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Full Length Research Paper

Vegetable growers in southern Tehran, Iran: Pesticides types, poisoning symptoms, attitudes towards pesticide-specific issues and environmental safety

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The main purpose of this study was to investigate vegetable growers' manner of use of pesticides, their attitudes towards pesticide-specific issues and opinions about environmental safety measures. For the study, 70 vegetable growers in southern Tehran, Iran were randomly selected and interviewed. Data were also collected through a well structured questionnaire. The validity of the questionnaire was checked by a panel of University professors. Reliability was measured by Chronbach's alpha and α=0.760 showed the reliability of the questionnaire was acceptable. Data analysis was carried out in two sections, consisting data description and data inferential analysis. Results showed that vegetable growers used only insecticides and fungicides, mostly on leafy vegetables. All reported having felt sickness after using pesticides, although all of them took prevention measures when they applied pesticides. A group of farmers who had attended extension and education courses were statistically different in terms of attitude towards pesticide-specific issues, with 44% expressing a favourable attitude towards pesticide-specific issues. Thirty-four (34%) percent of these vegetable growers discarded containers into the environment. Training of growers is clearly important for the safe and efficient use of pesticides by vegetable growers in Iran.

Key words: Vegetable growers, Tehran, Iran, pesticides, attitude, health effect.

INTRODUCTION

Pesticides have been used as one of the most important inputs to ensure the quality and quantity of their crops to feed a growing population (Matthews, 2006). The application of insecticides and fungicides is very prevalent for fruits and vegetables (Matthews, 2006) and thus correct application is crucial to avoid residues being a threat to human health. While the benefits of pesticides were considerable and have been acknowledged extensively, their potential harm to human health and the environment have been neglected, especially in developing countries where few farmers have received adequate training in their application. According to WHO (2002), developing countries used nearly 20% of the total pesticides in the world and this figure is increasing steadily. In Iran, pesticides are still used widely in agriculture. Despite extensive research and evidence about the harmful effects of pesticides on the health of farmers in other countries.

Ngowi et al. (2007) showed that 68% of vegetable growers in Tanzania suffered adverse dermal effects, dizziness and headache after typical application of pesticides. Similarly in Ghana, Ntow et al. (2006) reported that most vegetable growers suffered from dizziness and headache and weakness. Recena et al. (2006) reported that 59.6% of farmers in Brazil had typical intoxication symptoms. Damalas and Hashemi (2010), showed that cotton growers had used hat and boots more than other items such as gloves, goggles, face masks, coveralls, and respirators. Also, they indicated that the growers had used mostly insecticides

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and herbicides, which were not extremely hazardous according to WHO classification and all of them, were permitted to control cotton pests.

Hashemi et al. (2008) indicated that there was a significant diffrence between workshop participants and non-participants in terms of IPM knowledge. Insufficient data on the impact of pesticide use on the health of vegetable growers and the environment indicated an urgent need to assess the effect of pesticide applications on the vegetable growers community and other stakeholders. Therefore, the objective of this study was to explore the attitudes of the local community towards pesticide use, to determine the views of vegetable growers on the impact of the pesticides on the environment, to assess the attitudes and behaviours of vegetable growers regarding the safe use of pesticides and finally and most importantly to reveal the main reasons that hinder the safe use of pesticides.

MATERIALS AND METHODS

The main purpose of this study was to investigate the manner of use of pesticides by vegetable growers, attitudes towards pesticide-specific issues and opinions about environmental safety measures. The study was located in Ray county, south Tehran, which is one of the main centres of vegetable production in the country. Tehran has a population of around 7.7 million in an area of about 730 km^2. Although there are industrial plants in the area, farming and livestock breeding are the main sources of occupation and income. The data reported here was part of a project carried out under the sponsorship of the University of Tehran (UT). This area has many features similar to a typical rural community in Iran, the main source of income is agriculture and farming, the level of education of farmers are the same as other farmers in the country and the type of crops grown. Leafy vegetables such as dill, Iranian leek, basil, radish, parsley and garden cress are the most important crops of this area.

The investigation was carried out by means of field study, face to face interview with 70 vegetable growers selected at random. The interviews were usually at their farms, based on structured and semi-structured questionnaires between July and September 2009. Inspired by the work of Lichtenberg and Zimmerman (1999), and Parveen et al. (2003) five items were designed to assess the attitude of farmers to pesticide-specific issues. In addition, information was collected about the types of pesticides used by vegetable growers, poisoning symptoms, environmental safety and other variables like age, educational level, land tenure status, area under cultivation, on-farm income and farming experiences of the farmers. The questionnaire was reviewed and modified by the faculty members of the Departments of Agricultural Extension and Education, Horticulture and Plant Protection in the University of Tehran. The reliability of the questionnaire was assessed by Cronbach's alpha coefficient, a measure of internal consistency, it was equal to 0.760 for attitude, indicating an acceptable level of reliability (Nunally, 1978, as cited by Hashemi et al., 2009).

