

Original Article

Survey-Based Study on Farmers' Knowledge and Pattern of Using Insecticide on Different Crops in Aligarh District of Uttar Pradesh, India

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Abstract:

Background: Agrochemicals can play a significant role in enhancing post-harvest crop productivity and protection. But over the years, there's growing concern about the inaccurate use of pesticides in agriculture. **Objective:** To assess knowledge of farmers about pest management, perceptions of the kind and frequencies as well as severity of pests and disease, sources of information, awareness of farmers and safety measures followed during pesticide application. **Methods:** A random survey was conducted employing a standard structured questionnaire among 100 farmers in Wheat, Mustard and Paddy cultivating areas across the ten villages of Aligarh district, Uttar Pradesh, India. **Results:** Most ordinarily used pesticides applied by the farmers on different crops were Malathion, Cypermethrin and Chlorpyrifos. It was also observed during the survey that most of the farmers stored the pesticide bottles at safe places and the remaining in unsafe areas with no safety measures. It was found that no farmer was familiar even with Government Central Insecticides Board and Registration Committee (CIBRC)'s roles and guidelines about the use of labeled and unlabelled pesticide application. However, most of the farmers were mainly dependent by the recommendation of pesticide dealers.

Keywords: Agrochemicals, Labelled, Non-labelled, CIBRC, Malathion

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Introduction

In India pests and diseases cause damage on an average 18-20% of crop cultivated by the farmers every year. Due to the rising population and decreasing cultivable land, demand for food grains is increasing at a faster stride when compared to its production. Crop losses due to these harmful organisms can be substantial and may be prevented, or reduced, by crop protection measures.¹ Adequate knowledge on how farmers perceive pests, their attitude, and practices to crop protection problems are required to implement successful pest control programs.² Therefore, it is required to adopt more simple steps for crop productivity enhancement as well as crop protection methods.

Agriculture is the main occupation of the farmers in the study areas and has an important place in the economy of the district. Farmers of 10 villages of Aligarh i.e., Amroli, Chandekha, Chereth, Sudyar, Kalupura, Siya, Ratgao, Palla, Mirzapur and Manzorgadigrow wheat, mustard, paddy, maize, sugar cane and other season crops as well as off season crops vegetables. These crops are damaged by various insects, pests and diseases and cause reduction in yield. Use of pesticides can increase crop productivity by 25-50%, by reducing crop loss due to pest attacks. Thus, crop pesticides are also very essential to ensure food and nutritional security. Crop pesticides, poisons chemical substances used in certain circumstances to kill specifically targeted pests.³ Though strict regulations have been laid

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down by both international agencies like EPA and WHO and national agencies like India's Central Insecticide Board and Registration Committee (CIBRC) and Food Safety and Standard Authority of India (FSSAI), which work for the insecticides manufacturing, formulation and usage, however, farmers overlooked the desired dose, favourable time and frequency of application of these pesticides.⁴

At the same time, farmers do not give much attention to the requisite safety measures to be adopted and the recommended mode of application for different kinds of commonly used pesticides particularly in developing countries. Chemical pesticides are the most effective, short-term control method for a variety of crop pests and pathogens but their ailing effects on human, animal and environmental health have also been well accepted. Chemical pesticides tend to persist in soil, surface water as well as ground water for long periods thus imposing serious health threat for humans and animals.⁵ Apart from affecting the target pest, they also influence the native micro and macroflora of the agricultural soils and water.^{6,7} A numbers of ecological functions and properties are adversely influenced by pesticides such as nutrient cycling, natural food webs and food chains, soil structure and fertility, soil and water biodiversity, natural balance between pest and predator insects and many others.⁸

However, if proper care is not taken, pesticides can harm the environment by contaminating soil, surface and groundwater, and ultimately kill wildlife.⁹ We are living in an environment that is polluted not only by heavy metals, pharmaceutical chemicals but also by pesticides.¹⁰⁻¹¹ It is required to develop compounds naturally and synthetically that are capable of interfering with the processes of growth, development and metamorphosis of the target insects. One of the alternatives may be the inclusion of insect growth regulators (IGRs) in pest control programmes.⁹

There are only a few studies associated with these issues in India. Thus, a study focused on pesticide application practices and usage trends is highly required to know the farmer's perception. This investigation was, therefore, undertaken to assess various aspects of pesticide usage patterns, farmer's views in pest knowledge and management

in cultivating different crops in villages of Aligarh District, Uttar Pradesh, India.

