



A study of farmers' perception about methods of plant protection and their effects on health & environment in western Uttar Pradesh

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ABSTRACT

The present study was undertaken with objectives to assess the farmers' perception on using, handling of pesticides by farmers results revealed that 94% of farmers use chemical pesticide, and majority of farmers had greater influence of pesticide vendors' advice regarding pesticide use. It was found that sample farmers had limited knowledge about the proper guidelines of pest management and recommendation. Results showed that 60% of sample respondents agreed that organic farming or IPM is better options to chemical pesticide in brinjal. But the same time, farmers of the study area are reluctant to switch over from chemical pesticide to improved alternative practices. Regarding capacity building, it was found that 57% of the farmers did not attend any training on organic farming. Data reflected that 90% of sample farmers were aware about safe use of pesticide and also 95% of sample respondents were aware with the fact that exposure to pesticide has adverse health effects. The result implies that sample farmers were informed about alternatives or component of alternatives to chemical pesticide such as bio-pesticide (32%), organic farming (31%), crop rotation (18%), & cultivating crop mixture (12%). It was found that most of the farmers (87%) had an opinion that chemical pesticides are harmful for the environment.

Keywords: Perception, plant protection, pesticide, health, environment

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INTRODUCTION

Pesticides coupled with other modern inputs including chemical fertilisers undoubtedly have enabled our country to achieve unparalleled increase in agricultural productivity over the last five decades and thus enabled to achieve food security (Singh *et al.*, 2014b). Evidences indicate that in India, pests cause crop loss of more than Rs. 6000 crores annually, of which 46% is due to insects and diseases, 33% is due to weeds, 10% by birds and rodents and the remaining (11%) is due to other factors (Rajendran, 2003). The Government of India has taken several steps to ensure the safe use of pesticides. The Insecticide Act, promulgated in 1968 and enforced on 1st August, 1971 envisages to regulate the import, manufacture, sale, transport, distribution, and use of insecticides, with a view to prevent risks to human beings or animals, and for matters connected therewith. Several government organizations, national

laboratories, agricultural universities and other R&D organisations have been engaged in toxicological evaluation of pesticides, synthesis of safer molecules and evaluation of environmental contamination due to pesticides on human health and different components of environment. As a consequence, the paradigm shift in the pest management policy in favour of Integrated Pest Management (IPM) during the nineties has helped a lot in reducing pesticide consumption in the country. IPM, an alternative crop protection technology emphasizes the need for simpler and ecologically safer measures for pest control to reduce environmental pollution and other problems caused by excessive and indiscriminate use of the pesticides (Bhardwaj and Sharma, 2013). The main components of IPM are pest surveillance, use of crop varieties resistant to pest, sound cultural practices, biological control and use of eco-friendly pesticides having less mammalian toxicity.

In several studies, it was suggested that government interventions and attempts such as restrictions on hazardous pesticides and motivation about good crop

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protection practices such as organic farming and IPM were needed (Banerjee *et al.*, 2015). Use of pesticides has apparently increased all over the world. The fact that these chemicals have now entered ecosystems and food chain itself is alarming because of the range of dangerous ill effects they have on humans, animals, plants and the ecosystem in general. It is interesting to note that pesticide consumption in India is among the lowest in the world. But, this is no excuse for complacency, given the fact that the widespread illiteracy among farmers; while the unscrupulous trading and manufacturing practices make the situation very dangerous.

Consequences of injudicious use of pesticides in Western Uttar Pradesh cannot be eliminated altogether; their intensity can be minimized through development, dissemination and promotion of environment friendly technology and practices such as organic farming, bio-pesticides and bio-agents as well as Integrated Pest Management (IPM) rather than solely relying on chemical pesticides (Mahantesh and Singh, 2009).

MATERIALS AND METHODS

A clear-cut understanding of farmers' knowledge, attitudes, and practices regarding pesticide use is the first step towards understanding the reasons for overuse of pesticide by farmers. Farmers' perceptions of pest-related yield loss are important as such perceptions will have a direct effect on the amount of pesticides used by the farmers (Bharati *et al.* 2014). The awareness of different types of pesticides, pest enemies, alternative pest management measures, and the changes in the extent of pest problems over time are important measure of farmers' knowledge of pest management (Singh *et al.* 2014a). Farmers in developing countries mostly do not follow the adequate safety measures, which have a direct impact on their health and hence on the working efficiency. Visualizing the importance of various pesticide issues, the present study intends to examine the human health and environmental issues of pesticide usage in two districts namely Ghaziabad and Hapur of western Uttar Pradesh. The broader objectives of the study are: (1) To assess the extent of use of chemical and alternative methods of crop protection being used by the farmers in two of the said districts of western Uttar Pradesh and (2) To assess the extent of the awareness and perception about the harmful effects of chemical pesticides on health and environment. In the study, various types of primary as well secondary data have been utilized. The former being the survey, interviews and semi-structured questionnaires on

various issues of pesticide use and its effect on health and environment were collected extensively from the 100 selected sample farmers. In this study, brinjal has been selected to the year 2013-14 (Suman, 2014). There are two reasons behind the selection of brinjal. First, farmers use pesticides in this vegetable very much and secondly the crop season of brinjal comes between September to March and its fruits are gained throughout the year. The study area represented one of the most progressive regions in respect of productivity and input usage and also characterized by highly commercialized agriculture.

