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TRAINING NEEDS OF VEGETABLE GROWERS REGARDING PEST MANAGEMENT FOR SUSTAINABLE ENVIRONMENT HEALTH IN THE PUNJAB, PAKISTAN

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Vegetables are very important crop and are vulnerable to a number of overwhelming pests. Pesticides are considered a vital component of modern farming and playing a major role for the control of pests in maintaining high agricultural productivity. Pesticides sprayed on vegetables do not stay on the targeted area. Pesticides are toxin. However, concerns about human health and environmental effects of pesticides have increased over the past several years. High number of human's pesticides poisoning are happening in Pakistan. Effective use of pesticide is generally influenced by knowledge possessed by the vegetable growers. The study was conducted to evaluate the knowledge level of vegetable growers and determining their training needs regarding safe pest management in two potato growing districts of Punjab. The data were collected from randomly selected 367 vegetable growers proportionately chosen from randomly selected two tehsils of the selected districts. This study concludes that the growers need training for pest management on priority basis regarding the areas; pest identification (mean = 1.45); pest control (mean = 1.46); and pesticides (mean =1.59) respectively.
Keywords: Vegetable growers; knowledge; pesticides; MRL; pest control

INTRODUCTION

Vegetables are an integral part of daily diet in all walks of society. They are cheaper and are better source of protective foods. Daily consumption of sufficient vegetables could help to prevent major diseases such as cardiovascular diseases and certain cancers (WHO, 2003).

Pakistan is primarily a farming country. Vegetable production is increasingly becoming an important component of Pakistan's agriculture. For example, during year 2003-04, the total area under vegetables was 346 thousand hectares and the total production was 4966544 tonnes (Government of Pakistan, 2004a).

Vegetables are not even consumed domestically but are also exported regularly. For instance, during year 2003-04, 162514 tonnes of vegetables were exported worth Rs 1478006 thousands. Thus, Vegetables are playing an important role in Pakistan economy (Government of Pakistan, 2004b).

Vegetable crops are susceptible to a number of devastating pests including insects and diseases because they are juicy and delicate. High pest infestation is the greatest threat to vegetable production, sometimes causing more than 90% crop loss (Iqbal *et al.*, 1996). Therefore, in the case of vegetables, growers tend to be even more pesticide-dependent (Heong *et al.*, 1997).

Pesticides are toxin but their use is vital for crop protection. Excessive use of pesticides has been observed in Pakistan for controlling of vegetable pests (Khan, 2004).

In Pakistan, pesticide residues are not analyzed in the final product that goes to the market. Pesticide residues in agricultural commodities have a considerable influence in the area of global market. The importing country may refuse commodities having pesticides residues higher than the legally permitted level because Codex Alimantarius Commission (FAO/WHO) has set standards of Maximum Residual Limits (MRLs) for pesticides in food moving in global market. Thus, the export of vegetables is also at risk because of likely high level of pesticide residues (Hussain *et al.*, 2001).

Excessive use of pesticides is harming the health of the farmers and the community in Pakistan. According to the UN's 1998 report, above 500,000 Pakistanis suffered annually from poisoning due to agro-chemicals, out of which 10,000 died (DAWN, 2004). This presents an alarming situation and serves food for thought for all those who are concerned in ameliorating the plight of farming community.

Vegetable growers being less educated, pay very little attention to appropriate and safe pest management. Many of them try to find advice from pesticide dealers at the time of buying pesticides. The pesticide dealers are more concerned in their profit rather than guiding the farmers appropriately (Rehman, 1994). Most vegetable crops are harvested on a daily basis and in many cases are sprayed day by day. Thus, there are mounting concerns about the long-term environmental

impact of vegetable production in the Punjab, focusing particularly on the heavy use of pesticides with health hazards, pesticide residues, the build-up of resistance and contamination of the environment.
Thus, there is a dire need to identify the training needs of vegetable growers relating to pesticide use and organizing training programs for updating and strengthening the skills for pest management. Hence, the present study was deigned to analyze the knowledge of vegetable growers for identification and prioritization of their training needs regarding pesticide use.

