



# Knowledge Gap and Safe Use of Pesticides by Vegetable Growers of Bihar, India

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

## Article Information

DOI: 10.9734/IJECC/2024/v14i44111

## 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/109113>

Original Research Article

Received: 15/09/2023

Accepted: 18/11/2023

Published: 12/04/2024

## ABSTRACT

In this study, knowledge about pesticides and their safe use among vegetable growers of Purnea district was discussed. Data were collected from vegetable growers of Purnea district of Bihar. From the district, one block was purposively chosen. Three villages from one block, comprising of 50 respondents each were randomly chosen. The sample size was 150 vegetable growers. Frequency, percent, weighted mean and rank were used to analyze the data. It was found that majority of the respondents lack knowledge about banned pesticides and label on pesticide products. Finding discloses that there was lack of knowledge about proper disposal of pesticide and lack of knowledge about using protective clothing. Farmers' age, educational level, experience has positive effects on safe use of pesticides in vegetable cultivation. Under such condition, there is need of extension agents in establishing rapport with farmers on regular basis can help in enhancing knowledge level about safe use of pesticides among vegetable growers.

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**Keywords:** Pesticides; vegetable growers; knowledge; safe use.

## 1. INTRODUCTION

Agriculture is the basis of economy of Bihar. Major section of the population is dependent on agriculture for their livelihood. With each day, there is rise in population, causing immense pressure on natural resources such as land, air, water etc. Under such state, the use of chemicals in agricultural crops including vegetables for higher yield is the only option left. This compels farmer to use chemicals indiscriminately. In Bihar, the use of pesticides has increased from 787 MT in 2014-15 to 981 MT in 2018-19. This increase in usage of pesticides may have been by many factors such as due to lack of knowledge about pesticide usage and increase in incidences of insects and diseases attacks. As there is overuse of pesticides, its not only deteriorating natural resources but affecting human life too. Mengistie *et al.* [1] found that majority of the vegetable growers (87%) had not received any training regarding handling and application of pesticides in vegetable crops. The vegetable growers were not using any protective equipment such as gloves, mask while spraying pesticides in the vegetable plots [2]. A greater majority of the farmers had favorable to highly favorable perception on pesticide use in vegetable production. Also, most of the respondents faced myriad of difficulties in dealing with pesticide, especially eye and skin difficulties [3]. However, certain level of education and experience has contributed significant knowledge on safety use of pesticides which further has to make farmers to practice correct methods while applying pesticides [4,5,6,7]. Chemical pesticides were the primary choice for pest management. Growers used at least one form of personal protection equipment (PPE) during pesticide spray or handling, although the quality and appropriateness of the PPE warrants further investigation [8]. Social media connected farmers and experts in real-time basis can support farmers on pesticide management [9]. Under this backdrop, the present research was conducted to reveal the knowledge and practices of safe use of pesticides.

## 2. MATERIALS AND METHODS

Purnea district was purposively chosen for study because of commercial cultivation of vegetables. Three villages Chandi, Satdobh and Nayatola were selected under Purnea East block. Respondents were selected through random

sampling methods. A sample of 50 respondents from each village was randomly selected. Thus, sample size becomes 150 for research study. The study was based both on primary and secondary data. Primary data was collected through developed schedule by personal interview and Secondary data was gathered through government database and published sources. Multiple choice questions were specially included in the schedule to assess knowledge gap. It was calculated using the formula as mentioned below. Further, *Five points scale* was used and weighted mean was calculated on the basis of different values assigned to different response. Later ranking was done in accordance to the weighted mean.

Knowledge gap =  $1 - \frac{\text{no. of right answer given by the respondents}}{\text{total no. of questions given to the respondents}}$

## 3. RESULTS AND DISCUSSION

### 3.1 Socio-economic Profile of Vegetable Growers

The finding of Table 1 revealed that majority (35.33%) of the respondents involved in vegetable cultivation were of age group of 30-40 years, followed by 20-30 years of age group with 23.3%, 14.7% of respondents belonged to the age group of 40-50 years of age group, 13.33% of respondents belonged to 50-60 years age group, 10% respondents of the respondents belonged to 60-70 years of age group. Only 3.33% of the respondents belonged to the age group of 70-80 years.

The finding of Table 1 revealed that majority (24%) of the respondents had received education up to middle school, followed by 23.3% respondents up to secondary school, 19.3% of respondents had functional literacy, 18% respondents had completed Higher secondary school, 10.7% of respondents were Graduate and above degree. Only 4.7% of respondents had received education up to Primary School. None of the respondents were illiterate.

It was also noted that that majority (38.7%) of the respondents had newly started cultivation of vegetables as a profession with only 1-10 years of experience, followed by 11-20 years experience (27.3%), 21-30 years experience

(16%), 31-40 years of experience(13.3%) and 41-50 years of experience (4.7%).The perusal of the Table 1 revealed that majority of the respondents (72.7%) had not received any training related to vegetable cultivation while 27.3% had received training.