RESULTS AND DISCUSSION

The socio-economic characteristics of sample respondents were comprised (Table 1) of 70% male, 30% female and mostly having rural background (98%). On an average, the sample respondents were of the age of 46.39 years. Most of them (53%) were in middle age group (31-50 years) while 36% were found in the age of more than 50 years. Education status of sample farmers revealed that most of the farmers (25%) had primary level of education, and 21% of the sample farmers were illiterate farmers (Bharati *et al.*, 2014).

Table 1: Profile of respondents (N=100)

Characteristics	Percentage of respondent	Characteristics	Percentage of respondent
Age (year)		Education	
21-30	11	Illiterate	21
31-40	27	Primary/middle pass	25
41-50	26	Matric	19
Above > 50	36	Intermediate	9
Sex		Graduate	11
Male	70	Post-graduate	9
Female	30	Other qualification	6
Land holding		Background	
<1 ha	8	Rural	98
1-10 ha	86	Semi urban	1
11-20 ha	6	Urban	1

The average size of land holding of sampled farmers was found to be 4.25 hectares and range of landholding of sample respondents were from 0.4 to 20 hectare.

A majority of the farmers (86 %) belonged to semi-medium category (1-10 ha) of land holding, while only few belonged to marginal (less than 1 ha) and large (10-20 ha) holdings. Majority of the farmers in the study area had irrigation facilities and adequate use of chemical inputs such as fertilizers and pesticides, indicating prevalence of commercial agriculture in the region as revealed in focused group discussion and interaction (Suman, 2014).

It has been reported that farmers in the study area applied chemical pesticides frequently and since long time. It was found from study that 25% of sample respondents had been using pesticides since 10 years. It reveals that farmers are using chemical pesticide on an average of since past 9 years and the major reason behind use is greater yields and resultant profit. Results of farmers' survey, revealed that 94% of farmers used chemical pesticide, whereas a very few farmers use other traditional plant protection methods such as hand picking in case of brinjal fruit and shoot borer management. It was also found that majority (78%) of farmers applied pesticide immediately after initial attack of any pest. An alarming practice among the farmers of the study area is revealed that 43% of them used pesticide more than thrice in case of brinjal crop and majority of farmers (39%) had greater influence of pesticide vendors' advice regarding pesticide use. These findings suggest that farmers of the study area are very much depended on chemical pesticides and they use these pesticides indiscriminately. They usually follow pesticide vendors' advice which is not a correct and logical practice. Shopkeeper will always intend to sell more pesticides to farmers and will advise to use higher amount for yield because of his business angle. In the study, it was found that sample farmers had limited knowledge about the proper guidelines of pest management and recommendation. Data revealed that 63% of sample respondents did not know how many times any particular pesticide should be applied to the crop (Table 2).

Adoption of technologies is a dynamic process. Especially in case of pest management & alternative has a significant role. But data showed (Table 3) that 84% of sample respondents were not aware about better alternatives to the chemical pesticides to control pests in brinjal. Only 16% of sample farmers were aware of alternatives to pesticides. Some of them listed as larvae burying in soil, plucking of affected plants, organic farming and integrated pest management. Results showed that respondents of the study area are reluctant to switch over from chemical pesticide to improved

Table 2: Source of availability of pesticide (N=100)

Particulars	Percentage of farmers
Time since using pesticides	
1-5 years	30
6-10 years	42
11-15 years	26
>15 years	4
Measure used to control Brinjal fruit and shoot borer	
Apply pesticides	94
Hand picking (traditional method)	3
Any other method	3
Pesticide application stage	
After several attack	15
After initial attack	78
Without observing any pest	7
Source of inspiration to use pesticide	
Own decision	21
Other farmer/neighbour's advice	8
vendor's advice	39
Others	32
Knowledge about admissible frequency of pesticide application	
Yes	37
No	63
Source of inspiration to use pesticide	
Own decision	21
Other farmer/neighbour's advice	8
Vendor's advice	39
Others	32

alternative practices. Survey revealed that 72% of sample farmers had perception that chemical method of plant protection gave better yield in brinjal.