Methods

A survey-based study was conducted to collect the information on various aspects of pesticides usage like knowledge of farmers about pest management, perceptions of the kind and frequencies as well as severity of pests and disease, sources of information, awareness of farmers and safety measures followed during pesticide application.

The study was done across the 10 villages of Aligarh i.e., Amroli, Chandekha, Chereth, Sudyaar, Kalupura, Siya, Ratgao, Palla, Mirzapur and Manzorgadi. The study was conducted face to face with farmers at the place of their crop field and resident using a standard structured questionnaire in the vernacular language spoken and understood by the farmer. 100 farmers (10 farmers from each Village) were interviewed in which 35 were in the age group of 25-35 years and 65 were in the age group of 35-50 years. The farmers were not informed to avoid biased responses and to gain actual insight of the farming practices.

These farmers were divided based on land ownership. A household that has more than 10 acres of land were considered 'Large Farmer'; between 4 acres and 9 acres were 'Medium Farmer'; less than 4 acres as 'Small/Marginal Farmer' and with no land as 'Landless Farmer'. The landless farmers take a rented field for cultivation of crops and earn profit by selling crops and managing their home.

The uses of labeled/unlabelled, intensity and composition of pesticides used by farmers are kept in mind to have a better insight into farmers' pest management practices in crop production. Farmers' pest control practices, sources of information on the adoption of pesticide use and decision criteria were conducted. In addition to this, information regarding sources of information of toxicity levels, storage, disposal, application practices, sprayer maintenance, safety measures followed was also examined at the study site.

Percentages and averages were computed and compared using MS-excel and SPSS (16.0 version) to draw meaningful inferences.

Results

The present survey-based study was done after randomly selecting farmers of different crops, cultivating areas of Aligarh. Among the 100 interviewed farmers, 53 percent had received no formal education, 30 percent were educated below secondary level and 12 percent were educated up to secondary level and only 5 per cent had acquired a higher degree. The average ages of the interviewed farmers were between 35 years to 45 years of age (Table 1).

The Indian cropping pattern is exclusively within the world because it is characterized mainly by the paddy-wheat cropping pattern. The findings of the survey suggest that different types of crops are grown based on seasons and suitability of farmers. Basically, farmers are interested in growing two different types of crops annually, but sometimes they grow more than two crops in a year. Types of crops grown are totally dependent on quality of soil, irrigation supply, climatic condition and on the farmer wellbeing (Table 2).

Farmers buy the insecticides from the nearby places. They are more fascinated to get insecticides at lower cost. This way, they want to save both money and time. The pesticide dealer sells the insecticide to the farmers without any scientific reasoning (Table 3). Farmers were found using different equipment for introducing insecticides in the agricultural field, such as majorly tanks (capacity 20-25 litre of water), manual and electronic sprayers, etc.

Overall, 10 insecticides were found as most frequently used by the farmers. A region wise analysis on the use of fertilizers reveals that insecticides are being used most in study areas. Malathion was known to be the most effective and popular insecticide followed by other insecticides such as chlorpyrifos. Insecticides like imidacloprid and methyldemeton were also used to control sucking pests of sugarcane which acts as systemic (Table 4). The use of insecticides in agriculture is still essential to achieve adequate control of pests and desired production. However, applying large quantities of insecticides is most common, to ensure the result, without taking into account that this practice normally entails an excessive release of harmful products that make the environment unfit and increases production costs.

