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Factors Influencing Use of Integrated Pest Management in Greenhouses of Jiroft, Kerman, Iran

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ABSTRACT

Integrated Pest Management (IPM) is one of the important components to reduce the use of pesticides and their risk to farmers. This study aimed to determine the factors influencing IPM usage to reduce pesticide use by greenhouse farmers based on the Health Action Process Approach (HAPA). A total of 300 farmers from Jiroft, Kerman Province, Iran, participated in this cross-sectional study using multi-stage sampling, in 2021. The data collection tool was a questionnaire including demographic information, status of the use of IPM, and HAPA constructs regarding IPM (risk perception, outcome expectancies, task self-efficacy, action planning, coping planning, recovery self-efficacy, and maintenance self-efficacy), of which psychometric properties were examined and approved. Kruskal-Wallis test and Structural Equation Modeling (SEM) were used to analyze the data. There was a significant correlation between action planning (r= 0.29), coping planning (r= 0.33), maintenance self-efficacy (r= 0.23), and recovery self-efficacy (r= 0.23) with IPM. SEM revealed a direct and significant relationship between task self-efficacy, maintenance self-efficacy, coping planning, and recovery self-efficacy with IPM. HAPA is suggested to be used as a framework for interventions aiming at increasing application of IPM and lower pesticide use in agriculture.

Keywords: Health Action Process Approach (HAPA), Kruskal-Wallis test, Pesticides.

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INTRODUCTION

The agricultural sector of any country is the main source of food supply for people of that country (Ghadimi *et al.*, 2013). With a growing population in the world, efforts to increase crop production rates have led to overuse of pesticides in agricultural environments and the presence of pesticide residues in people's water and food can endanger their health (WHO. 2015). Public health policies are often ineffective in overcoming such problems. Studies on pesticides have highlighted the importance of reducing their risks and helping to improve public health policies in this area (Zyoud *et al.*, 2010). Various studies have shown that most pesticides are very resistant and cannot be easily degraded in nature due to the formation of complex chemical compounds. Therefore, in addition to affecting various pests, pesticides may lead to environmental pollution as well as chronic human poisoning in the long-run (Ashournezhad *et al.*, 2012). Studies in this field have shown that following an organic diet can quickly reduce the effects of these pesticides on the body and decrease the level of these metabolites (Curl *et al.*, 2015). Moreover, according to studies, unsafe use of pesticides is more common in developing countries (Zyoud *et al.*, 2010). Iran is also exposed to the excessive use of pesticides (Dehghani *et al.*, 2012) .

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Various studies have shown that despite the favorable knowledge and attitude of farmers regarding the adverse effects of pesticides, there is no good practice in relation to the use of pesticides (Oesterlund *et al.*, 2014; Recena *et al.*, 2006; Taghdisi *et al.*, 2019; Yuantari *et al.*, 2015). Jiroft City, in Kerman Province, is one of the most important agricultural hubs in Iran, and with more than 12,000 hectares of greenhouses, has the first rank of greenhouse cultivation in the country. Studies conducted in Jiroft also indicate a good knowledge but unfavorable practice of farmers in relation to the use of pesticides (Faryabi *et al.*, 2017).The status of farmers' practice in other regions of Iran is the same. In 2009, the analysis of toxin levels in melon samples showed that diazinon residue levels in Torbat-e-Jam melon were 4.98 times and in Shirvan melon were 4.11 times higher the standards. The diazinon residue levels in cucumber were more than the acceptable limits, except in Mashhad cucumber. The level of this toxin in Dezful cucumber was 6.1 times, in Rafsanjan 4.4 times, in Jiroft 4.2 times, in Kerman 1.2 times, and in Shirvan cucumber was 1.8 times higher than the allowable limit. However, the toxin level in tomatoes and cucumbers planted in Mashhad was determined to be less than the allowable limit (Rezvani Moghadam *et al.*, 2009).

An alternative pest control method, namely, Integrated Pest Management (IPM), is one of the important components to reduce the use of pesticides and ultimately reduce their risk to farmers (Pretty *et al.*, 2015). IPM includes preventive behaviors, such as regular crop monitoring, use of trap plants, pruning of infected plants and mechanical weed control, proper greenhouse ventilation, use of biopesticides, and biological control agents for pest control (Van den Berg *et al.*, 2007).