In addition, the total score of attitude towards pesticide-specific issues was divided into three groups using the following formula. This formula shows the cut-off points of normally distributed variable when it was divided into three categories:

$$A > \bar{X} + \frac{1}{2}\,SD$$

$$\bar{X} - \frac{1}{2}\,SD \leq B \leq \bar{X} + \frac{1}{2}\,SD$$

$$C < \bar{X} - \frac{1}{2}\,SD$$

Where $\bar{X}$: is mean of total score of attitude, SD: is standard deviation of the total score of attitude, the categories are A: favourable, B: neutral and C: unfavourable.

Descriptive and inferential statistics were used to analyze the collected data. Descriptive statistics were frequency, mean, standard deviation and inferential statistics included mean difference (Mann-Whitney test). The data were analyzed using Statistical Package for Social Science (SPSS) version 13.0 and Microsoft Excel.

RESULTS AND DISCUSSION

Characteristics of the respondents

The demographic characteristic of the vegetable growers are presented in Table 1. Only male farmers were sampled with the largest proportion in the 51 to 60 age groups (25.7%). Most were literate (80%), with many having had high school education and attended college (35.6%). The size of the household of 58.5% of the farmers was four. Most of the respondents (62.9%) had a 20 years farming experience. Over 50% were smallholders. 60.0% had 3 to 5 tonnes/ha annually. A majority (45.7%) had less than 6 Million Toman per annum on-farm income.

Types of pesticides used by vegetable growers

Respondents reported the use of 13 different pesticides (Table 2).The study showed that vegetable growers mostly applied insecticides and fungicides. The majority (70%) reported using *Deltamethrin*, *Oxydemeton* and *Thiometon*, which were identified by WHO as Class Ib (Highly hazardous). *Diazinon*, a broad-spectrum pesticide, identified by WHO as Class II (moderately hazardous) was used by over 90% of vegetable growers, while *Chlorpyrifos-ethyl*, *Endosulfan* (75.7%) and Pirimicarb were used by 78.6, 75.7 and 24.3% respectively. The pesticides reported by the vegetable growers included mostly insecticides followed by fungicides. This finding is in accordance with findings of Damalas and Hashemi (2010), carried out in Greece.

Vegetable growers' reports of pesticide poisoning symptoms

All vegetable growers (100%) reported health problems after routine usage of pesticides. The most common symptoms that were reported by the interviewees are indicated in Table 3. Dizziness (57.1%), cough (44.3%) and nausea (42.9%) were more commonly reported and skin problems (18.6 %), poor vision (18.6 %) and stomach-ache (5.7%) were less commonly reported.

Table 1. Socio - economic characteristics of the vegetable growers who participated in the study.

Characteristics	Number of individuals (%)	Characteristics	Number of individuals (%)
Age(years)		21 or over	44(62.9)
20-30	9(12.9)	Hectares of cultivated land	
31-40	14(20.0)	Smallholder	56(80.0)
41-50	14(20.0)	large holder	14(20.0)
51-60	18(25.7)	Production yield(ton/ha)	
61 or over	15(21.4)	>3	18(25.7)
Education(years)		3-5	42(60.0)
0(Illiterates)	14(20.0)	6 or over	10(14.3)
literates(more than 1 year)	56(80.0)	On-farm income(Million Toman[a] /Yr)	
Land tenure status		>6	32(45.7)
Owner	38(54.2)	6-10	21(30.0)
Tenant	20(28.5)	11 or over	6(8.6)
other	12(17.3)	No answer	11(15.7)
Number of people in household		Participation in extension and education courses	
>5	41(58.5)	Participants	15(21.4)
5-8	27(38.6)	Non-participants	54(77.1)
9 or over	2(2.9)	No answer	1(1.5)
Vegetable growing experience(years)			
>10	5(7.1)		
10-20	21(30.0)		

[a] 1 US dollar=10370 Iranian Toman.

Table 2. Pesticides most used by the farmers and their toxicological class.

