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## Adoption of safe plant protection measures by vegetable farmers of Eastern Uttar Pradesh, India

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**Abstract**

In the case of vegetables, farmers tend to be even more pesticide dependent. The extent of adoption of safe plant protection measures by the farmers of eastern Uttar Pradesh was studied with the help of structured interview schedule. Adoption index was developed to measure the adoption among the respondents. The schedule was administered over 205 vegetable growers of Varanasi and Chandauli districts under various sub-sections including adoption of application equipment, drift control and calibration, adoption of safe transportation, storage, handling & disposal, adoption of Pests & pest control, adoption of Plant Protection Practices Safety. Data indicates the ignorance of more than 80 per cent farmers towards their safety measures stressing upon the dire need for training on pesticides usage, thus, increasing adoption of safe plant protection measures.

**Keywords:** Pesticide poisoning, safe plant protection, safety practices, adoption

**Introduction**

Pesticide is an essential input for maximizing the agricultural production through controlling pests. For sustainable agriculture plant protection activities hold significant importance in the overall crop production programmes. The effort aims at minimizing crop losses due to ravages of insect pests, disease, weeds, nematodes, rodents etc.

Pesticides are poisons and their exposure is causing humans' poisonings. Considerable concern has been expressed about the use of pesticides by the smallholder farmers. Human pesticide poisoning is a global health problem. The excessive use of these chemicals, under the proverb 'if little is good, a lot more will be better' has played an adverse role with human and other life forms (Aktar and Paramasivam, n.d.). Unfortunately, this increase not along with proper understanding of the pesticides effects on human health, living organisms and the environment, that was the problem in most developing countries (Nazarian *et al.*, 2013) [15].

Due to poverty, small-scale farmers in developing countries are often the most vulnerable to pesticide exposure and poisoning. The high incidence of pesticide poisonings among smallholders is also related to faulty pesticide practices (Wesseling *et al.*, 1997; WHO, 1990; Jeyaratnam, 1990) [21, 22, 10]. Indiscriminate and heavy use of pesticides on vegetables has been observed in India (Khan, 2004) [11]. Hence, the gravity of the problem is more severe in India as high-risk pesticide residues have been found on vegetables.

In the case of vegetables, farmers tend to be even more pesticide-dependent (Heong *et al.* 1997) [9]. Being less educated, growers pay very little attention to adopt personal protection measures regarding pesticide use. Majority of them seek advice from pesticide dealers at the time of purchasing pesticides. The pesticide dealers are more interested in earning their profit rather than guiding the farmers properly (Rehman, 1994) [17]. Hence, the vegetable growers are making the excessive use of pesticides to keep the produce pest free and to force pests inside not to peep out which might reduce the market price. Unsafe use of pesticides is damaging the health of the farmers and the community in India.

The present study was planned to analyze the knowledge of vegetable growers for identification and prioritization of training needs regarding pesticide use.

**Research Methodology**

The study was conducted in eastern Uttar Pradesh in Varanasi and Chandauli districts. On the basis of maximum area under vegetable cultivation, Araziline and Chakiya blocks were purposively selected from Varanasi and Chandauli districts, respectively. After preparation of a list of vegetable farmers, 205 respondents were selected from 10 villages through stratified random sampling. Stratification was done according to the land holding of the farmers (Marginal, Small, Medium and Large). Data was collected with the help of interview schedule. Adoption index was developed to measure the adoption of safe plant protection among the

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respondents.

### Result and Discussions

The findings have been reported under various sub-sections related to safe plant protection measures including adoption of application equipment, drift control and calibration, adoption of safe transportation, storage, handling & disposal, adoption of Pests & pest control, adoption of Plant Protection Practices Safety and overall adoption of safe plant protection measures by the vegetable growers of eastern U.P.

#### A) Adoption of application equipment, drift control and calibration

In case of adoption of application equipment, drift control and calibration, data in table 1 revealed that 76.09 per cent of respondents never made it sure that the application equipment was of correct choice for the job. Only 2.93 per cent

respondents always used and considered equipment, correct for the job. Regarding cleanliness and good working condition of equipment, 26.34 per cent of respondents reported that they made it sure sometimes while only 3.98 per cent of respondents always check whether the equipment was clean and in good condition. The table also depicts that majority of respondents (82.93%) never calibrated the equipment before use. During the study, majority of the respondents (63.42%) reported that they never read the labels given on pesticide container. In a study by Damalas *et al.* (2006) [6], farmers stated that they do not read the labels because they do not need the information of the labels. This might be due to complexity of the information which is hard to understand. Locwkwood *et al.* (1994) [12] found that the average label required a cognitive reading ability (i.e. read, interpret, comprehend).