In a study in India, there were many limitations to the application of IPM, leading to an increase in the overuse of pesticides. These included the complexity of the factors affecting decision-making, the lack of trained personnel, and farmers' beliefs about pesticides (Bond *et al.*, 2009).

It is necessary to use theories to explain the factors related to farmers' behavior in this regard (Taghdisi *et al.*, 2018). Theory of planned behavior has been used to predict and analyze the behavior of farmers in the application of pest and pesticide management (Taghdisi *et al.*, 2018; Despotović *et al.*, 2019; Gowda *et al.*, 2021). The most important behavior predictor construct in this theory is the behavioral intention, which is affected by attitude (positive or negative), subjective norms (perceived social pressures), and perceived behavioral control (simplicity or complexity of a behavior from their perspective) (Solhi *et al.*, 2016). In most social - cognitive theories, it is assumed that the individual's intention to change is the best direct predictor of actual change. However, people often do not act according to their intentions. The gap between intention and behavior is due to several reasons. For example, unforeseen barriers may arise, or people may succumb to temptation. Therefore, the intention needs to be complemented by other factors, most of which are finite factors, which may compromise and facilitate the conversion of the intention into action. Some of these are identified as post-intentional factors, such as self-efficacy and strategic planning. They help bridge the gap between intention and behavior. A model that explicitly includes post-intentional factors in overcoming this gap is the Health Action Process Approach (HAPA) (Schwarzer, 2008).

Schwartz proposed HAPA based on Bandura's social cognitive theory (Bandura, 2001). This approach is used in predicting and modifying the acceptance and maintenance of health behavior (Schwarzer, 2008). The main hypothesis of HAPA is that in order to adopt a behavior, an individual must go through two phases of motivational and volitional. In the motivational phase, three factors of risk perception, outcome expectancy, and self-efficacy affect behavioral intention. Subsequently, the

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individual gets ready to accept a certain behavior and make related decisions. After the formation of behavioral intention, the individual enters the volitional phase, consisting of the constructs of action planning, coping planning, coping self-efficacy and recovery self-efficacy (Zhang *et al.*, 2019). HAPA has been used to predict, evaluate, and design various educational interventions in many health behaviors (Gholami *et al.*, 2013; Schwarzer, 2008; Steca *et al.*, 2017; Scholz *et al.*, 2009; Scholz *et al.*, 2005).

Identifying the factors affecting healthy and unhealthy behaviors, and determining the most important effective socio-psychological variables are vital and fundamental steps before designing and conducting educational interventions (Zhang *et al.*, 2019). Therefore, given the gap between farmers' knowledge and practice, and the increasing prevalence of pesticides in agricultural products, it seems necessary to identify post-intentional factors affecting the application of IPM. Moreover, due to the lack of studies in this field in Iran and worldwide, this study aimed to determine the most important factors related to IPM usage for reducing pesticide use in greenhouse cucumbers based on HAPA.

MATERIALS AND METHODS

Study Design and Participants

A total of 300 farmers from Jiroft, Kerman Province, Iran, participated in this cross-sectional study using multi-stage sampling, in 2021. After obtaining the necessary permits to conduct the project, two Comprehensive Health Centers, CHC, (centers providing second level of health services in the health services system of Iran) were randomly selected from 10 CHC located in the central and Ismailiye Regions of Jiroft (greenhouse farming is used in these regions). Then, 2 main villages were randomly selected from each CHC and the participants' list was extracted according to the list of farmers in the CHC randomly. After writing their names and telephone numbers, in case of meeting the inclusion criteria, informed consent was taken from them and were asked to complete the study questionnaires.

The inclusion criteria consisted of informed voluntary consent, being male, owning a greenhouse with a cultivation area between 10,000 and 20,000 m^2 (between one to two hectares), living in the village, using traditional method of greenhouse cultivation, aged between 20 to 75 years, owning the greenhouse for at least 3 years, and being literate.

Data Collection Instrument and Process

The study objectives were explained to the participants and were asked to set a specific date for completing the questionnaires. The individuals were referred on the specified date and after providing the necessary instructions, the questionnaires were completed through interviews with the participants.

Data collection instrument included the following sections.

A) Demographic information, including age, gender, marital status, and education level.

B) Scales for HAPA constructs measurement, including the following sections:

- The risk perception scale consisted of 5 items and was used to measure the risk perception to use alternative pest control methods. Based on a 4-point Likert scale, the responses ranged from 0 (completely incorrect) to 15 (completely correct). The score for this scale ranged from 0 to 27, and higher scores indicated higher levels of the risk perception. For instance, an item of this scale was "If I take measures related to the health of greenhouse products, consumers will be exposed to a variety of cancers."