Trade name	Common name	Toxicological class[a]	Number of individuals (%)	Target pests
Thiodan	Endosulfan	II	53(75.7)	Insects
Vertimice	Abamectin	O	11(15.7)	Insects
Decise	Deltametrin	Ib	21(30.0)	Insects
Metasystox R	Oxydemeton	Ib	18(25.7)	Insects, Butterfly
Pirimor	Pirimicarb	II	17(24.3)	Insects
Ridomil	Metalaxyl	III	52(74.3)	Fungus
Dithan Z-78	Zineb	U	10(14.3)	Fungus
Dithane M-22	Maneb	U	6 (8.6)	Fungus
Dithane M-45	Mancozeb	U	31(44.3)	Fungus
Dursban	Chlorpyrifos-ethyl	II	55(78.6)	Insects,Thrips
Ekatin	Thiometon	Ib	10(14.3)	Insects
Basudin,Diacap	Diazinon	II	65(92.9)	Insects
Omite	Propargite	III	21(30.0)	Insects

[a]Ia=Extremely hazardously; Ib=highly hazardous; II=moderately hazardous; III=slightly hazardous; U=product unlikely to present acute hazard in normal use; O=not classified.

Vegetable growers' attitudes towards pesticide-specific issues

Over 60% of vegetable growers who responded to the statement on "the effect of pesticide residue on foods" said their attitude towards pesticide-specific issues was very positive (Table 4). This finding is in accordance with findings of Hashemi and Damalas (2011), carried out in Iran. The mean value indicates that almost all of the vegetable growers had favourable attitude towards the 5

Table 3. Self-reported pesticide-poisoning symptoms amongst vegetable growers in southern Tehran, Iran, 2009 (n=70).

Symptoms	Frequency	Frequency (%)
Dizziness	40	57.1
Cough	31	44.3
Nausea	30	42.9
headache	27	38.6
Sneezing	24	34.3
Excessive sweating	21	30.0
Skin Problems	13	18.6
Poor vision	13	18.6
Stomach-ache	4	5.7

pesticide-specific issues assessed. The opinions on a 5-point scale show that the vegetable growers had more positive attitudes towards the effect of pesticide residue on foods and drinking water, while exposure to residues by birds, fish or other wildlife by pesticides was said to generate the lowest level of illness or injury. The lowest mean values were found for exposure when mixing or loading pesticides (4.21) and exposure while applying pesticides (4.23) with a comparatively high standard deviation (Table 4). According to Table 5, most of the vegetable growers in this study showed moderately favourable attitude towards illness or injury due to the application of pesticides assessed, while only 28.6% of them were not aware of the problems caused by them.

Protection measures and environmental safety measures by vegetable growers

Table 7 indicates the pesticide vegetable growers' protection measures. According to Table 5, the adverse influences of pesticides on human health and environment were almost obvious to vegetable growers in this survey as all of them took some prevention measures. Some specific prevention measures taken by vegetable growers were given in Table 6. All of them applied pesticides strictly according to the instructions, over 97% stopped spraying pesticide when they felt uncomfortable, 95.7% stored pesticides away from food. But measures such as not eating, drinking and smoking while spraying pesticides (82.8%) and taking a shower after spraying pesticides (90%) were taken but were not completely considered by vegetable growers in comparison with other protection measures. The disposal of pesticide container was another matter that was examined by the study. The majority of vegetable growers (35.7%) would burn pesticides containers; also 34.3% of them discarded the empty containers into the environment, 15.7% sold the empty containers to junk dealers and 11.5% buried them. However, it must be noted that none of them returned the containers to pesticide distributors and used them for keeping other things (Table 7).

The findings of this study imply that the vegetable growers strongly depend on pesticides. They used 13 types of pesticides for controlling insects and fungi of leafy vegetables. They viewed pesticides as the most effective and efficient solution to pest problems (Dinham, 2003; Ngowi et al., 2007). Previous study in other developing countries (Salameh et al., 2004) showed that farmers did not have adequate pesticide knowledge and were exposed to pesticides while applying it. In this study, all of the vegetable growers reported health problems including dizziness, cough, and nausea. Ngowi et al. (2007), in a study on vegetable growers also reported that a large number of them had ill health symptoms after the application of pesticides. Similar studies carried out in rural Nepal (Atreya, 2008) also confirmed these results. A study in a similar study area (Samiee et al., 2009) showed that there was no significant difference in the use of IPM practices between the compared groups in terms of participation in extension and education courses, but the effect of the farming system used is borne out in this study. Therefore, it seems that agricultural extension services could be somewhat successful as vegetable growers depend heavily on the use of pesticides (Ngowi et al., 2007). Also, the education level of vegetable growers was observed to be an important factor for the improvement of their attitude towards pesticide-specific issues. Therefore, it seems this can help vegetable growers for improvement of attitude about pesticide-specific issues. Previous studies (Salameh et al., 2004; Ibitayo, 2006; Recena et al., 2006) showed that farmers in developing countries rarely wear protective coverings such as gloves, face masks and goggles during work with pesticides but, this was not borne out in our study, while a majority of them took a shower after work, an observation reported by previous studies (Recena et al., 2006; Isin and Yildirim, 2007).