Training and capacity building is important consideration for technology adoption. In this perspective, in the present study (Table 4), it was found that 57% of the farmers did not attend any training on organic farming, IPM or any other alternative to pesticide whereas 43% attended training generally at Krishi Vigyan Kendra or at private company. Out of the sample farmers, who attended training, 58.7% replied that organic farming and integrated pest management was the main topic covered in the training. In the study, awareness level of sample farmers was judged about safe use of pesticide and its effect and source of information. Data reflected that 90% of sample farmers were aware about safe use of pesticide and also about the effect of pesticide. Only

Table 3: Knowledge about alternatives to chemical pesticide & practices of plant protection (N=100)

Particulars	Percentage of farmers
Knowledge about better alternative/s to the pesticides to control pests	
Yes	16
No	14
Alternatives like organic farming or Integrated Pest Management (IPM) better options to the pesticides	
Yes	25.8
No	63.9
Knowledge about natural enemy of pests	
Yes	20
No	80
Perception about traditional & chemical methods of crop protection, with respect to better yield	
Traditional	4
Chemical	72
didn't know	23
didn't matter	1

10% was unaware of above and the major source of information was kisan mela (58 %), TV & radio (21.6%), newspaper/magazine (19.3) & other like KVK, fellow farmer, friend & neighbour (1.1%). From above findings, it is revealed that kisan mela is the largest source of information and TV-radio are the next major source in respect of farmers' awareness about pesticide use (Table 4).

It was found from the result that farmers were aware about labels and information on pesticide container. 83% of respondents did not bought pesticides without label and 84% of sample farmers read the information leaflet available on pesticide container before its use. Simultaneously most of them (75.9%) followed the instructions of the label. Regarding handling of pesticide it was revealed from survey that 87 % of sample respondents knew that pesticides should be kept separately in the home and should be safely handled. Farmers' disposal and storage of pesticides was also a safety concern. The data showed that 88% of the sample farmers stored pesticides in the original containers in a locked area. Out of this result, it may be considered that farmers of the study area are well aware of ill effects of chemical pesticide on our health & environment and they use proper precautions while pesticide handling (Table 5).

Table 4: Capacity building programme on plant protection (N=100)

Particular	Percentage of farmers
Training course attended on organic farming/IPM and/or any other alternatives to pesticides or pesticide use	
Yes	43
No	57
Topic/s of the training	
Organic farming & IPM	58.7
Safe use of pesticides	13.0
Health and environmental impacts of pesticides	15.2
Any other (KVK & private company)	13.0
Awareness about safe use of pesticide	
Yes	90
No	10
Sources of information about safe use of pesticide	
TV/Radio	21.6
Newspaper/magazines	19.3
Kisan Mela	58.0
Any other	1.1
Association with any of the following for consultation about plant protection	
Government extension agent	8
Neighbours or friends	5
Pesticide shop keepers	41
Pesticide company representatives	8
Farmer association	12
Staff of agri-college/ University	3
I don't consult with anybody on other crop protection methods	5
Other	18

Possible alternatives of chemical pesticides, their availability and information level were also judged in the study and result implies that sample farmers were informed about alternatives or component of alternatives to chemical pesticide such as bio-pesticide (32%), organic farming (31%), crop rotation (18%), & cultivating crop mixture (12%). This is a good sign that majority of the farmers are aware and convinced with better prospects of many of the alternative practices of crop protection. Hence, further plan of motivation/awareness could be chalked out with respect of farmers by the concerned agencies for adopting the suitable alternative/s of chemical pesticide. (Table 6)

Table 5: Information about safety concerns, handling & storage of pesticide (N=100)

Particular	Percentage of farmers
Have you ever bought pesticides without a label?	
Yes	17
No	83
Following information leaflet of pesticide prior to its use	
Yes	84
No	16
Do you know that the pesticides should be kept separately in the home and be safely handled?	
Yes	87
No	13
Pesticides storage	
In the original container in a locked area	88
In an unlocked area	1
Anywhere, it doesn't matter	5
any other	6

Table 6: Knowledge & awareness about alternatives to pesticide (N=100)

Particular	Percentage of farmers
Knowledge about alternatives to pesticide	
Bio-pesticides (prepared out of plants)	32
Organic farming	31
Crop rotation	18
cultivating crop mixtures	12
Any other alternative	7
Information about pesticides prepared out of plants	
Yes	41
No	59
Availability of bio-pesticides	
Yes	72
No	28
Awareness about organic farming	
Yes	72
No	28
Understanding of organic farming	
No chemical fertilizers	51
No chemical pesticides	21
Composting	8
Crop rotation	13
Intercropping	5
Other	2

Findings of the study revealed that 95% of sample respondents were aware with the fact that exposure to pesticide has adverse health effects while very few (5%) were unaware about the above fact. Response to pesticidal effect on personal health was examined (Table 7) and the related data showed that approximately half of the sample respondents (46%) felt discomfort/illness after pesticide application. Among them, 64% felt dizziness, 26% observed headache and few felt blurred vision or excessive sweating (4% & 6% respectively).