### 3.2 Knowledge Level about Pesticide Usage

#### 3.2.1 Knowledge about banned pesticide

The result of Table 2 revealed that majority (42%) of the respondents had knowledge gap of >80% followed by 26.7% of respondents with knowledge gap of >60-80%, 18% of respondents with knowledge gap of >40-60%, 10.7% of respondents with knowledge gap of >20-40% and 2.6% of respondents with knowledge gap of up to 20%.

#### 3.2.2 Knowledge about label on pesticide products

The finding of Table 3 highlighted that majority (39.3%) of the respondents had knowledge gap

of >50-75% followed by 34% of respondents with knowledge gap of >75%, 18.7% of respondents with >25-50% knowledge gap and 8% of respondents with up to 25% of knowledge gap.

#### 3.2.3 Knowledge about safety measures during handling of pesticides

Five points scale was used and weighted mean was calculated on the basis of different values assigned to different response. Later ranking was done in accordance to the weighted mean. The finding of Table 4 revealed that 'I wear protective clothing during handling' statement ranked 1<sup>st</sup> with weighted mean 3.82 followed by 'I read instructions on pesticide container label carefully before use' statement ranked 2<sup>nd</sup> with weighted mean 3.66, 'I use suitable equipments for measuring out, mixing and transferring pesticides' statement ranked 3<sup>rd</sup> with weighted mean 2.93, 'I follow recommended dose of pesticides' statement ranked 4<sup>th</sup> with weighted mean 2.52 and 'I scoop/ stir pesticides with bare hands' statement ranked 5<sup>th</sup> with weighted mean 2.03.

**Table 1. Distribution of the respondents as per their age, education, farming experience and training received**

Sl. No.	Socio-economic factors	Frequency	Per cent (%)
<b>I. Age groups</b>			
1	20-30 years	35	23.30
2	30-40 years	53	35.33
3	40-50 years	22	14.70
4	50-60 years	20	13.33
5	60-70 years	15	10.00
6	70-80 years	5	3.33
<b>II. Educational level</b>			
1	Functional literacy	29	19.30
2	Up to Primary school	7	4.70
3	Up to Middle school	36	24.00
4	Up to Secondary School	35	23.30
5	Up to Higher Secondary School	27	18.00
6	Graduation and Above	16	10.70
<b>III. Farming Experience</b>			
1	1-10 years	58	38.70
2	11-20 years	41	27.30
3	21-30 years	24	16.00
4	31-40 years	20	13.30
5	41-50 years	7	4.70
<b>IV. Training Received</b>			
1	Yes	41	27.30
2	No	109	72.70

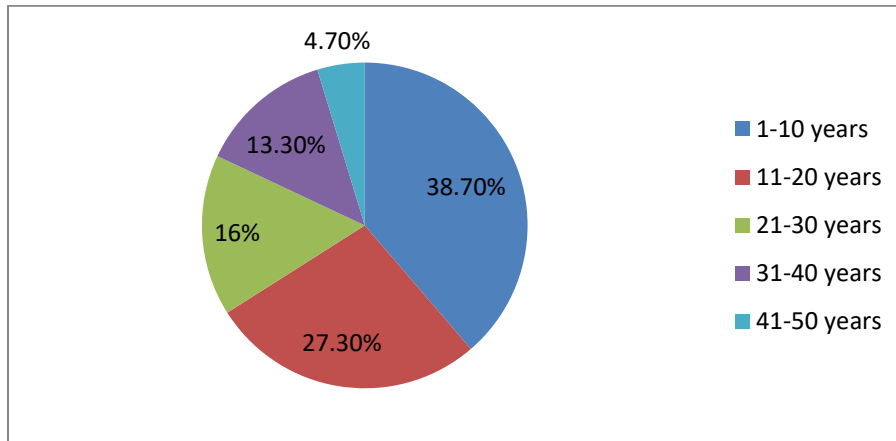


Fig. 1. Farming experiences of the vegetable growers

Table 2. Distribution of respondents as per their knowledge gap about banned pesticides

Sl. No	Knowledge gap range	Frequency (f)	Percent (%)
1	Up to 20%	4	2.6
2	>20-40%	16	10.7
3	>40-60%	27	18
4	>60-80%	40	26.7
5	>80%	63	42
	Total	150	100

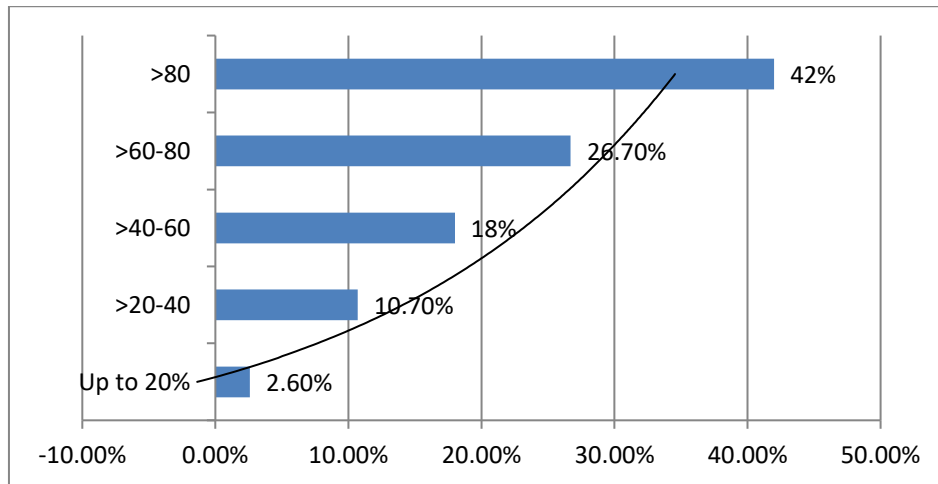


Fig. 2. Vegetable farmers knowledge gap on banned pesticides

Table 3. Distribution of respondents as per their knowledge gap about labels on pesticide products

