P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 6; June 2024; Page No. 381-384

Received: 29-04-2024
Accepted: 04-06-2024

Indexed Journal
Peer Reviewed Journal

A study on mode of pesticide application by the vegetable growers in Bemetara District of Chhattisgarh

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DOI: https://doi.org/10.33545/26180723.2024.v7.i6e.735

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Abstract

In the research, the major focus was on the mode of pesticide application in Okra and Tomato crops. This study was conducted in Chhattisgarh. The research was based on data collected from 120 respondents in the Bemetara district using a pre-tested interview schedule. The primary sources of information for pesticide use and application patterns as input dealers, followed by RAEOs/RHEOs. All the respondents were procured pesticides from input dealers, and pesticide application was mainly used during the flowering and fruiting stages, primarily in the evening time. The mode of spraying was predominantly used for pesticide application, followed by dusting and granular application. Most of the respondents were taken precaution during the pesticide application, including handwashing after spraying and spraying according to wind direction. Regarding knowledge about major insect pests and diseases, respondents showed varying levels of awareness, with fruit borers, whiteflies, and early and late blight being notable. The correlation coefficient reveals that the independent variables i.e. education, annual income, Income from vegetable cultivation, and Irrigation availability had positively and highly significantly correlated at a 0.01% level of probability. Area under vegetable crops, Occupation, Experience in vegetable farming had positively and correlated at 0.05% level of probability. Land holding, Net cultivated area under okra and tomato crops, Source of information, Knowledge about major insect pest in vegetable crops had positive & non-significant relationships with the dependent variable.

Keywords: RAEO/RHEO, pesticide, respondents, correlation coefficient, Probability, significant etc.

1. Introduction

Vegetables are an important part of a healthy diet since they provide a plentiful and relatively inexpensive source of vitamins, minerals, proteins, and carbohydrates. Vegetables are not rich in fat, which is less than 0.1% in most of them. Vegetables also help digestion and bowel movement by neutralizing the acids created during the digestion of proteins and fatty foods. All around the country, vegetable cultivation has become very popular. The production of vegetables has a significant impact on enhancing the diet and enhancing agricultural economies. Today's requirement is therefore for healthy production. The Indian subcontinent has a favorable climate that allows for year-round vegetable growth. According to a dietitian, a daily serving of vegetables should include 75 to 125 g of green leafy vegetables, 85g of other vegetables, and 85g of roots and tubers. Vegetable crops have been promoted to increase food security, supply local market demand, and meet export market expectations.

Chemical pesticides are used by farmers because they are simple to use, widely accessible, and quick to work. Whatever, it destroys insects both helpful and harmful. There are a few safer pesticides, but their usage has been constrained since so many farmers are not aware of them. The majority of them are ignorant of the types of pesticides, safety measures, degree of safety measures, degree of poisoning, and potential risks to human health and the environment. Low levels of education among rural residents, a lack of knowledge and instruction about pesticide safety, subparts praying technology, and insufficient personal protection when using pesticides have all been found to play a significant part in creating dangers.

Today, India ranks among the top importers and is the fourth-largest producer of pesticides in the world, behind the United States, Japan, and China. The pesticide industry in India ranks 12th globally and is the largest in Asia. The pesticide market in India is anticipated to develop at a rate of 12–13% per year to reach $6.8 billion in (2017), with domestic demand likely to rise at an 8–9% annual rate and export demand likely to grow at a rate of 15–16%. In Chhattisgarh, the total area under vegetable crops was recorded at 4,89,271 ha in the year 2020-21, producing 68,68,126 MT. (Government of Chhattisgarh, agriculture development and farmer welfare and biotechnology department, statistics 2020-21). In Chhattisgarh, the total Insecticide consumption is 1740 MT. (Government of India ministry of agriculture & farmers welfare department of agriculture & farmer's welfare directorate of plant protection, quarantine & storage, 2022). Bemetara district has a net sown area of 224.7 ha., a gross cropped area of

342.4 ha., and net irrigated land of 71.6 ha. And gross irrigated area 126 ha. Bemetara district, the total area under tomato is 2.80 ha. Production 140 MT and okra area under 1.52 ha. and production 22,87 MT. The cropping intensity of the district is 152% with an annual rainfall of 1027 mm.

Pesticides are important agricultural chemicals for crop production. They help farmers grow more food on less land by protecting crops from pests, diseases, and weeds as well as raising productivity per hectare. India is the second largest consumer of pesticides followed by the USA. In the years 1950-51 the consumption of pesticides (technical grade) in India was about 2,35,000 tons and in 2020-21 it was 8645 MT and the consumption of pesticides in Chhattisgarh state during the year was 605 MT, Ministry of Statistics and Program Implementation, Govt. of India. (Ministry of Agriculture & Farmers Welfare, Govt. of India 2020-21).