Table 7: Perception about health impact of chemical pesticide (N=100)

Particular	Percentage of farmers
Type of experiences/symptoms appeared	
Dizziness	28
Head ache	52
Blurred vision & Excessive sweating	12
Hand tremor	8

It was found that (Table 8) most of the farmers (87%) had an opinion that chemical pesticide are harmful for

Table 8: Knowledge, perception & information about impact of pesticide on environment

Particular	Percentage of farmers
Knowledge about pesticide residues left out in air, soil, ground water, fruits, seeds, stems, roots and leaves	
Yes	73
No	27
Place of mixing (preparing) pesticides before application	
Near community water source	11
Near a river	3
At home	7
In the field	79
Place of cleaning equipment/s after the application/spraying of pesticides	
At home	11
In the bathroom of home	14
outside the yard	49
nearby river/lake	20
Other	6
Are the pesticide containers used for other purposes afterwards?	
Yes	10
No	90

the environment and also majority of farmers (73%) perceived that after using pesticide its residues are left out in air, soil, ground water and plant parts. The result of the study showed that majority of sample farmers mixed / prepared pesticide mixture at their field, whereas some (11%) prepared pesticide mixture near community water source. This showed that primary contamination of soil, water and air occurred while preparing the pesticidal solution. Chemical pesticide has also impact on animals, insects, pollinating agents.

Perception about pesticide on weeds, insect pests, bees, pollinating agents etc. was examined (Table 9). It was revealed that 75% of sample respondents have perception that due to chemical pesticide application, weeds were increased; 79% responded that it increased mosquitoes; 71% told about the increase of spiders; 77% told that also bees increased and 71% replied that other pollinating agents decreased during last 2 years in the study area.

Table 9: Observance of change in flora/fauna due to chemical pesticide during last 2 years in the study area by farmers (N=100)

Particulars	Percentage of farmers			
	Increased	De-creased	No change	Did not know
Weeds	75	19	3	3
Mosquitoes	77	18	2	3
Spiders	71	22	6	1
Bees	77	7	11	5
Other pollinating insects	7	71	14	8
Other insects	27	16	11	46

Change in water quality following pesticide application was also asked (Table 10) and data showed that 25% respondents noticed change in water quality; 26% did not find any obvious change while 49% did not know about any difference in water quality of study area. 58% of respondents were in agreement that chemical pesticides caused ground water pollution and they had very harmful effect on environment. It was revealed that majority of respondents knew that after using pesticide its residues are left out in air, soil, ground water and plant parts. Majority of respondents were agreed that exposure to pesticides had an adverse effect or impact on human health (59% agreed and 24% strongly agreed). Based on the above perspective, farmers may be motivated to stay observant towards changes in their surrounding environment including soil, water, flora and fauna after

chemical pesticide use.

Table 10: Observance of change in diversity (terrestrial or aquatic), water quality and incidence/hazard due to chemical pesticide during last 2 years in the study area by farmers

Particular	Percentage of farmers
Observance of differences in the diversity of terrestrial and aquatic lives in surroundings following pesticide application	
Yes	16
No	36
Didn't know	48
Observance of differences in water quality following pesticide application	
Yes	25
No	26
Didn't know	49
Knowledge of any incidence caused by hazardous pesticide occurred in the community in past 2 years	
Yes	12
No	64
Didn't know	24

Though a number of researches have been conducted to study the reasons of excessive use of pesticides, and their consequences on our health and environment, but very limited efforts have been made to popularize the findings of such studies among the stakeholders. In fact there is a need to study effectiveness of the findings of such studies and to assess how effectively such findings have been communicated at the grass root level. Besides strict implementation of the policies related to the use of pesticides, there is a great need of creating awareness among the farmers, and other stakeholders by both governments and non-government organizations (Dwivedi and Sheth, 2008). Economics of using pesticides and the expenditure on the health problems generated due to pesticide use also need to be studied.

CONCLUSION

With the increase of population, there is a need for increased crop production. So far pesticides and other chemicals have been excessively used for this purpose. But keeping in view the harmful effects of pesticides on both our health and environment, it is now imperative to search for the safe and eco-friendly alternative methods of crop protection and for increased yield. Organic farming and IPM are two very effective alternatives of

pesticides and hence there is a strong need for immediate steps to be taken by the individual, as well as by the government and non-government organizations to train farmers regarding the safe and eco-friendly methods of farming to secure health and conserve environment.

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