



Awareness Among Farmers of Punjab Regarding Pesticide Use in Agriculture and its Complications

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ABSTRACT

The present study investigated levels of understanding of pesticide handling among the farmers of Punjab by focusing on their ability to understand the information displayed on product labels, which might affect risk reduction. A set of 9 statements were put to the farmers through Google forms during the Covid-19 pandemic period as it was not possible to visit individual farms of the farmers. Basic information about the farmer such as gender, age, educational level, and farming practices (crop types and yields, agrochemical products used etc.) was recorded. A discussion was also performed with individual farmer regarding practices of pesticide application followed. It was found that 27 (24.32 %), 60 (54.10%) and 24 (21.62%) farmers were in the age group of young (up to 30 yr), middle age (30-50 yr) and elder (>50 yr), respectively. The land holding status revealed that 46 (41.44%), 32 (28.83%) and 33(29.73%) farmers possessed less than 2 ha, 2 to 4 ha and more than 4 ha. indicating that majority population falls under small land holding (<2ha). Similarly, it was observed that majority of the middle age group (38-50 yr) farmers were more aware of the various questions posed by the researcher, as compared to the youngsters (<30 yr). On the other hand, elder farmers (>50 yr) were either equally or more aware than the younger population. The study revealed that there was no correlation between the land holding, age and awareness level about various pesticides usage and its harmful effects. Hence, it was observed that the education level could have played a significant role in the awareness level of farmers.

Key Words: Agriculture, Awareness, Complications, Farmers, Pesticide, Use.

INTRODUCTION

Modern chemicals in the form of fertilizers and pesticides have increased the food production to match the ever-increasing demand and have become an indispensable part of the agricultural system. Around 1.8 billion people are engaged in agriculture and most of them use pesticides for pest control. Several reports have highlighted the effect of indiscriminate and excessive use of pesticides not only on human health but also the environment. Literature shows that pesticide exposure leads to various health issues, ranging from acute poisoning, skin disorders, endocrine disruption, foetal deformities, miscarriages, reproductive problems, lowering the sperm count of applicants,

cardiopulmonary and neurological impairments and various cancers (George and Shukla, 2011; Mrema *et al*, 2013; Araújo *et al*, 2016).

Organochlorines (DDT, heptachlor, endosulfan) are very potent insecticides, and are structurally similar to steroid hormones (Tebourbi *et al*, 2011). Similarly, Organophosphate (malathion, parathion and DDVP) and carbamates (carbofuron and aldicarb, to name a few) act as AChE (acetylcholinesterase) inhibitors and cause interruption of impulse transmission at synaptic level. Likewise, insecticides such as imidacloprid are neurotoxic and antagonist to nicotinic acetylcholine receptors (nAChRs) (Tomizawa and Casida, 2005). Each year almost 355,000 people die

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Table 1. Questions designed to assess awareness among farmers of Punjab.

Sr. No.	Question put to the participating farmer	Expected reply
1.	Do you use pesticides/ insecticides in your farm? If yes, can you name them?	Yes No
2.	Do you take necessary safety precautions while spraying/using insecticides? If yes, what precautions do you use?	Yes No
3.	Can you name any insecticides/pesticides known to cause poisoning?	Yes No
4.	Have you ever attended any camp or workshop related to insecticide poisoning?	Yes No
5.	Are you aware of the signs and symptoms to identify if someone is adversely affected by the insecticide or pesticide? If yes, can you name a few signs and symptoms?	Yes No
6.	Do you read the safety instructions given on the label printed about the chemical?	Yes Sometimes No
7.	Do you think the instructions mentioned on the label are relevant/ important?	Yes May be No
8.	Are all pesticide/ insecticide poisoning result into death?	Yes May be No
9.	First aid is essential to be provided to anyone who is poisoned by insecticides/pesticides?	Yes May be No

of unintentional poisoning because of unrestrained use of toxic chemicals (WHO, 2012; Alavanja and Bonner, 2012). India alone, account for one-third of all pesticide poisoning cases in the world. Being a developing country, India is already struggling with problems like high MMR, IMR, malnutrition etc., pesticide poisoning adds to the burden on healthcare.

