Knowledge, Attitude, and Behaviour of Iranian Pistachio Farmers about the Environmental Aspects of Pesticide Use, 2017-18

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Abstract

Introduction: The use of pesticides has a significant negative effect on human health. The present study aims to assess pistachio farmers' knowledge, attitude, and behaviour concerning the environmental effects of using pesticides.

Materials and Methods: This cross-sectional study was carried out on 140 rural pistachio farmers of Rafsanjan City, Southern Iran, during the period from 2017 to 2018. Data were collected using a questionnaire with the variables of knowledge, attitude, and behaviour, with the validity and reliability of which having been confirmed. After data collection, the data were analysed by SPSS 16.0 using the statistical independent t-test, a one-way ANOVA, and the Pearson's correlation test. The significance level was set at 0.05.

Results: The results showed that there were statistically significant differences ($P< 0.05$) in the knowledge and attitude level of the research samples upon an increase in the level of literacy between those who participated in the training classes on health and safety principles during the spraying period and those who had not been trained at all. However, there was no statistically significant relationship between the knowledge score of the samples, for health items, and adherence to safety principles during the spraying period in terms of age, work experience, spraying history, and the area under cultivation among the research samples ($P> 0.05$).

Conclusion: It is suggested that training sessions be held continuously on health issues as well as compliance with safety principles during the spraying period by professionals for all farmers to enhance their level of knowledge and attitude.

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1. Introduction

The considerable increase in current population growth requires more agricultural production in the world. In addition, large quantities of crops are tainted by pests in fields or warehouses every year, thereby increasing the need for the protection of products. Unfortunately, nowadays in most countries of the world, especially in developing countries, pesticides and chemical warfare play a major role in protecting products [1, 2]. According to the World Health Organization (WHO), developing countries use about 20% of total pesticides in the world, with the use of this inherently hazardous technology being on the rise in an environment not having the right technology to counter its effects and the right HR education [3]. A great amount of chemical pesticides belonging to different chemical groups is used in pistachio fields, and less than 1% of them reach target pests or consumed by them; in addition, more than 99% of these pesticides enter the environment in the form of wastes without reaching the target pests [4, 5]. Pesticide wastes, including spray solutions, residues of chemical pesticides, contaminated water from washing equipment and containers, contaminated materials for making solutions, empty unwashed pest containers, as well as expired chemical pesticides, could harm human health and cause environmental pollution. Water contaminated with pesticides is a great danger to non-target organisms, such as plants, beneficial insects, fish, and other aquatic organisms [5, 6]. The use of pesticides not only has a significant negative effect on human health, but it also adversely affects various environmental factors, such as soil, product efficiency, as well as the environment in which plants and animals live. Pesticides are among the major sources of surface water. The uncontrolled use of pesticides by farmers makes soil unable to absorb them, thereby leading to the pollution of surface water and groundwater. Despite such environmental and health impacts, farmers around the world keep using pesticides ever-increasingly [5-8]. Among the main reasons for the improper use of pesticides, one could refer to the low level of education, lack of knowledge, inadequate training, low price of pesticides, inappropriate work conditions, as well as profiteering. Due to the lack of training and guidelines for the proper management of low quantities of pesticides and hazardous chemicals in the form of wastes, the major part of them is released around villages and urban areas [9-13]. In a survey, only 25% of the farmers were aware of the dangers of pesticides, and 68% of them did not use personal protection equipment when using pesticides [14]. In a study conducted in China, the subjects' low level of knowledge and attitude was reported as the major cause of occupational poisoning [15]. For the correct and safe use of pesticides, it is required that farmers' knowledge be elevated [16]. In addition, appropriate educational tools could provide sufficient information and increase the level of knowledge among farmers [11]. Pistachios are the major agricultural product in Rafsanjan County, which have turned this city into one of the major pistachio production regions in the world [17]. Therefore, the rational and principled control of pests, plant pathogens,

and weeds, with an emphasis on meeting environmental, health, and hygienic standards of the society, is of utmost importance. During the cultivation period, farmers spray pesticides several times to increase their production and prevent pests. In addition, some factors, such as the effects of pesticides on the health of farmers, the need for environmental protection, the consideration of health issues in formulating hygienic programs, the existence of several factors related to farmers' behaviour towards the use of chemical pesticides, as well as the lack of a similar study in Rafsanjan County, made us conduct the present study. Therefore, this study aims to assess rural farmers' knowledge, attitude, and behaviour in Rafsanjan City concerning environmental health aspects of pesticide use to come up with solutions for the promotion of their level of knowledge and behaviour.

