

A study on farmers' knowledge, perception and intensity of approved pesticide use practices/patterns in tomato and cabbage in Himachal Pradesh

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ABSTRACT

The present study was carried out at three different locations of Himachal Pradesh during the year 2015-16 in order to find out the farmers' knowledge, perception and intensity of approved pesticide use practices/patterns in tomato and cabbage. It was revealed that no farmer was familiar with Central Insecticides Board and Registration Committee (CIBRC) guidelines about the use of labeled and non-labeled pesticide application and majority of the farmers (57.33%) were mainly dependent on the advice of pesticide dealers. Most commonly used pesticides applied by the farmers on tomato and cabbage were malathion, chlorpyrifos, cypermethrin, carbendazim and mancozeb. It was also observed during the survey that most of the farmers stored the pesticide bottles (81.33%) at safe places in their houses and the remaining (18.67%) placed the bottles in unsafe areas without any safety measures. CIBRC recommendations are yet to percolate down through various agencies to arrive at the farmers' level by educating them at various forums

Keywords: CIBRC; malathion; chlorpyrifos; cypermethrin; carbendazim; mancozeb

INTRODUCTION

Horticulture is the main occupation of the people of Himachal Pradesh and has an important place in the economy of the state. It provides direct employment to about 70 per cent of the total workers of the state. Out of the total geographical area of 55.67 lakh hectares of the state, the area of operational holding is about 9.99 lakh hectares and is being operated by 8.63 lakh

farmers (Anand 2015). Solan, Shimla and Sirmour are the leading districts in vegetable production in comparison to others districts of the state. The farmers of these districts have been growing tomato, cabbage, capsicum, cauliflower, broccoli and other exotic vegetables. In order to keep pace with the growing demand for food and to avoid the risk of crop loss due to pests/pathogens, farmers mainly depend upon the agricultural inputs like chemical fertilizers

and pesticides to boost their economy. Though strict regulations have been laid down by agencies like Central Insecticide Board and Registration Committee (CIBRC) and Food Safety and Standard Authority of India (FSSAI) regarding the pesticide manufacturing and usage, the recommended doses, time and frequency of application of the pesticides are generally overlooked by the farmers. It is well known fact that chemical pesticides recommended by the CIBRC are the most effective and serve as short-term control method for a variety of crop pests and pathogens but their ill effects on human, animal and environmental health have also been well established as they may enter into the environment through a variety of trophic levels. Chemical pesticides tend to persist not only in soil surface but also in water bodies besides contaminating ground water for long periods thus imposing serious threat to human health and to other animals (Ongley 1996). Apart from affecting the target pest they also affect the native micro- and macro-flora of the agricultural soils and water (Lupwayi et al 2009). A number of ecological functions and properties are unfavorably influenced by chemical pesticides such as nutrient cycling, natural food webs, food chains, soil structure and fertility, soil and water biodiversity, natural balance between pest and predator insects and many others (Zacharia 2011).

Another major point of concern regarding pesticide application is their effect on human health. Human beings may be

exposed to pesticides through three basic modes viz oral, dermal and nasal. Thus they may enter in the body in a variety of forms such as the toxic residues in all forms of food crops particularly fruits and vegetables, contaminated water and aquatic animals consumed as food, aerosols in air, direct contact through skin etc (Sacramento 2008). A study conducted in underdeveloped country like Philippines showed that the farmers spent as much money on health care as they did to combat pests menace by the application of pesticides and their investigations showed that for rice production, when health costs factored in, the natural control ('do nothing') option is most profitable and useful pest control strategy (Antle and Pingali 1994).

Visualizing the importance of these issues, attempts in some leading districts of Himachal Pradesh have been made which is most likely to highlight various issues relating to pesticide usage in selected vegetable cultivation. The specific objectives of the investigation were to study the farmers' knowledge and perceptions of pests and their pesticide use pattern and to analyze the practices of pesticide use in vegetable cultivation.

METHODOLOGY

The study envisaged various types of primary as well as secondary data pertaining to different facets associated with pesticide usage in crop production in the

study area. The primary data relating to various issues involved in pesticide usage like knowledge of farmers about pest management, perceptions of the kind and frequency as well as severity of pests and diseases, sources of information, awareness of farmers, safety measures followed during pesticide application etc were collected.