There are various methods to control pests in different pest management systems, yet the use of pesticides continues to be the major component in most of the pest control programmes and will probably remain so in the near future. The large-scale use of pesticides has caused many

environmental problems like pesticide poisoning, insecticide resistance, resurgence of pests and effect on non-target organisms besides accidents involving human deaths and injury. India lacks accountability on the front of pesticide usage especially when misbranded or spurious pesticides are involved. The conviction in cases of pesticide accidents is very low. One probable solution to combat these problems is to use recommended pesticide at the right time with the recommended dose and to avoid using banned or restricted pesticides. Kaur *et al* (2018) conducted a study to know about the use, pattern of pesticide application, reasons for using non recommended pesticides at higher doses and

Awareness Among Farmers of Punjab Regarding Pesticide Use

the suggestions to tackle this issue by the Punjab farmers. It was reported that amongst the various reasons cited for using higher doses of pesticides, spurious quality of pesticides has emerged as the main reason, 100 per cent of the farmers were of the view that pesticide usage should decline in the state because of the ill effects of pesticides on the human and animal health. Fifty per cent of the total sampled farmers suggested that quality of the pesticides must be ensured for effective control of pests/diseases while 26 per cent were in favour of developing new formulations of better quality than existing ones. The present study investigated levels of understanding of pesticide handling among farmers by focusing on their ability to understand the information displayed on product labels, which might affect risk reduction.

MATERIALS AND METHODS

In order to conduct the study all over the state of Punjab, 9 statements were put to the farmers through google forms during the covid-19 pandemic period as it was not possible to visit individual farms of the farmers (Table 1). In order to classify and calculate frequency and percentage of farmers giving response of various questions, the numerical values allotted were: yes = 3, sometimes/may be = 2 and no =1. These forms were filled with the help of scientists working in different Krishi Vigyan Kendras in the state. Basic information about the farmer such as gender, age, educational level, and farming practices (crop types and yields, agrochemical products used etc.) was recorded. A discussion was also performed with individual farmer regarding practice of pesticide application, to know about their attitude towards the use of pesticides, reading and following the label instructions, clothes worn during preparation and application of pesticides,; smoking or consumption of food or water during application of pesticides; taking water bath after application; and whether they complied with the safety period and concentration recommended.

The level of awareness about the toxic effects of the pesticides, including knowledge of the acute

and chronic toxicity of pesticides, the effects on human health and route of pesticide entry into the human body was also discussed with the farmers of the state. The data obtained were analysed simply by giving frequency and percentage in order to assess the status of awareness among the farmers of Punjab.

RESULTS AND DISCUSSION

Distribution of farmers based on age and land holding

The data showed that information was taken from a total of 111 farmers from 12 districts of Punjab randomly. All participants were classified based on age and land holding. It was found that 27 (24.32 %), 60 (54.10%) and 24 (21.62%) farmers were in the age group of young (up to 30 yr), middle age (30-50 yr) and elder (>50 yr) , respectively. The land holding status revealed that 46 (41.44%), 32 (28.83%) and 33(29.73%) farmers possessed less than 2 ha, 2 to 4 ha and more than 4 ha. indicating that majority population fall under small land holding (<2ha).

Awareness status about pesticides usage

Pesticides are known human and environmental toxicants, and are widely used throughout the world in order to assure crop protection against pests and guarantee high crop yields (Hashemi *et al*, 2012). Even though several products have been banned due to their acute and chronic effects (Verger and Boobis, 2013), pesticide users are often not aware that modern pesticides retain a significant toxicological profile with a consequent global health burden (Fan *et al* ,2015). Sharma (2016) reported that age and educational levels were two important factors which affected decision making of the farmers in Punjab. Similarly, it was observed that majority of middle age group (38-50 yr) farmers were aware about various questions posed by the researcher, as compared to the younger population(<30 yr). On the other hand, elder farmers (>50 yr) were either equal or more aware than the younger population. The probable reason might be the educational level

Table 2. Response of participants of different age groups about pesticide usage (per cent).

Age	Do you use pesticides/ insecticides in your farm? If yes, can you name them?		Are you aware about pesticide/ insecticide poisoning?			Can you name any insecticides/pesticides known to cause poisoning?		Have you ever attended any camp or workshop related to insecticide poisoning?		Do you read the safety instructions given on the label behind the chemical?		
	Yes	No	Yes	Maybe	No	Yes	No	Yes	No	Yes	Sometimes	No
less than 30	18.02	6.31	16.22	5.41	2.70	17.12	7.21	6.31	18.02	9.91	9.01	5.41
30-50	48.65	5.41	46.85	4.50	2.70	37.84	16.22	19.82	34.23	27.93	9.91	16.22
>50	20.72	0.90	18.02	1.80	1.80	17.12	4.50	9.91	11.71	9.91	4.50	7.21
Overall	87.39	12.61	81.08	11.71	7.21	72.07	27.93	36.04	63.96	47.75	23.42	28.83

