crop, respectively. None respondents found in unfavourable attitude towards insecticide application on cotton crop.

Relational analysis of variables

Table 5: Correlation coefficients of selected characteristics of the respondents with their knowledge, attitude and adoption of insecticide application

Sr. no.	Independent Variables	Knowledge	Attitude	Adoption
1	Age	-0.3603**	-0.1673	-0.3949**
2	Education	0.4608**	0.2374**	0.5536**
3	Land holding	0.2478**	0.1756*	0.2293**
4	Area under cotton cultivation	0.1828*	0.0572	0.1632
5	Farming experience	-0.2174*	-0.1433	-0.2845**
6	Extension contact	0.3040**	0.1915*	0.4620**
7	Social participation	0.6042**	0.2515**	0.5469**
8	Mass media exposure	0.4765**	0.1837**	0.4676**
9	Economic motivation	0.4095**	0.3663**	0.4765**
10	Innovativeness	0.5169**	0.3995**	0.5044**
11	Risk orientation	0.4699**	0.4128**	0.5906**
12	Scientific orientation	0.3165**	0.1767*	0.4305**

** Significant at 0.01 level of probability

* Significant at 0.05 level of probability

It is observed from the Table no. 23 that respondents' age was found to be highly significant and negatively correlated with knowledge and adoption of insecticide application practices, while non-significant relationship with attitude of the respondents was found. Education was highly significant with knowledge, attitude and adoption. It was indicated that age and education were an important personal characteristics of farmers play a vital role in insecticide application behaviour of cotton growers. Education help them to understand the safe practices of insecticide, their attitude become favourable and tried to adopt recommended practices of insecticide application, hence the hypothesis is accepted regarding education.

Land holding was found to be significant with knowledge and adoption at 0.01 level of probability. Similarly, with attitude it was significant at 0.05 level of probability. Regarding area under cotton cultivation it was significant with knowledge and non-significant with attitude and adoption of insecticide application practices. Farming experience of the respondents was negatively significant with knowledge (0.05 level of probability) and adoption (0.01 level of probability) and non-significant with attitude. It means that area under cotton cultivation and farming experience could not influence the attitude of respondents.

Further, communicational and psychological variables viz. extension contact, social participation, mass media exposure, economic motivation, innovativeness, risk orientation and scientific orientation were significantly correlated with knowledge, attitude and adoption of recommended insecticide application practices at 0.01 level of probability. It means hypothesis for psychological variables was proved. It was clearly indicated that psychological variables help farmers to improve their insecticide application behaviour. In the research area educated farmers could try to gain knowledge of insecticide application through different sources which make them psychologically strong that may have resulted in favourable attitude and leads to adopt the safe insecticide application practices.

These findings are in conformity with the findings of Kumar (2012) [6], Deogirkar (2014) [4], Bhaltilak (2017) [3], Kantheti (2018) [5] and Lamkane (2018) [7].

Conclusion

Study concluded that majority of the cotton growers had medium level of adoption of recommended insecticide application practices on cotton crop. The reason behind that as shown in knowledge level of the cotton growers majority of the respondents had medium level of the knowledge so that the adoption level is also medium as per the knowledge of the cotton growers. It can be inferred from the study that majority of the cotton growers had moderately favourable attitude towards insecticide application on cotton crop. Most of the respondents were literate having medium knowledge about insecticide application and have more than 22 years of cotton cultivation experience might be the possible reason for creating moderately favourable attitude towards insecticide application.

References

1. Barik Anupam, HC Gautam. Revolution in Indian cotton, Directorate of Cotton Development, Government of India, Mumbai and national centre of integrated pest management, ICAR, Pusa, New Delhi, 2009.
2. Barkhade AT. Knowledge and adoption of integrated weed management practices followed by cotton growers in Washim district. M.Sc. (Agri.) Thesis (Unpub), Dr. PDKV, Akola, 2015.
3. Bhaltilak Kajal Bramhdeo. Knowledge and adoption of insecticides as per the label claim by cotton growers in Akola district. M.Sc. (Agri.) Thesis (Unpub.), Dr. PDKV, Akola, 2017.
4. Deogirkar VA. Knowledge and adoption of herbicide by soybean farmer. M.Sc. (Agri.) Thesis (Unpub.), Dr. PDKV, Akola, 2014.
5. Kantheti V. A study on tenant farmers of Bt. Cotton in Guntur district of Andhra Pradesh. M.Sc. (Agri.) Thesis

(Unpub.), ANGRAU, Rajendranagar, Hyderabad, 2018.
6. Kumar GA. Knowledge and adoption of system of rice intensification (SRI) among farmers in nagapattinam district of Tamil Nadu. M. Sc. (Agri.) Thesis. Acharya N. G. Ranga Agricultural University, Hyderabad, India, 2012.
7. Lamkane YS. Attitude of farmers towards recommendation of soil health card. M.Sc. (Agri.) Thesis (Unpub.). VNMKV, Parbhani, 2018.
8. Reddy PN. Knowledge of cotton farmers on health hazards of pesticides in Kurnool district of Andhra Pradesh. M.Sc. (Agri.). Thesis. A.N.G.R.A.U., Hyderabad, 2013.
9. Sarada O, Kumar GVS. Knowledge and adoption of recommended production technology by cotton farmers. Journal of Research. ANGRAU. 2013; 41(4):63-64.
10. Shetty PK. Socio-Ecological Implications of Pesticide Use in India, economic and political weekly. 2004; 39(39):261-67.