Sl. No	Knowledge gap range	Frequency(f)	Per cent (%)
1	Up to 25%	12	8
2	>25-50%	28	18.7
3	>50-75%	59	39.3
4	>75%	51	34
	Total	150	100

### 3.2.4 Knowledge about safety measures during disposal of pesticides

Five points scale was used and weighted mean was calculated on the basis of different values

assigned to different response. Later ranking was done in accordance to the weighted mean. The finding of the Table 5 found that 'I dispose empty pesticide containers by throwing them anywhere after use' statement ranked 1st with weighted

**Table 4. Distribution of respondent as per their knowledge gap about safety measures during handling of pesticides**

SI. No	Statements	SA	A	UD	DA	SDA	Weighted mean	Rank
1	I read instructions on pesticide container label carefully before use.	46.6%(70)	18.7%(28)	2.7%(4)	18%(27)	14%(21)	3.66	2 <sup>nd</sup>
2	I wear protective clothing during handling.	35.3%(53)	41.3%(62)	2.7%(4)	11.3%(17)	9.4%(14)	3.82	1 <sup>st</sup>
3	I use suitable equipments for measuring out, mixing and transferring pesticides.	22%(33)	16.6%(25)	4.7%(7)	46%(69)	10.7%(16)	2.93	3 <sup>rd</sup>
4	I scoop/ stir pesticides with bare hands.	5.3%(8)	8%(12)	5.4%(8)	47.3%(71)	34%(51)	2.03	5 <sup>th</sup>
5	I follow recommended dose of pesticides.	22.7%(34)	7.3%(11)	2.7%(4)	34%(51)	33.3%(50)	2.52	4 <sup>th</sup>

(SA –Strongly agree, A – Agree, UD- Undecided, DA- Disagree, SDA- Strongly Disagree)

**Table 5. Distribution of respondents as per their knowledge gap about safety measures applied during disposal of pesticides**

SI. No	Statements	SA	A	UD	DA	SDA	Weighted mean	Rank
1	I dispose the empty pesticides containers by burning and burying it in depth.	36.7%(55)	12%(18)	0(0)	22%(33)	29.3%(44)	3.04	2 <sup>nd</sup>
2	I wash the empty pesticide container and reuse them.	4.6%(7)	14.7%(22)	4%(6)	42%(63)	34.7%(52)	2.12	4 <sup>th</sup>
3	I dispose empty pesticide containers by throwing them anywhere after use.	39.3%(59)	12%(18)	1.4%(2)	24%(36)	23.3%(35)	3.2	1 <sup>st</sup>
4	I keep the left over pesticides in drinking container.	5.3%(8)	12.7%(19)	4%(6)	33.3%(50)	44.7%(67)	2.00	5 <sup>th</sup>
5	I dispose the left over spray solution at safer place viz. barren isolated land.	29.3%(44)	10%(15)	0(0)	22.7%(34)	38%(57)	2.7	3 <sup>rd</sup>

(SA –Strongly agree, A – Agree, UD- Undecided, DA- Disagree, SDA- Strongly Disagree)

mean 3.2 followed by 'I dispose the empty pesticides containers by burning and burying it in depth' statement ranked 2<sup>nd</sup> with weighted mean 3.04, 'I dispose the left over spray solution at safer place viz. barren isolated land' statement ranked 3<sup>rd</sup> with weighted mean 2.7, 'I wash the empty pesticide container and reuse them' statement ranked 4<sup>th</sup> with weighted mean 2.12 and 'I keep the left over pesticides in drinking container' statement ranked 5<sup>th</sup> with weighted mean 2.00.

#### 4. CONCLUSION

The study revealed that the majority of the respondents were of the age group 30-40 years, having middle school qualification and with experience of 10 years. It was also found that majority of the respondents had wide knowledge gap about banned pesticides and labels on pesticide products. Majority of respondents also lack knowledge about handling of pesticides and safety measures applied during disposal of pesticides. There is need to provide training to the vegetable growers about vegetable cultivation. More training programs and awareness programs needs to be organized for vegetable growers for timely dissemination of information related to vegetable cultivation and practices. Krishi Vigyan Kendras, State Agriculture Departments in various states, Agricultural Universities and various other private and government extension agencies need to join hand to provide real time information at the grass root level to the farmers regarding using other non chemical practices for eradicating pests and diseases, as well as obtaining higher production of the vegetables round the year.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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