Age	Do you think the instructions mentioned on the label were important?			Do you take necessary safety precautions while spraying/using insecticides? If yes, what precautions do you use?		Are you aware of the signs and symptoms to identify if someone is adversely affected by the insecticide or pesticide? If yes, can you name a few signs and symptoms?		Are you aware of the first aid to be provided to anyone who is poisoned by insecticides/ pesticides?		
	Yes	Sometimes	No	Yes	No	Yes	No	Yes	Maybe	No
less than 30	12.61	8.11	3.60	19.82	4.50	14.41	9.91	9.91	8.11	6.31
30-50	36.04	11.71	6.31	44.14	9.91	36.94	17.12	27.93	9.91	16.22
>50	13.51	3.60	4.50	17.12	4.50	15.32	6.31	8.11	3.60	9.91
Overall	62.16	23.42	14.41	81.08	18.92	66.67	33.33	45.95	21.62	32.43

Table 3. Response of farmers about pesticide usage based on land holding (Per cent).

L a n d holding	Do you use pesticides/ insecticides in your farm? If yes, can you name them?		Are you aware about pesticide/ insecticide poisoning?			Can you name any insecticides/pesticides known to cause poisoning?		Have you ever attended any camp or workshop related to insecticide poisoning?		Do you read the safety instructions given on the label behind the chemical?		
	Yes	No	Yes	Maybe	No	Yes	No	Yes	No	Yes	Sometimes	No
<2 ha	33.3	8.1	30.6	8.1	2.7	28.8	12.6	17.1	24.3	19.8	11.7	9.9
2-4ha	27.9	0.9	27.0	0.9	0.9	22.5	6.3	10.8	18.0	14.4	6.3	8.1
>4 ha	26.1	3.6	23.4	2.7	3.6	20.7	9.0	8.1	21.6	13.5	5.4	10.8
Overall	87.4	12.6	81.1	11.7	7.2	72.1	27.9	36.0	64.0	47.7	23.4	28.8

Land holding	Do you think the instructions mentioned on the label are relevant/ important?			Do you take necessary safety precautions while spraying/ using insecticides? If yes, what precautions do you use?		Are you aware of the signs and symptoms to identify if someone is adversely affected by the insecticide or pesticide? If yes, can you name a few signs and symptoms?		Are you aware of the first aid to be provided to anyone who is poisoned by insecticides/ pesticides?		
	Yes	Sometimes	No	Yes	No	Yes	No	Yes	Maybe	No
<2 ha	27.9	7.2	6.3	34.2	8.1	28.8	12.6	17.1	12.6	11.7
2-4ha	19.8	6.3	2.7	24.3	4.5	19.8	9.0	16.2	5.4	7.2
>4 ha	14.4	9.9	5.4	22.5	6.3	18.0	11.7	12.6	3.6	13.5
Overall	62.2	23.4	14.4	81.1	18.9	66.7	33.3	45.9	21.6	32.4

of the young farmers. The effect of educational level was evident from the findings of Sharma (2016) who showed that as the education level went on increasing farmers became reluctant to do field operations. Infact, education level helped in acquiring the knowledge but adoption was found to be less in highly educated persons.

The data (Table 2) revealed that large number of farmers were using pesticides at their farms (87.39%) and aware about its poisoning effects (81.08%) in human beings, however only 72.07 per cent could name the pesticide. It was interesting to note that in spite of large efforts made by various development agencies including the health department, only 36.04 per cent farmers attended any training course, camp or workshop pertaining to pesticide poisoning or its safe use in agriculture and allied fields. This indicates that still there is a wide gap in the information available and its adoption by the end users. This may be due to the fact that the primary information source for the farmers are their fellow farmer, relatives, friends, dealers or shopkeepers. Abdullah *et al* (2019) mentioned that mass media like television and radio talks were infrequent source of information for farmers mostly because, related programmes were not broadcasted at prime time. Similarly, only 47.75 per cent read the instructions printed on the label, 23.42 per cent and 28.87 per cent, read sometimes and never, respectively. It is interesting to note how reading of labels whether it is on pesticides, or our daily household items is not a common practice in the Indian households. Therefore, it is not surprising to find that farmers are not in the habit of reading the labels on the agrochemicals used. However, it was found that the information displayed on the labels of the products was not effective in promoting protective and safety measures. The reasons for the same were that the fonts were too small causing difficulty in reading and that the instructions were too long and in the English instead of the language of choice, Punjabi. Further, in many cases, the inability to understand the information displayed led to the adoption of practices which in reality increased

exposure, risks to human health and environmental contamination. Contrary to this, 62.16 per cent thought that instructions mentioned on the label were important, 23.42 per cent revealed may be and 14.41 per cent said not important.