Review literature

Khan (2005) reported that tomato, okra, brinjal, cauliflower, pea, and onion these vegetables received insecticides most frequently in Peshawar. Cypermethrin (19.99%) followed by methamidophos (13.33%), chlorpyrifos (12.41%), methomyl (10.52%), dimethoate (8.57%), and endosulfan (7.62%) are the commonly used insecticides on fruits and vegetables. Total fruit and vegetable samples (608) were analysed; 250 samples (41%) contained detectable residues; of which 13.8% had residues that exceeded maximum residue limits (MRLs).

Sharma *et al.* (2022) conducted a study to know the extent of the use of agricultural chemicals in vegetable production and to explore the factors responsible for the use of insecticides in vegetable production and found that all the vegetable growers used insecticides at a very high concentration than the recommended dose.74.66% of farmers applied insecticides in the fields at an interval of less than 10 days and 19.33% of farmers applied when necessary. Out of eight different determinants, the use of chemical fertilizers (kg) showed a positive and significant relationship with the use of insecticides at 0.001 level in all three groups of farmers.

Methods and Materials

There are 33 districts in the state of Chhattisgarh, out of which 1 district Bemetara has been purposefully selected for this study. It includes the exact method and procedure adopted during the research work as well as the preparation of the manuscript. The framework used in carrying out the investigation is outlined in this following.

Variables of the study

- **Independent Variables**

An overview of the various variables taken from the aspect of production activities is further described on the major discussion.

- **Dependent variables**

Mode of application of pesticide.

Method of analysis

The data collection process involved personal interviews with the respondents. Before conducting the interviews, efforts were made to establish trust by openly explaining the study's true purpose. Additionally, great care was taken to build a positive report with the participants.

Statistical analysis

During the investigation, the data was collected and then organized into a coding sheet. The analysis of the data was carried out according to the objectives suggested by Cochran and Cox (1957), using statistical techniques such as frequency, percentage, mean, standard deviation, and coefficient of correlation. The Computer Section of IGKV, Raipur assisted in carrying out the analysis.

Results and Discussions

Dependent variable

Mode of pesticide application

The data regarding the mode of pesticide application Table 1. The finding revealed that majority of respondents, 75 per cent of the respondents used a Knapsack Battery sprayer for their spraying mode, while 29.16 per cent of the respondents used a Knapsack hand sprayer, and only 8.33 per cent used a Tractor-operated sprayer for spraying.

As for the dusting mode, 37.50 per cent of the respondents used a Plunger duster, while 16.66 per cent used a hand rotary duster, and 29.16 per cent used a granular form in tomato and okra crops.

Table 1: Distribution of respondents according to their mode of pesticide application.

Mode of pesticide application	Equipment	Tank volume/l	Pressure/ M.pa	Flow rate/ l.	F	%
1. Spraying	Knapsack hand sprayer	15	0.25-0.45	0.8-1	35	29.16
	Knapsack Battery sprayer	20	0.3-0.65	2.5-3.5	90	75.00
	Tractor-operated sprayer	250-300	2.0-4.5	80-100	10	8.33
2. Dusting	Plunger duster	5	-	-	45	37.50
	Rotary duster		-	-	20	16.66
3. Granular	Hand spraying				35	29.16

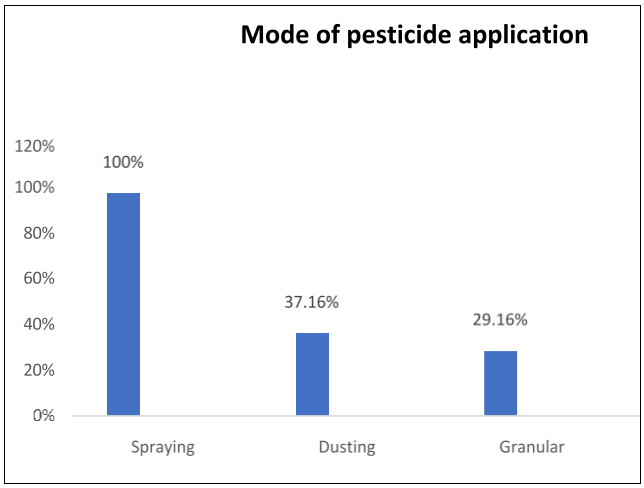

Fig 1: Distribution of respondents according to their Mode of pesticide application.

Precautions during pesticide application

Table 2 shows regarding the Precautions during pesticide application that majority of respondents cent per cent washed their hand after spraying the pesticide and sprayed the pesticide according to wind direction, followed by 83.33 per cent of the respondents changing their clothing after spraying of pesticide, were 66.66 per cent respondents were using shoes during spraying of pesticide, while 12.50 per cent respondents were using gloves and caps, 8.33 per cent using masks, and only 6.66 per cent respondents were using goggles during spraying of pesticide.

Table 2: Distribution of respondents according to their precautions of pesticide application.