MATERIALS AND METHODS

The potato crop was selected as a reference vegetable. Population of this study consisted of all potato growers in two districts: Jhang and Okara which are the top potato growing districts in the Punjab. Two tehsils Chiniot and Depalpur one from each district was selected randomly. For each selected tehsil, a sampling frame was constructed by registering all potato growers. The sample size was determined by using Fitzgibbon, *et al.* (1987) table. The sample size comprised randomly selected 367 respondents. Validated interview schedule was used to collect the data through personal interview. The data were analyzed with the help of Statistical Package for Social Sciences (SPSS).

Development of knowledge assessment scale of pesticide use

Vegetable growers' level of knowledge was assessed by using "Pesticide Knowledge Test (PKT)" developed by McCauley *et al.* (2002). The PKT involved true-false items based on two point response i.e., 1-yes, 0-no. Every respondent was asked all the questions and one score was given for true response of one item. Test scores were calculated by adding up the number of true answers and reported as total scores by the area of knowledge tested.
A weight was assigned to each grade as follows:

% Accuracy	Level of knowledge	Weight
<60%	Poor	1
60-74.99%	Fair	2
75-84.99%	Good	3
>85%	Very good	4

The respondents were asked about their knowledge of safe pest management for sustainable environment health during spraying. Three knowledge areas: i) knowledge of pest identification; ii) knowledge of pest control (chemical and non-chemical); iii) knowledge of pesticides to control pests, were identified.

RESULTS AND DISCUSSION

Knowledge of pest identification

An insect pest is causing sufficient damage in agriculture. To minimize these losses, farmers must identify the pests and adopt management strategies that are effective, specific, practical, economical and safe for environment.
The table 1 shows 29 questions that measured the respondents' knowledge of pest identification. Knowledge regarding insect identification shows that the knowledge of *Aphid* and *Jassid* identification was at very good level. Knowledge of *Army worm* and *White fly* were at good level. Knowledge of *Potato tuber moth, Heliothis sp., Leaf miner, Cutworms* and *Mites* were at poor level. Knowledge of viral diseases identification shows that the knowledge of *Leaf roll* was at fair level. Knowledge of *Mop top virus*, *Mosaic* and *Virus Y* were at poor level. Knowledge of fungal diseases identification shows that the knowledge of *Early blight* and *Late blight* was at very good level. Knowledge of *Black scurf, Vertcillium vilt, Powdery scab*, and *Fusarium wilt* was at poor level. Knowledge of bacterial diseases identification shows that the knowledge of *Bacterial wilt, Common scab* and *Black leg wilt* were at poor level. Knowledge of other diseases identification shows that the knowledge of *Non virus leaf roll* and *Mycoplasma* disease were at poor level. Knowledge of weeds identification shows that the knowledge of *Bathoo, Kurand, Deela, Khabbal* and *Senji* were at very good level.
Thus the data depicted in the table, indicate that the knowledge of respondents regarding identification of most of pests (17 out of 29) was at poor level. Table 4 shows that mean value regarding overall knowledge of pest identification was 1.45 with SD 0.847.
These findings are in line with the findings of Schlosser (1999) who reported that many farmers in Jamaica were unable to distinguish several key pests. However, the above findings negate the results obtained by Banjo *et al.*, (2003) who reported that majority of the farmers in Nigeria were aware of the insect pests that were attacking their crops.

Knowledge of pest control (chemical and non-chemical)

Knowing a range of pest control methods gives farmer the ability to choose an effective treatment and also the choice of limiting their exposure to potentially harmful control method.
Table 2 shows 20 questions that measured the respondents' knowledge of pest control. Knowledge of chemical control shows that the knowledge of insecticides, weedicides and fungicides were at very

Table 1. Rank order of possessed level of knowledge of respondents about identification of pests as reported by them