The study showed that 18.92 per cent farmers did not take any necessary precautions while using any pesticide. In addition, they were even not aware (33.33%) of its dangerous effects on human body. The major reason may be that most of the field operations are being carried out by the hired labourers and farmer or contractor did not invest in providing necessary required protection kits like, shoes, mask, gloves, goggles etc to the pesticide applicator. The use of the above-mentioned items during pesticide application was also associated to discomfort due to hot weather or causing hinderance in carrying out spraying activities. Hence, present results were in agreement with Hosseini *et al* (2011) who showed that the awareness was very weak in terms of safety precautions and the use of personal protection equipment. Similarly, Rijal *et al* (2018) concluded that information regarding the type of pesticide and its characteristics was very low among the farmers. Improper handling and not using the recommended dose of pesticides is the main reason behind the health issues. Though, a number of socio-economic factors contribute to this but education and extension plays a vital role in making the concept understandable to the farmers.

Further, only 45.95 per cent knew about the first aid which is an important tool in quickly responding to accidents to ensure that injuries can be efficiently and promptly dealt with before a trained medical professional arrives to administer more specialised treatment, and 32.43 were totally ignorant about it. In this situation, education level is of great importance because in general, first aid information is only considered important in emergencies like road accident etc and appropriate infrastructure is developed to tackle these situations however, no arrangement is available neither at farmer's level nor at the hospital level for pesticide poisoning cases

7 **Table 4. Correlation between age, land holding and awareness level.**

	Age Group	Land Holding	Use chemical	Awareness about chemical poisoning	Knowledge of chemical that cause poisoning	Attended camp or workshop related to insecticide poisoning	Read safety instructions	Are instructions important	Take safety precautions using chemicals	Awareness about toxicity symptoms	Awareness about first aid
Age Group	1										
Land Holding	0.15	1.00									
Use chemical	-0.23	-0.11	1.00								
Awareness about chemical poisoning	-0.12	-0.01	0.44	1.00							
Knowledge of chemical that cause poisoning	-0.06	-0.01	0.25	0.45	1.00						
Attended camp or workshop related to insecticide poisoning	-0.14	0.12	0.00	0.21	0.22	1.00					
Read safety instructions	0.02	0.07	0.05	0.23	0.16	0.32	1.00				
Are instructions important	-0.03	0.11	0.17	0.25	0.19	0.20	0.52	1.00			
Take safety precautions using chemicals	0.02	0.01	0.30	0.34	0.31	0.12	0.35	0.38	1.00		
Awareness about toxicity symptoms	-0.08	0.08	0.31	0.31	0.37	0.05	0.13	0.23	0.44	1.00	
Awareness about first aid	0.09	0.06	0.06	0.30	0.19	0.27	0.39	0.17	0.21	0.26	1

occurring during agricultural and allied activities. Therefore, more emphasis should be given for the well-being of human health, particularly of those who are working at the field level. In Iran, Karunamoorthi *et al* (2012) revealed that majority 174 (99.4%) of farmers had ample awareness about pesticide impact on human health. One hundred thirty-five (77.2%) farmers made use of the empty pesticide containers for various household purposes. The most frequent self-reported toxicity symptoms associated with pesticide use were headache (58.8%), salivation and vomiting (38.2%), nausea (36.5%), and sneezing (12.5%). Chi-square analysis revealed a strong association between the farmer's educational status and reported toxicity symptoms ($p = .0001$; $\chi^2 = 498.2$; $df = 30$). Creating awareness about safe usage of pesticide is extremely vital by special orientation programs. Besides, promoting alternative pest control strategies such as use of biopesticides and integrated pest management (IPM) could be productive.

Correlation of age and land holding with the level of awareness

The data (Table 4) revealed that there was no correlation between the land holding, age and awareness level about various pesticides usage and its harmful effects. Hence, it was felt that education level might have a significant effect on the awareness level of farmers.

CONCLUSION

The study revealed that in the state of Punjab, majority of the farmers had small land holding and the knowledge level about pesticide and or insecticide poisoning was poor, which is a great concern as the health of the residents of the nation is of utmost importance. Further, since these pesticides are very dangerous but majority of users were neither reading nor following any safety instructions available along with the chemical. It was observed that while making use of any pesticide, the main source of information was observed to be the retail dealers who provided them non recommended

brands due to personal benefits, which is highly unethical. Therefore, it is felt that education and awareness among the applicators of these pesticides, is the need of the hour. More trainings and workshops must be conducted particularly in the rural areas regarding awareness on proper usage and application of pesticides and its dosage and safety measures to be followed. Promotion of integrated pest management and organic farming could reduce the use of agrochemicals to some extent.

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Awareness Among Farmers of Punjab Regarding Pesticide Use

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