Knowledge level					
SI. No	**Precaution**		**Yes**		**No**
		F	**%**	**F**	**%**
1.	Use of Mask	10	8.33	95	79.16
2.	Use of Gloves	15	12.50	105	87.5
3.	Use of Shoe	80	66.66	40	33.33
4.	Use of Goggles	08	6.66	85	70.83
5.	Use of Cap	15	12.5	95	79.16
6.	Hand wash after spraying the pesticide	120	100	00	00.00
7.	Cloth changes after spraying of pesticide	100	83.33	20	16.66
8.	Spread in wind direction	120	100	00	00.00

Application of pesticides in different growing stages

The data regarding the application of pesticides in different growing stages in Table 3. The findings revealed that majority 66.60 per cent of respondents applied pesticides during the flowering stage (45-50 days), followed by 58.0 per cent of respondents applied during the fruiting stage (55-65 days), 54.16 per cent of the respondents were applied pesticides during the vegetative stage (25-35 days), 33.33 per cent respondents were applied pesticides during the ripening stage (65-80 days), and only 20.83 per cent respondents were applied pesticides during the germinating stage.

Table 3: Distribution of respondents according to their pesticide application in different growing stages

Crops	Growing stages	Frequency	Percentage
Tomato and Okra			
1. Germination (up to 6-8 days)		25	20.83
2. Vegetative growth (25-35 days)		65	54.16
3. Flowering (45-50 days)		80	66.60
4. Fruit formation (55-65 days)		70	58.00
5. Ripening (65-80 days)		40	33.30

*Based on multiple responses

Application time of pesticide

The data regarding the application time of pesticide, Table 4 shows that majority of 83.33 per cent respondents applied pesticides in the evening time, followed by 75 per cent who their using in the morning time. and only 9.16 per cent respondents were applied pesticides in the afternoon time.

Table 4: Distribution of respondents according to their Time of pesticide application

SI. No.	Time	Frequency	Percentage
1.	Morning (6 to 12 am)	90	75
2.	Afternoon (12 to 4)	11	9.16
3.	Evening (4 to 6)	100	83.33

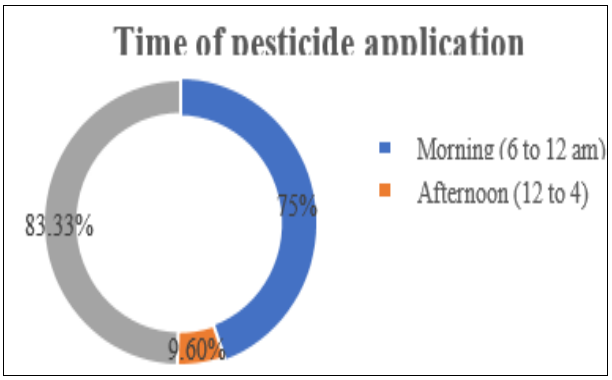

Fig 2: Distribution of respondents according to Time of pesticide application

Correlation analysis

To determine the relationship of selected independent variables with Mode of application of pesticides the correlation analysis was worked out and results are presented in the Table 5.

Table 5: Correlation coefficient of independent variables with mode of application of pesticides

Variable code	Independent variables	Correlation coefficient ("r value ")
X1	Education	0.189**
X2	Land holding	0.171
X3	Area under vegetable crops.	0.302 *
X4	Net cultivated area under okra and tomato crops	0.182
X5	Occupation	0.158 *
X6	Annual income	0.367**
X7	Income from vegetable cultivation	0.371 **
X8	Source of information	-0.179
X9	Irrigation availability	0.206* *
X10	Experience in vegetable farming	0.185*
X11	Knowledge about major insect pest in vegetable crops	-0.244

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

NS means non-significant the correlation calculated in the table 4.20 shows that the relationship independent & dependent variables. i.e. education, annual income, Income from vegetable cultivation, Irrigation availability had positively and highly significantly correlated at 0.01% level of probability. Area under vegetable crops, Occupation, Experience in vegetable farming had positively and correlated at 0.05% level of probability. Land holding, Net cultivated area under okra and tomato crops, Source of information, Knowledge about major insect pest in vegetable crops had positive & non-significant relationships with the dependent variable.

Conclusions

- The data regarding the mode of pesticide application Table. The finding revealed that majority of respondents, 75 per cent of the respondents used a Knapsack Battery sprayer for their spraying mode, while 29.16 per cent of the respondents used a Knapsack hand sprayer, and only 8.33 per cent used a Tractor-operated sprayer for spraying.
- As for the dusting mode, 37.50 per cent of the respondents used a Plunger duster, while 16.66 per cent used a hand rotary duster, and 29.16 per cent used a granular form in tomato and okra crops.
- Finding revealed that majority of respondents cent per cent washed their hand after spraying the pesticide and sprayed the pesticide according to wind direction.
- The findings revealed that majority of respondents, 66.60 per cent applied pesticides during the flowering stage.
- The findings reveled that majority of 83.33 per cent respondents applied pesticides in the evening.

Suggestion

- The study finding revealed that majority of the 75.00 per cent of respondents suggested that subsidies should be provided for pesticides, followed by 66.66 per cent of respondents suggested that pesticides should be directly provided through government departments.
- 45.83 per cent of respondents suggested that farmers should be given training to promote technical guidance on pesticide application, 37.50 of respondents suggested that Input should be timely available in the market (bio-agents, resistance variety, traps, etc.).

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