**Table 1:** Adoption of application equipment, drift control and calibration

S. No.	Statement	Never	Sometime	Always
1.	Do you take steps to ensure your application equipment is the correct choice for the job?	156 (76.09)	43 (20.98)	6 (2.93)
2.	Do you make sure your application equipment is clean & in good working order?	143 (69.76)	54 (26.34)	8 (3.90)
3.	Do you make sure your application equipment is calibrated?	170 (82.93)	32 (15.61)	3 (1.46)
4.	Do you read the label given on pesticide container?	130 (63.42)	49 (23.90)	26 (12.68)
5.	Do you wash all equipments after use?	120 (58.54)	53 (25.85)	32 (15.61)

Figures in parentheses indicate percentage

In a survey, conducted in UK, almost half of the respondents felt that labels were both inadequate and hard to understand (Grey *et al.*, 2005) [7]. Study also indicated that 58.54 per cent of respondents never used to wash the equipments after use.

sometimes followed the safety measures during transportation of pesticides, followed by never (40.00%). It is also evident from the above table that majority of respondents (81.95%) never store the pesticides in safe manner.

#### B) Adoption of safe transportation, storage, handling & disposal

Table 2 depicts that almost half of the respondents (40.49 %)

**Table 2:** Adoption of safe transportation, storage, handling & disposal

S. No.	Statement	Never	Sometime	Always
1.	When you transport pesticides, do you take steps to do so in a safe manner?	82 (40.00)	83 (40.49)	40 (19.51)
2.	When you store pesticides, do you take steps to do so in a safe manner?	168 (81.95)	22 (10.24)	16 (7.81)
3.	When you dispose of excess pesticides &/or containers, do you take steps to do so in a safe manner?	178 (86.83)	15 (7.32)	12 (5.85)
4.	When you mix & load, do you take steps to do so in a safe manner?	181 (88.29)	15 (7.32)	09 (4.39)

Figures in parentheses indicate percentage

Also majority of the respondents (86.84%) never practiced the safety measures during disposal of excess pesticide or empty container. In response to question dealing with the safety measures related to mixing and loading of pesticide solution, 88.29 per cent responded negatively to practicing safe way. A study carried out by Bury *et al.* (2005) [3] showed that training led to more number of farmers following the ideal method of pesticide storage and storing it in separate rooms as compared to the untrained farmers.

#### C) Adoption of Pests & pest control

Table 3 presents the information related to adoption of pest and pest control practices. It indicates that majority of respondents (92.20%) never used IPM practices. Also, the study reveals that usage of lowest rate of pesticide was only by 0.96 per cent respondents which is negligible.

**Table 3:** Adoption of Pests & pest control

S. No.	Statement	Never	Sometime	Always
1.	Do you use IPM (integrated pest management)?	189 (92.20)	16 (7.80)	00 (00)
2.	Do you use the lowest rate of pesticide possible?	192 (93.68)	11 (5.36)	02 (0.96)
3.	Do you identify the pest before choosing your control measure?	154 (75.12)	37 (18.05)	14 (6.83)

Figures in parentheses indicate percentage

Poor knowledge and understanding of safe practices in pesticide may be the reason for the use of pesticide in excessive concentration. Koh *et al.* (1996) [10] also found the similar result in their study.

It was also found that majority of respondents (75.12%) did not identify the pest before choosing controlling measure.

**D) Adoption of Plant Protection Practices Safety**

Table 4 reveals that 71.71 per cent respondent had been never covered their body during application of pesticides. 83.90 per cent of respondents never make sure their protection from pesticide exposure and majority of respondents (85.85%) are not concerned with the exposure of others from chemical. Lack of awareness towards health issues related to pesticide might be one of the reasons for such practice followed by them. It is evident from the study that respondents had lower

level of knowledge about toxicity of pesticides. Only 2.93 per cent reported that they always used the least toxic pesticides. Majority of respondents never wear proper personal protective equipments (PPE). While farmers may be aware of the necessity of using protective equipments during pesticide application, they usually prefer not to wear such equipments which they consider as uncomfortable, cumbersome, or non-essential (Perry *et al.*, 2002; Yassin *et al.*, 2002) [16, 23].