The three districts of Himachal Pradesh namely Solan, Shimla and Sirmour were purposively selected because of commercial cultivation of vegetables here. Main leading vegetables like tomato and cabbage were selected for detailed investigations. The sample blocks of Solan, Shimla and Sirmour were selected as the selected vegetables were extensively grown in this region. The information pertaining to knowledge and perception of pests and the pesticide use pattern by the growers in vegetable cultivation was collected from 150 farmers of the selected districts. In order to have a better insight into farmers' pest management practices in crop production a detailed examination of farmers' pest control practices, intensity and composition of pesticides used, sources of information on the adoption of pesticide use and decision criteria on pesticide application at farm level was conducted. In addition to this information regarding pest enemies, sources of information on pesticide use, toxicity levels, storage, disposal, application practices, sprayer maintenance, safety measures followed etc were also probed at farm level. An attempt to collect the data pertaining to the entry of pesticides in the

sample districts through various agencies involved in procurement such as government/private dealers/distributors was also made to draw the meaningful inference. Percentages and averages were computed and compared to draw meaningful inferences.

RESULTS and DISCUSSION

It was observed that all the farmers interviewed in this study reported to use various kinds of chemical pesticides. On the basis of information collected during the survey it was concluded that three types of pesticides were prevalent in the area viz insecticides, acaricides and fungicides. Insecticides were found to be more popular than fungicides in case of cabbage while the condition was opposite in case of tomato. A total of 11 pesticides were found as most widely used by the farmers (Table 1). Malathion was found to be more popular and effective insecticide by 60.00 per cent of the respondents followed by chlorpyrifos and cypermethrin while among fungicides carbendazim was reported to be most effective by 52.00 per cent respondents (Table 2). An acaricide namely propargite was also used to a greater extent on tomato for the management of mite infestation.

It was found that vegetable growers in the study area were aware of various issues related to pest management. On an average 65.33 per cent of the farmers were aware about pesticide hazards in

vegetable cultivation. In Solan, Sirmour and Shimla 62, 56 and 78 per cent farmers respectively had knowledge about pesticide hazards. From 32 to 44 per cent of sampled respondents were aware of IPM practices indicating their willingness to move towards safer pest control measures (Table 3). Farmers were accessing pest management information in different ways. Farmers got the information on pesticide use from multiple sources (Table 4). It was observed that about 57.33 per cent of farmers were mainly dependent on the advice of pesticide dealers followed by public extension system/SAU personnel (22%) as well as relatives/friends (14%). The data in Table 4 reveal that no farmer followed CIBRC guidelines for pest management. This supports the analytical findings by the detection of non-labeled pesticides viz profenofos and chlorpyrifos on cabbage and triazofos, profenofos and cypermethrin on tomato (Patyal 2014).

There were various insect pests and diseases associated with cabbage and tomato in the monitored area. The farmers' knowledge on severity of insects and diseases in the vegetables was examined on the basis of three criteria namely slight, medium and heavy infestation/infection (Table 5). The severity of insect pests and diseases varied according to the microenvironment of the crops in the region. In case of tomato 74, 76 and 74 per cent of the farmers were of the same opinion that there was heavy severity of

diseases (damping-off, buckeye fruit rot, *Alternaria* leaf spot, bacterial wilt and canker) in Solan, Sirmour and Shimla respectively. However in contrast to tomato, farmers perceived that there existed heavy severity of insects in cabbage (72% in Solan, 70% in Sirmour and 74% in Shimla) as the diamond back moth, aphid and cabbage butterfly caused heavy toll in the area.

It was observed that most of the farmers stored the pesticide bottles (81.33%) at safe places in their houses (Table 6). The remaining (18.67%) placed the bottles in unsafe areas without any safety measures. As compared to the farmers of Sirmour (78%) the Shimla farmers were more aware and took precautions (84%) regarding safe storage of pesticides after purchase due to their greater awareness of health safety. For the farmers, disposal of empty bottles was not a safety concern. Majority of farmers (62.00%) sold or reused the empty bottles of pesticides after washing them properly especially large size containers. Only few farmers (18.67%) adopted safe disposal methods like crushing/burying the empty containers in the soil (Table 6). Only 20.67 per cent of sampled farmers disposed the empty bottles in the fields or outside their houses. It was also found that 39.33 per cent of the farmers used self-protection and rest of the applicants did not use any safety measures like face masks/hand gloves etc. Majority of the farmers (79.33%) washed their hands with soap after pesticide

Farmers' knowledge, perception, intensity of pesticide use

Table 1. Commonly used pesticides, their classification and usage in the study area