Name of pest		Vegetable growers knowing pests N (%)	Level of knowledge	Rank order
A-Insects	White fly	315 (85.8)	Good	2
	Mites	211 (57.5)	poor	6
	Heliothis sp.	65 (15)	Poor	10
	Jassid	367 (100)	Very good	1
	Aphid	367 (100)	Very good	1
	Leaf miner	29 (7.9)	Poor	13
	Army worm	289 (78.7)	Good	3
	Cutworms	107 (29.2)	Poor	8
	Potato tuber moth	159 (43.3)	poor	7
B-Viral Diseases	Leaf roll	263 (71.7)	Fair	4
	Virus Y	107 (29.2)	poor	8
	Mosaic	3 (0.8)	poor	15
	Mop top virus	0 (0.0)	poor	16
C-Fungal Diseases	Early blight	367 (100)	Very good	1
	Late blight	367 (100)	Very good	1
	Fusarium wilt	29 (7.9)	poor	13
	Vertcillium wilt	52 (14.2)	poor	12
	Powdery scab	107 (29.2)	poor	8
	Black scurf	81 (22.1)	poor	9
D-Bacterial Diseases	Black leg	81 (22.1)	poor	9
	Common scab	55 (15)	poor	11
	Bacterial wilt	26 (7.1)	poor	14
E-Other Disease	Mycoplasma Disease	237 (64.6)	poor	5
	Non virus leaf roll	3 (0.8)	poor	15
F-Weeds	Bathoo	367 (100)	Very good	1
	Senji	367 (100)	Very good	1
	Deela	367 (100)	Very good	1
	Khabbal	367 (100)	Very good	1
	Kurand	367 (100)	Very good	1

good level. Knowledge of juvenile hormones and pheromones were at poor level. Knowledge of mechanical and physical control shows that the knowledge of screens, electrocution, heat and cold, radiation and trap light was at poor level. Knowledge of cultural control indicates that the knowledge of harvest timing, insect-resistant varieties, timely planting and cultivation of the soil was at very good level. Knowledge of improved drainage and crop residue removal were at poor level. Knowledge of biological control shows that the knowledge of pathogenic organisms, parasitoids and predators were at poor level.

The data in the above table show that the knowledge of the respondents about most of the pest control methods (12 out of 20) was at poor level. Yassin *et al.* (2002) had found the same result in this regard and clearly indicated that very small number of the respondents knew biological and natural control in Gaza Strip. Table 4 shows that the overall level of knowledge of pest control (chemical and non-chemical) has a mean value 1.46 with SD 0.848.

Table 2. Rank order of possessed level of knowledge of respondents about pest control methods as reported by them

Pest control methods		Vegetable growers knowing control N (%)	Level of knowledge	Rank order
A) Chemical control	Insecticides	367 (100)	Very good	1
	Fungicides	367 (100)	Very good	1
	Weedicides	367 (100)	Very good	1
	Pheromones	107 (29.2)	Poor	5
	Juvenile hormones	29 (7.9)	Poor	7
B) Non-chemical Control				
1. Mechanical and physical control	Screens	133 (36.2)	Poor	4
	Trap light	81 (22.1)	Poor	6
	Heat and cold	3 (0.8)	Poor	8
	Radiation	3 (0.8)	Poor	8
	Electrocution	3 (0.8)	Poor	8
2. Cultural control	Crop rotation	367 (100)	Very good	1
	Cultivation of the soil	367 (100)	Very good	1
	Crop residue removal	133 (36.2)	Poor	4
	Insect-resistant varieties	341 (92.9)	Very good	2
	Timely planting	367 (100)	Very good	1
	Harvest timing	367 (100)	Very good	1
	Improved drainage	107 (29.2)	Poor	5
3. Biological control	Predators	107 (29.2)	Poor	5
	Parasitoids	29 (7.9)	Poor	7
	Pathogenic organisms	291 (7.9)	Poor	3

Knowledge of pesticides to control pests

A large number of pesticides (chemical products) of different types are used to control pests. Each pesticide has a different spectrum of pests control and a different impact on human health and the environment.