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- The task self-efficacy scale consisted of 9 items for measuring participants' perceptions of their ability to perform IPM. The responses, based on a 4-point Likert scale, ranged from 0 (completely incorrect) to 3 (completely correct). The possible score for this scale ranged from 0 to 27, and higher scores indicated higher levels of task self-efficacy. For instance, an item of this scale was "I'm sure I can use insect monitor cards."
- The outcome expectancy scale consisted of 8 items for measuring participants' perceptions of benefits and barriers of performing IPM. The responses, based on a 4-point Likert scale, ranged from 0 (completely incorrect) to 3 (completely correct). The possible score for this scale ranged from 0 to 24, and higher scores indicated higher levels of outcome expectancies. For instance, an item of this scale was "If I take measures related to the health of greenhouse products, consumers will be less likely to be poisoned."
- The behavioral intention scale consisted of 9 items and was used to measure the intention to use alternative pest control methods and IPM. The responses, based on a 4-point Likert scale, ranged from 0 (completely incorrect) to 3 (completely correct). The possible score for this scale ranged from 0 to 27, and higher scores indicated higher levels of behavioral intention. For instance, an item of this scale was "I intend to use yellow pest traps to eliminate insects and flies."
- The action planning scale consisted of 4 items for measuring whether participants have a clear and precise plan for IPM. The responses ranged based on a 4-point Likert scale from 0 (completely incorrect) to 3 (completely correct). The possible score for this scale ranged from 0 to 12, and higher scores indicated higher levels of action planning. For instance, an item of this scale was "I currently have a detailed plan about the time of taking measures related to the health of greenhouse products."
- The coping planning scale consisted of 4 items for measuring whether participants had a clear and precise plan for coping with barriers of performing IPM. The responses, based on a 4-point Likert scale, ranged from 0 (completely incorrect) to 3 (completely correct). The possible score for this scale ranged from 0 to 12, and higher scores indicated higher levels of coping planning. For instance, an item of this scale was "In case of any interference with measures related to the health of greenhouse products, I have a detailed plan for what I need to do."
- Maintenance self-efficacy scale consisted of 3 items for measuring participants' perceptions of their ability to continue performing IPM in difficult situations. The responses, based on a 4-point Likert scale, ranged from 0 (completely incorrect) to 3 (completely correct). The possible score for this scale ranged from 0 to 9, and higher scores indicated higher levels of maintenance self-efficacy. For instance, an item of this scale was "I'm sure I can regularly continue to take measures related to the health of greenhouse products, even if it takes a long time."
- The recovery self-efficacy scale consisted of 3 items for measuring participants' perceptions of their ability to restart performing IPM after temporary occasional stop periods. The responses, based on a 4-point Likert scale, ranged from 0 (completely incorrect) to 3 (completely correct). The possible score for this scale ranged from 0 to 9, and higher scores indicated higher levels of recovery self-efficacy. For instance, an item of this scale was "Even if for some

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reason I leave taking measures related to the health of greenhouse products, I am sure I will be able to resume them."

- The preventive measures scale related to the health of greenhouse products consisted of 9 items with different response ranges. In this scale, participants were asked about the status of implementation of measures related to IPM. The possible score for this scale ranged from 0 to 45, and higher scores indicated higher levels of IPM usage. For instance, an item of this scale was "How much insect monitor cards did you use to eliminate pests during the harvest period on average per week? And the possible responses for this scale were, Never (0), Once a week (1), Twice a week(2), Three times a week (3), Four times a week (4), Five or more times a week (5)".

Summary of scales for measurement of HAPA constructs is shown in Table 1.

The face validity of the scales of HAPA constructs was confirmed by obtaining the opinion of 10 farmers. The content validity of the scales was confirmed using the opinions of 8 experts (five academic staff with PhD in health education and three academic staff with PhD in agriculture) by calculating the Content Validity Ratio (CVR) and Content Validity Index (CVI). In this study, CVR and CVI scores in all items were desirable.