Class of pesticide	Common name	Trade name	WHO's toxicity class	User farmers (%)
Fungicide	Mancozeb	Indofil M-45/Dithane M-45	U	75.33
Fungicide	Carbendazim	Bavistin/Mavistin	U	66.00
Insecticide	Malathion	Cythion 50 EC, Malathion	III	64.00
Insecticide	Chlorpyrifos	Dursban, Durmet	II	55.33
Insecticide	Cypermethrin	Shakti, Cyfil	II	52.00
Insecticide	Profenofos	Profex 50 EC	II	49.33
Acaricide	Propargite	Omite/Simba 57 EC	III	42.00
Acaricide	Fenazaquin	Magister/Majestic 10 EC	II	40.00
Insecticide	Imidacloprid	Confidor 200 SL	II	37.33
Insecticide	Methyl demeton	Metasystox 25 EC	Ib	37.33
Insecticide	Dimethoate	Rogor 30 EC	II	32.00
Fungicide	Captan	Captaf/Dhanutan	U	28.00

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

Table 2. Farmers' opinion (%) about efficiency of five most commonly used pesticides

Efficacy level	Pesticide				
	Chlorpyrifos	Cypermethrin	Carbendazim	Mancozeb	Malathion
Very effective	58	54	52	40	60
Effective	32	34	32	28	22
Moderately effective	10	12	16	32	18
Not effective	0	0	0	0	0

Table 3. Farmers' knowledge about pest management practices

Aspect	Farmers (%)			
	Solan	Sirmour	Shimla	Average
Having knowledge about pesticide hazards	62	56	78	65.33
Having knowledge about the pests	64	62	74	66.67
Have heard about IPM practices	32	38	44	38.00

application. Majority of the farmers (71.33%) washed the sprayers with water after every use and rest (28.67%) did not do so. The

farmers of Shimla were found to be more cautious about washing of sprayers than the farmers of Solan and Sirmour. The private

Table 4. Source of information for the adoption of pest management

Source	Farmers (%)			
	Solan	Sirmour	Shimla	Average
Fellow farmers/friends/relatives	14	18	10	14.00
SAU personnel/State Dept of Agric/ICAR institutes	22	16	28	22.00
Pesticide dealers/company representatives	58	62	50	57.33
CIBRC approved labeled pesticides	0	0	0	0

Table 5. Severity of pests in cabbage and tomato as perceived by the farmers

District	Crop	Pest	Severity of insects and diseases (%)		
			Slight	Medium	Heavy
Solan	Cabbage	Insect	12	16	72
		Disease	58	28	14
	Tomato	Insect	12	66	22
		Disease	10	16	74
Sirmour	Cabbage	Insect	14	16	70
		Disease	50	28	22
	Tomato	Insect	16	62	22
		Disease	8	16	76
Shimla	Cabbage	Insect	12	14	74
		Disease	46	30	24
	Tomato	Insect	12	60	28
		Disease	8	18	74

dealers did not provide the information about the exact quantities of pesticides supplied to them by the various private industries hence data pertaining to the quantity of pesticide entering the sample districts could not be collected.

CONCLUSION

The study revealed that the farmers' order of preference for insecticides, fungicides and acaricides on cabbage and tomato was malathion, mancozeb and

propargite respectively. The most effective pesticides in their opinion were malathion, chlorpyrifos, cypermethrin, carbendazim and mancozeb. Crop protection measures were being adopted by the farmers on the advice of pesticide dealers rather than agricultural extension officers or farm scientists. They also used the pesticides not approved by the CIBRC. The results showed that farmers need to take more precautionary and safety measures to keep their health as well as environment in good state.

Farmers' knowledge, perception, intensity of pesticide use

Table 6. Pesticide storage, disposal and application practices adopted by farmers

Aspect	Farmers (%)			
	Solan	Sirmour	Shimla	Average
Pesticide storage after purchase				
Safe storage	82	78	84	81.33
Unsafe storage	18	22	16	18.67
Disposal of pesticide containers				
Throw in field	22	20	20	20.67
Sold/reused	58	66	62	62.00
Crushed/buried	20	14	18	18.67
Safety measures used by applicants				
Use of masks/hand gloves	38	38	42	39.33
Wash hands with soap	78	74	86	79.33
Use of sprayer				
Use after wash	72	68	74	71.33
Wash rarely or never wash	28	32	26	28.67

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