2. Materials and Methods

This descriptive cross-sectional study was conducted on the rural farmers of Rafsanjan City. In this study, 140 participants were examined about the environmental effects of using pesticides [11]. The data collection tool was a valid and reliable four-part questionnaire, based on the studies of Heidari et al and Hosseini et al, with minor changes [1, 11]. The data were collected by questionnaires in a self-report method by participants as well as face-to-face interviews. The first part of the questionnaire was about personal and background information, including age, sex, marital status, the educational level, agricultural activity, the type of cultivated product, and the type of insecticides used. The second part was about the farmers' knowledge of health issues and adherence to safety principles during the spraying period. This part included 25 questions with answers yes (score 2), I do not know (score 1), and no (score 0). In addition, the scores ranged from 0 to 50. The third part was about the farmers' attitude towards environmental hazards and the use of pesticides, which had 16 questions with the Likert response scale. The answers to these questions were quite agree (score 4) and quite disagree (score 0) with the scores ranging from 0 to 64. The fourth part of the questionnaire was about the farmers' preventive measures in relation to the environmental hazards of pesticides, which included 9 questions; the answers included always (score 2), sometimes (score 1), and never (score 0). In addition, the scores ranged from 0 to 18. The validity of the questionnaire was evaluated using an expert panel. Furthermore, the reliability of the research was calculated using the Cronbach's alpha coefficient for knowledge, attitude, and behaviour, which were 0.75, 0.77, and 0.78, respectively. The collected data were analysed by SPSS 16.0 using the statistical independent t-test, a one-way ANOVA, and the Pearson's correlation test. The significance level was set at 0.05.

3. Results

The number of participants in this study was 140 men with an average age and an average work experience of 41.5± 12.93 and 17.89± 13.08 years, respectively. In the present study, the farmer's scores of knowledge, attitude, and behaviour were 37.41± 7.72, 51.3± 8.3, and 21.32± 5.6, respectively. Moreover, the farmers'

knowledge score, attitude score, and behaviour score were 78, 80, and 67 out of 100. According to the results, there was a significant relationship between the scores of knowledge (P= 0.008) and attitude (P= 0.004) in the samples who participated in the educational classes on health and safety principles during the spraying period. However, in terms of the behaviour score (P= 0.134), this relationship was insignificant (Table 1).

Table 1. The mean score and standard deviation of knowledge, attitude, and behaviour of the study samples in terms of health items and adherence to safety principles during the spraying period based on the completion of the pre-study course

Variables	Passing a pre-study course		Significant level with independent T test
	Yes	No	
	Mean ± SD	Mean ± SD	
Knowledge (0-50)	41.70 ± 4.35	36.78 ± 8.01	0.008*
Attitude (0-64)	56.25 ± 6.29	50.64 ± 8.09	0.004*
Behaviour (0-37)	23.10 ± 6.50	21.04 ± 5.45	0.134

*Significant (P< 0.05)

there was no significant relationship between the knowledge, attitude, and behaviour scores of the samples in terms of health items and adherence to safety principles during the spraying period with age, work experience, spraying history, and cultivars (P> 0.05). Furthermore, there was a significant difference between the mean scores of the level of knowledge and literacy among the research samples using the ANOVA test. Therefore, there was a significant difference between the knowledge score of those with reading literacy and those with a degree higher than a high school diploma (P= 0.002), those with middle school education and those with a degree higher than a high school diploma (P= 0.005), as well as those with a high school diploma and those with a higher degree (P= 0.002). However, there was no significant difference in other categories of literacy. In terms of the attitude score, the results were similar to those of knowledge, and there was a positive correlation in a way that the attitude score of those with reading literacy and those with post-diploma degrees was higher (P= 0.001). There was no significant difference in other categories of literacy. In addition, there was no significant difference between the mean score of behaviour and that of the level of literacy in the research samples (P= 0.876) (Table 2).

Table 2. The distribution of the mean and standard deviation of the scores of knowledge, attitude, and behaviour of the study samples in terms of health items and adherence to safety principles during the spraying period based on the level of literacy

Variable		Mean ± SD	Significance level with ANOVA
Knowledge	**Reading**	33.95 ± 8.55	0.001*
	Elementary	38.83 ± 7.49	
	Middle School	35.19 ± 6.30	
	Diploma	35.11 ± 8.23	
	Higher than Diploma	41.32 ± 6.21	
Attitude	**Reading**	46.35 ± 9.03	0.002*
	Elementary	51.83 ± 6.30	
	Middle School	50.11 ± 7.40	
	Diploma	50.41 ± 8.30	
	Higher than Diploma	54.60 ± 7.64	
Behaviour	**Reading**	20.84 ± 6.17	0.876
	Elementary	20.66 ± 7.28	
	Middle School	21.61 ± 5.24	
	Diploma	20.79 ± 5.71	
	Higher than Diploma	21.96 ± 5.39	