In this study, more than half of vegetable growers were greatly concerned about injuries due to the remains of pesticides on foods, drinking water (Lichtenberg and Zimmerman, 1999; Recena et al., 2006) but exposure to pesticide while applying them and exposure while mixing and loading them are borne out by previous study (Parveen et al., 2003). The results of previous research (Zhang and Lu, 2007) showed that the majority of farmers discard empty pesticides containers into the environment, an observation borne out in this study. The fact that none of the vegetable growers returns containers to pesticide distributors or use containers for keeping other things is not borne out by previous research (Ibitayo, 2006; Zhang and Lu, 2007).

Comparison of attitude towards pesticide-specific issues among vegetable growers

Table 8 indicates a statistically significant difference between Groups 1 and 2 on attitude towards pesticide-

Table 4. Vegetable growers' attitude towards pesticide-specific issues, Ray County, Tehran and Iran 2009.

Statement	Respondents (%)						
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Mean	Standard deviation
Pesticide residue on foods	61.4	27.2	0.0	0.0	1.4	4.47	0.80
Pesticide presence in drinking water	61.4	30.0	2.9	1.4	4.3	4.43	0.96
Pesticide exposure or residues by bird, fish or other wildlife	60.0	28.6	4.3	2.8	4.3	4.37	1.01
Exposure when applying pesticides	54.2	32.9	2.9	1.4	8.6	4.23	1.17
Exposure when mixing and loading pesticides	50.0	37.1	2.9	4.3	5.7	4.21	1.09

Table 5. Frequency distribution of vegetable growers in terms of attitude towards pesticide-specific issues.

Attitude towards pesticide-specific issues	Frequency	Frequency (%)
Favourable	29	41.4
Neutral	21	30.0
Unfavourable	20	28.6
Total	70	100.0

Table 6. Vegetable growers' protection measures.

Questions	Variable	Frequency	Frequency (%)
Do you take prevention measures when you apply pesticides? [a]	Yes	70	100.0
	Sometimes	0	0.0
If you said" yes", please mark which measures you take[b].	Take a shower after spraying pesticide	63	90.0
	Separate clothes while cleaning	64	91.4
	Wear masks , gloves and goggles during spraying pesticide	64	91.4
	Stop spraying pesticide If feel uncomfortable	68	97.1
	Store pesticides away from food	67	95.7
	Apply pesticides according direction strictly	70	100.0
	Do not eat, drink and smoke during spraying pesticide	58	82.8

[a]Single choice; [b]Multiple choice.

Table 7. Methods used to dispose of empty pesticides containers.

Methods[a]	Frequency	Frequency (%)
Discard containers into the environment	24	34.3
Sell them	11	15.7
Return containers to pesticide distributors	0	0.0
Use containers for keeping other things	0	0.0
Burning containers	25	35.7
To bury containers	8	11.4
other	2	2.8
Total	70	99.9

Percent is less than 100 due to rounding; [a] single choice.

Table 8. Comparison of attitude towards pesticide-specific issues among the two groups of vegetable growers.

Mann-Whitney value	Mean rank	Groups	Grouping variable	Test Variable
257.00*	37.91	literates	Education Level	Attitude towards pesticide-specific issues
	25.86	Illiterates		
373.00	34.14	Large holder	Farming system	
	35.84	Smallholder		
94.500**	55.70	Participants	Participation in extension and education courses	
	29.25	Non-participants		

*, ** Probability at 0.05 and 0.01 levels, respectively.

specific issues. In particular, there was a statistically significant difference between the two groups of participants and non-participants in extension and education courses. This result approved the findings of Hashemi et al. (2008) and Hashemi et al. (2009) conducted in Iran. Also, there was a statistically significant difference between two groups of literates and illiterates. The finding is not in concordance with findings of Hashemi and Damalas (2010) carried out in Iran. Furthermore, there was no significant difference between the compared groups in terms of farming system. The obtained result is in accordance with findings of Hashemi and Damalas (2011), carried out in Iran.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the results of this survey provide some insight into the pesticides used for diseases and insects control in leafy vegetable production, health symptoms, attitude toward pesticide-specific issues, protection measures and methods used to dispose empty pesticides containers by vegetable growers in Tehran, Iran. Findings from this study strongly show that vegetable growers lack knowledge of safe control and usage of pesticides in our farms, although they have a favourable attitude.

This is attributed to the absence of appropriate extension and education courses and encouragement to take these courses. The mixed results of this study can be used for the improvement of extension services on pesticide use in agriculture, particularly for eating fresh vegetables and may also contribute to change of pesticides policy in Iran to improve vegetable growers' conditions, environmental conditions and farmers' productivity.

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