Farmers take only primary action to store, dispose and safety measures for use of insecticides. Most of the farmers stored the pesticide bottles in their houses. Only a few farmers adopted safe disposal methods like crushing/burying the empty containers into the soil. They resold or reused the empty bottles of pesticides after washing them properly, especially large size containers. It was also found that very few farmers used self-protection such as like face masks/hand gloves, etc, and rest of the applicants did not use any safety measures (Table 5).

In the survey conducted, it was observed that farmers had limited knowledge of pest management as well as the consequences of pesticide use in crop cultivation. About 35.3 per cent (average) or more of farmers were not aware of the hazards of insecticides and 70 per cent mainly dependent on the advice of pesticide dealers, followed by relatives/friends as well as information from the public. 50 per cent were not recognizing the pest which causes damage to their crops (Table 6). They are only interested in increasing their yield and saving their crop from insects. In some villages, farmers take advice from private instructors or advisers who have knowledge about different pesticides and for these, farmers must pay for the advice.

The knowledge about IPM and Biological control practices was also examined. On an average 33.2 per cent farmers are here about the IPM and said that they are willing to achieve the IPM techniques, but they don't have a proper knowledge about that and good financial conditions (Table 6).

Table-1: General characteristics of the farmers growing different crops

Variables	Percentage
Age	
25 – 35	20
35-45	55
45-55	15
More than 55	10
Qualification	
Illiterate	53
Primary school	16
High school	14
Intermediate	12
Bachelor	05

Table 2: Crops grown by different farmers

Crop type		Percentage
Scientific Names	Common Names	
<i>Oryza sativa</i>	Rice	46
<i>Triticum</i>	Wheat	20
<i>Pennisetum glaucum</i>	Bajra	18
<i>Saccharum officinarum</i>	Sugarcane	6
<i>Zea mays</i>	Maize	5
<i>Cicer arietinum</i>	Gram	4
<i>Glycine max</i>	Soyabean	2
Other		5

Table 3: Shops available in Aligarh through which the farmer buys Pesticides

Shop name	Location
Aligarh Agricultural Store	Patthar Bazar, Aligarh
Neelam Fertilizer	Mathura Road, Aligarh
Kisan Agricultural Store	Quarsi, Aliagrh
Jyoti Beej Bhandar	Charra Road, Aligarh
Mahadev Seed Agencies	Dhanipur Mandi, Aligarh
Chola Beej Bhandar	Khair, Aligarh

Table 4: Commonly used Insecticides by farmers

Common name	Trade name	Type of pesticide	Toxicity class*	Percentage of farmers using
Malathion	Cythion 50 EC	Insecticide	III	79
Chlorpyrifos	Dursban, Durmet20	Insecticide	II	71
Cypermethrin	Shakti 25 EC	Insecticide	II	68
Profenofos	Profex 50 EC	Insecticide	II	66
Imidacloprid	Confidor 200 S.L	Insecticide	II	59
Dimethoate	Tafgor 30 EC	Insecticide	II	57
Fenpyroximate	Pyromite	Insecticide	U	49
Lambdacyhalothrin	Karate	Insecticide	II	38
Dichlorvus	Nuvan	Insecticide	II	29
Methyl demeton	Metasystox 25 EC	Insecticide	Ib	24

*Ib= Highly hazardous, II= Moderately hazardous, III= Slightly hazardous, U= Unlikely to cause acute hazard in normal use.

Table 5: Pesticide storage, disposal and application practices adopted by farmers

Particulars	Pesticide storage after purchase		Disposal of pesticides			Safety measures used (e.g., face masks)	Use of machinery for pesticide application
	Safe storage	Unsafe storage	In crop field	Sold/reuse	Crushed/buried		
Amroli	84	16	33	56	11	34	44
Chandekha	78	22	31	50	19	29	51
Chereth	79	21	28	54	18	32	53
Sudyaar	66	34	33	49	18	26	48

Particulars	Pesticide storage after purchase		Disposal of pesticides			Safety measures used (e.g., face masks)	Use of machinery for pesticide application
	Safe storage	Unsafe storage	In crop field	Sold/reuse	Crushed/buried		
Kalupura	65	35	30	60	10	31	48
Siya	68	32	26	61	13	33	49
Ratgao	74	26	29	59	12	30	52
Palla	64	36	33	54	13	26	51
Mirzpur	60	40	25	63	12	28	47
Manzorgadi	50	50	29	57	14	36	43
Average	68.8	56.72	29.7	56.3	14.0	30.5	48.6

Note: All figures are in percentage.