Knowledge regarding 24 commonly used pesticides was determined and data in this regard are presented in the table 3. The knowledge of the respondents that the *Gramaxone (Paraquat), Sencor (Metribuzin)* and *Stomp (Pendimethalin)* as herbicides were at fair level. The knowledge of *Topogard (Terbuthylazine)* as herbicides was at poor level. Among the fungicides the knowledge of *Ridomil (Metalaxyl+mancozeb*) was at good level. The knowledge of *Antracol (Propineb*) and *Dithane (Mancozeb)* were at poor level. Among insecticides, the knowledge of *Thiodan (Endosulfan)* was at very good level. The knowledge of *Match (Lufenuron)* and *Karate (Cyhalothrin)* were at good level. The knowledge of *Talstar (Bifenthrin) ,Lorsban(Chlorpyrifos), Polytrin-C (Cypermethrin+ profenofos) and Sundaphos (Methamidopho*s) were at fair level. The knowledge of rest of the insecticides such as, *Carbosulfan, Cypermethrin Acetamiprid, Profenofos,Thiodicarb, Cyhalothrin, Methomyl, Carbaryl, Triazophos* and *Diafenthiuron* were at poor level.

The overview of the data in the table 3 depict that the knowledge of the respondents about half of the pesticides (13 out of 24) was at poor level. However, the above findings contradict the results obtained by Yassin *et al.* (2002) who reported that majority (96.8%) of the respondents in Gaza Strip knew the name of the pesticides. Table 4 shows that the overall level of knowledge of pesticides to control pests has a mean value 1.59 with SD 0.927.

CONCLUSIONS

It is concluded from the findings that the vegetable growers have poor knowledge regarding pest management. It was found that vegetable growers need training for pest management on priority basis regarding pest identification (mean=1.45), pest control (mean=1.46) and use of pesticides (mean=1.59) respectively. It is infered that poor knowledge leads to irrational use of pesticide to control pests that is threat to environment health. It is recommended that training should be imparted to vegetable growers for safe pest management for sustainable environment on priority basis.

Table 3. Rank order of possessed level of knowledge of respondents about pesticides to control pests as reported by them

Pesticides		Vegetable growers knowing pesticides N (%)	Level of knowledge	Rank order
A - Herbicides	Sencor (Metribuzin)	237 (64.6)	Fair	7
	Gramaxone (Paraquat)	267 (72.8)	Fair	3
	Stomp (Pendimethalin)	254 (69.2)	Fair	6
	Topogard (Terbuthylazine)	160 (43.6)	Poor	10
B - Fungicides	Dithane (Mancozeb)	211 (57.5)	Poor	8
	Ridomil (Metalaxyl+mancozeb)	289 (78.7)	Good	2
	Antracol (Propineb)	185 (50.4)	Poor	9
C - Insecticides	Thiodan (Endosulfan)	341 (92.9)	Very good	1
	Talstar (Bifenthrin)	263 (71.7)	Fair	4
	Karate (Cyhalothrin)	289 (78.7)	Good	2
	Lorsban (Chlorpyrifos)	237 (64.6)	Fair	7
	Polytrin-C (Cypermethrin+ profenofos)	263 (71.7)	Fair	5
	Match (Lufenuron)	289 (78.7)	Good	2
	Sundaphos (Methamidophos)	237 (64.6)	Fair	7
	Carbosulfan	107 (29.2)	Poor	11
	Diafenthiuron	29 (7.9)	Poor	19
	Acetamiprid	87 (23.7)	Poor	12
	Profenofos	81 (22.1)	Poor	13
	Thiodicarb	57 (15.5)	Poor	17
	Cyhalothrin	58 (15.8)	Poor	16
	Methomyl	26 (7.1)	Poor	20
	Carbaryl	55 (15)	Poor	18
	Triazophos	62 (16.9)	Poor	15
	Cypermethrin	81 (22.1)	Poor	14

Table 4. Overall rank order of possessed levels of knowledge and training needs of respondents regarding pest management for safe environment health

Knowledge Area	Level of Knowledge				Mean	SD	Rank order	Training Priority
	Poor (1) N (%)	Fair (2) N (%)	Good (3) N (%)	Very Good (4) N (%)				
Pest identification	260(70.8)	77 (21.0)	2 (0.5)	28 (7.6)	1.45	0.847	3	1
Pest Control	258 (70.3)	77 (21.0)	5 (1.4)	27 (7.4)	1.46	0.848	2	2
Pesticides	234 (63.8)	78 (21.3)	26 (7.1)	29 (7.9)	1.59	0.927	1	3

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