*Significant (P< 0.05)

4. Discussion

In the present study, the farmers' knowledge score, attitude score, and behaviour score were 78, 80, and 67 out of 100. According to a study conducted by Faryabi et al, farmers with a score above 75 have a desirable condition, those with a score from 50 to 75 have a moderate condition, and farmers with a score less than 50 have a poor condition [18]. Accordingly, the participants of this study had good knowledge and attitude as well as a moderate performance. There was a significant difference between the mean score of knowledge and that of the level of literacy in the research samples. In other words, those who were more aware had a higher level of literacy. A similar result was obtained in the studies of Sa'ed et al [19] as well as Atreya [7]. Against this background, there was a significant statistical difference between the knowledge, attitude, and behaviour of the research samples who participated in training classes on health and safety principles during the spraying period and those who did not receive training. Therefore, proper training classes could increase knowledge and change attitude of farmers, thereby improving their performance. In the present study, about 85% of the farmers did not attend any spraying classes. In the study of Sharafi et al, more than 78% of the participants did not attend any training classes [10]. Accordingly, there was no significant relationship between the knowledge score of the samples in terms of hygienic items and adherence to safety principles during the spraying period with age and work experience, which was consistent with the study of Heidari et al [1] as well as that of Hosseini et al [11]. The relationship between the increase in the age and work experience with an increase in knowledge will be significant if farmers receive necessary specialized trainings in this field during their work; hence, trainings will be effective if they are provided periodically and aligned with farmers' level of literacy. The results of this study showed that about 66% of the farmers consider wind blow at the spraying time. Paying attention to this issue is important in tropical regions to reduce skin respiration in the inhabitants of the region, for temperature fluctuations lead to an increase in chemical substances [20]. Adopting protective measures during and after the use of pesticides is an effective way of reducing risks posed to farmers, which lowers the possibility of poisoning by about 44% [21, 22]. The results of this study showed that the maximum use of protective masks among the farmers was 35.8%, but 32.8% of them did not use any protective equipment; however, in the study of Mohanty et al [23], about 40-70% of the subjects, and in the study of Oliveira Pasiani et al [20], less than 50% of the samples used protective equipment. Acute symptoms caused by exposure to pesticides include skin problems as well as nervous system disorders [24]. Up to 55.5% of the farmers who participated in this study had always, and 38.7% of them had occasionally problems during the spraying period, such as a burning sensation in the eyes and nose, as well as nausea, headache, and skin inflammation. A study in Ghana reported weakness and headache as common problems after contact

with pesticides, with 97% of the participants having experienced these symptoms [25]. In the study of Lekei et al, burning sensation in the eyes, skin, throat, and nose was the most common symptom during and after the spraying period [26]. In this study, 89.8% of the subjects washed their clothes, and 79.6% of them bathed after spraying pesticides. In a study by Wang et al, 93% of female farmers and 87% of male farmers bathed after spraying [12]. Inability to understand the information on the labels of pesticides results in inappropriate spraying, thereby increasing risks posed to human health as well as environmental pollution [27]. In this study, 32.1% of the participants read the labels on poisons before the start of spraying, and 92.7% of the empty containers of poisons were not used for other purposes. However, in a similar study conducted by Oesterlund et al, 74% of the farmers read labels on the containers and used them only for the use of pesticides [28]. In the present study, 59.8% of the farmers kept pesticides at a special storage site, 22.7% in the field and in the garden, and 17.5% in their houses. However, in the study of Shammi et al, most of the farmers kept pesticides in their houses. This dangerous practice increases the risk of unintentional poisoning among children and other family members [29]. In addition, 22.6% of the study subjects disposed of empty poison containers on the ground, and 7.3% of them unloaded the poison solution on soil. However, in the study of Aghilinezhad, 55% of the farmers abandoned the remaining poisons in the environment, and only 27% of them burned or buried poison containers [14]. In the same vein, in the study of Damalas et al, 66% of the farmers dumped poison containers in the field or in water flow [6].

5. Conclusions

Despite the relatively high level of knowledge and attitude among farmers in Rafsanjan City, there was no satisfactory behaviour displayed towards the effects of pesticides on their health and environment. This is indicative of the fact that the desirability of the level of knowledge and attitude does not necessarily lead to a desirable performance on the part of the farmers. Therefore, the designing of appropriate educational packages, the provision of educational materials for group discussions, the periodical use of mass media (radio and television), as well as the use of visual and audio media instead of written ones, are highly recommended for illiterate farmers and those of low literacy to improve their level of knowledge in areas where they are in need of it.

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this article.

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