Table 6: Farmer's knowledge about Pest Management

Particulars	Have known about insecticide hazards	Have heard about IPM	Have knowledge about the pests	Source of information for adoption of pest manage
Amroli	72	39	59	PD,FF
Chandekha	70	40	58	PD,FF
Chereth	69	41	60	PD
Sudyaar	65	36	56	PD
Kalupura	66	33	48	PD
Siya	68	31	52	PD
Ratgao	59	29	45	PD,FF,F
Palla	64	30	43	PD,FF,F
Mirzpur	59	25	46	PD
Manzorgadi	55	28	42	PD,FF,F
Average	64.7	33.2	50.9	

Note: All figures are in percentage.

Key: FF- Fellow Farmer; F- Friends; SDA-State Dept. of Agricultural; PD-Pesticide Dealer; GP-Govt. Adviser

Discussion

Based on the information received during the survey, it can be concluded that different varieties of insecticides are prevalent in areas of study and 96 per cent of the farmers in the study area grow two or more crops in a year. The use of insecticides seems to be regular, occasional, and conditional. The farmers were interested in pest control of pests, but they are not fully aware about the hazards of insecticides. The observations were quite unsatisfactory regarding the adoption of

adequate safety and protective measures related to Insecticides application practices. Majority of the interviewed farmers confirmed that no safety measures are taken by them except covering of their mouth and nose with cloth during pesticide spraying.

We found Malathion as the most popularly used insecticide followed by Chlorpyrifos in the surveyed area. It was reported by the farmers that they are interested in buying cost effective, easy availability of Insecticides. Majority of the

farmers tend to use Insecticides even before the onset of crop damage by Pest and they follow a continuous application of pesticides throughout the crop season up till harvesting. Due to poor financial conditions farmers are unable to use the equipment and leading to the continuous exposure of high concentrations of toxic chemicals, as a result acute as well as chronic health problems were associated by the interviewed group of famers.

It is an important to control the impact of pesticides on the environment and reduce the risks associated with their application. We studied the actual need of the dose of pesticides, knowing their level of toxicity, required for which type of crop and what time it uses should be known is one way to achieve the goals. Pesticide Management is the regulation of the import, manufacture, export, sale, transport, distribution, quality, and use of pesticides with a view to control pests and minimizes the contamination of agricultural commodities by pesticide residues. Study of mode of action is helpful to prevent development of Insecticide resistance in the target pest and development of pest resistance can be avoided or delayed by rotating Insecticides that work through different modes of action. To minimize the number of insecticides to be applied in a treatment of crops, it is required to study the relationships between the quantity/quality of deposited active ingredient, how it is deposited and how it affects the control of the pest.

There are few serious issues which need more attention to strengthen the domestic pesticide industry and safe application practices of pesticides. Firstly, it is important to regulate and encourage the use of cost-effective and environment friendly

Insecticides. Hazardous pesticides should be avoided because of its adverse impacts. The second important consideration is the promotion of safe application practices and awareness of Insecticides among farmers. Data on use of IPM and Biocontrol agents are scanty. It is required to provide basic and advisory services and farmer's organizations with adequate information about IPM strategies and methods. Farmers are disappointed with the overall condition of farmers in India. Even though the government of India affirms to have introduced many schemes and policies to enhance their condition, the farmers feel that only rich farmers got the benefits of government schemes and policies related to farming. Only few believe that poor and small farmers have got the benefit from related schemes. The data, described in this paper, on benefits and environmental-health risk assessment studies may be regarded as a tool towards a more understanding of the problems related to global use of insecticides.

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