**Table 4:** Adoption of Plant Protection Practices Safety

S. No.	Statement	Never	Sometimes	Always
1.	Do you cover your body during pesticide application?	147 (71.71)	34 (16.59)	24 (11.71)
2.	Do you make sure that you are protected from exposure to pesticides?	172 (83.90)	28 (13.66)	05 (2.44)
3.	Do you make sure that you are not exposing others to pesticides?	176 (85.85)	17 (8.29)	12 (5.85)
4.	Do you use the right pesticide to do the job with the least toxicity to humans?	181 (88.29)	18 (8.78)	06 (2.93)
5.	Do you wear the correct PPE (personal protective equipment)?	171 (83.41)	24 (11.71)	10 (4.87)
6.	Do you clean, maintain & store your PPE properly?	156 (76.10)	34 (16.58)	15 (7.32)
7.	Do you keep up your education on pesticide safety?	198 (96.59)	07 (3.41)	00 (00.00)

Figures in parentheses indicate percentage

It is also clear from the table that majority of respondents (76.91%) never clean, maintain and store their PPE properly. This might be due to unavailability of more pair of cloths and other protective equipments. It is also observed that almost all the respondents (96.59 %) never kept up their education on pesticide safety. None of the respondents kept his education up to date always.

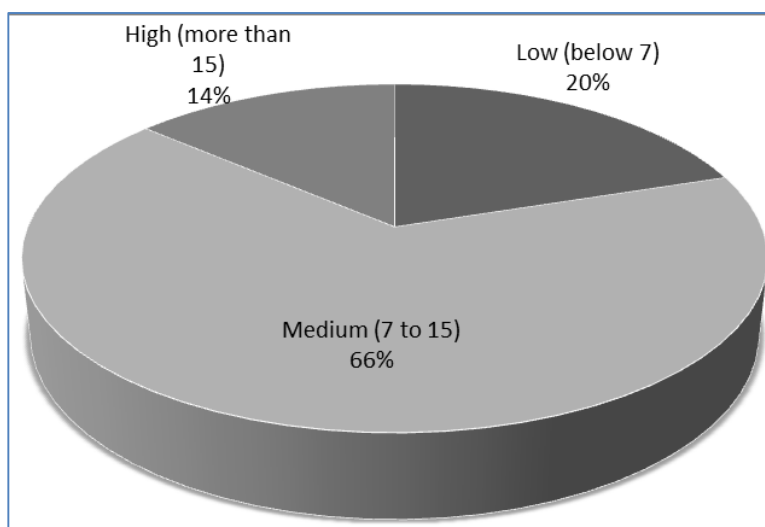
Poor use of protective equipments has also been reported by London (1994), Sivayoganathan *et al.* (1995), Stewart (1996), Richter *et al.* (1997) Clarke *et al.* (1997), Gomes *et al.* (1999), Yassin *et al.* (2002), Mekonnen *et al.* (2002), Carpenter *et al.* (2002) and Damalas *et al.* (2006) [13, 19, 20, 18, 5, 8, 23, 4, 6].

**Overall Adoption of Safe Plant Protection Measures**

It is evident from the table that majority of respondents (66.3%) had medium level of adoption. This might be due to the fact that farmers were getting maximum information about the use of pesticides from the input dealers, neighbours, friends or relatives, who were not able to provide technical information on safety measures. Study also shows that vegetable farmers go for more than recommended dose of pesticide because vegetables are highly remunerative crops.

**Table 5:** Distribution of respondents according to overall adoption of safe plant protection measures

S. No.	Category	Frequency	Percentage
1.	Low (below 7)	41	20.0
2.	Medium (7 to 15)	136	66.3
3.	High (more than 15)	28	13.7
	Total	205	100

**Fig 1:** Distribution of vegetable farmers according to overall adoption of safe plant protection measures before training

The findings are in the line with Ankulwar *et al.* (2001) [2]. They indicated that majority of respondents (66.3%) had medium level of adoption followed by low (20.00%) and high (13.7%) level of adoption.

**Conclusion**

The findings above stress upon the fact that there is a dire need to empower the farmers through updating their knowledge and increasing adoption regarding safe pesticide use to meet the challenges of sustainable environmental

health; otherwise, India may face more poverty, economic crises and health problems of increased numbers of incurable chronic diseases, resulting unbearable losses to national exchequer. It can be done by training the farmers, thus, developing interest among them towards safe plant protection measures and improving the adoption of various plant protection practices.

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