After confirming the face and content validity of the scales, internal consistency and stability were calculated by Cronbach's alpha and test-retest with 2 weeks interval in a pilot study with 30 samples. The results were as follows: risk perception (α= 0.74, ICC= 0.74), outcome expectancies (α= 0.76, ICC= 0.93), task self-efficacy (α= 0.90, ICC= 0.69), behavioral intention (α= 0.95, ICC= 0.85), action planning (α= 0.93, ICC= 0.64), coping planning (α= 0.97, ICC= 0.67), maintenance self-efficacy (α= 0.64, ICC= 0.73), and recovery self-efficacy (α= 0.98, ICC= 0.95).

Ethical Considerations

In order to observe the research ethics, first, the study objectives were explained to the participants and, if they were satisfied, they entered the study. In addition, the information was collected anonymously by the research team.

Statistical Analysis

Frequency indices, frequency percentage, mean and standard deviation, median and interquartile range were used for descriptive analysis. The normality of the error distribution in quantitative variables was evaluated by Kolmogorov-Smirnov test.

Spearman correlation coefficient was used to determine the correlation between HAPA constructs. In order to determine the most important factors related to the application of IPM, Structural Equation Modeling (SEM) was used using AMOS 24 software. In order to determine the model fit, Goodness of Fit Index (GFI), Root Mean Square Error of approximation (RMSEA), Normed Fit Index (NFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Minimum discrepancy function by degrees of Freedom Divided (CMIN/DF) were used. Acceptable RMSEA was less than 0.08, GFI, CFI, NFI and TLI more than 0.9, and optimal CMIN/DF was considered less than 3.

RESULTS

Demographic Profile of Participants

Of the participants, 71.33% (214) were in the age group of 40-60 years, 86% (258) were married, and 48.3% (145) had a high school diploma (Table 2).

Descriptive Findings of HAPA Construct

The mean, standard deviation, median, and interquartile range of the scores of HAPA constructs are shown in Table 3. The mean

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Table 1. Summary of scales for measurement of HAPA constructs.

Scale	Items ' no	Possible responses	Possible score	Sample item	Psychometric properties
Risk perception	5	0 (completely incorrect) to 3 (completely correct)	0-15	If I take measures related to the health of greenhouse products, consumers will be exposed to a variety of cancers	α = 0.74, ICC [a] = 0.74
Task self-efficacy	9	0 (completely incorrect) to 3 (completely correct)	0-27	I'm sure I can use insect monitor cards	α= 0.90, ICC= 0.69
Outcome expectancy	8	0 (completely incorrect) to 3 (completely correct)	0-24	If I take measures related to the health of greenhouse products, consumers will be less likely to be poisoned	(α= 0.76, ICC= 0.93)
Behavioral intention	9	0 (completely incorrect) to 3 (completely correct)	0-27	I intend to use yellow pest traps to eliminate insects and flies	(α= 0.95, ICC= 0.85)
Action planning	4	0 (completely incorrect) to 3 (completely correct)	0-12	I currently have a detailed plan about the time of taking measures related to the health of greenhouse products.	(α= 0.93, ICC= 0.64)
Coping planning	4	0 (completely incorrect) to 3 (completely correct)	0-12	In case of any interference with measures related to the health of greenhouse products, I have a detailed plan for what I need to do.	(α= 0.97, ICC= 0.67)
Maintenance self-efficacy	3	0 (completely incorrect) to 3 (completely correct)	0-9	I'm sure I can regularly continue to take measures related to the health of greenhouse products, even if it takes me a long time	(α= 0.64, ICC= 0.73)
Recovery self-efficacy	3	0 (completely incorrect) to 3 (completely correct)	0-9	Even if for some reason I leave taking measures related to the health of greenhouse products, I am sure I will be able to resume them	(α= 0.98, ICC= 0.95).
Preventive measures	9	Never (0), Once a week(1), Twice a week (2), Three times a week (3), Four times a week (4), Five or more times a week (5)"	0-45	"How much insect monitor cards did you use to eliminate pests during the harvest period on average per week	

[a] Interclass Correlation Coefficient (ICC).

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Table 2. Demographic characteristics of the participants (N= 300).

Variable		Frequency	Percentage
Age	20-40	76	25.33
	40-60	214	71.33
	60-75	10	3.34
Marital status	Single	39	13
	Married	258	86
	Widowed	3	1
Education level	Elementary school	16	5.3
	Junior high school	49	16.3
	High school Diploma	145	48.3
	Associate degree	65	21.7
	Bachelor's degree and higher	25	11

Table 3. Median and interquartile range distribution of HAPA constructs related to IPM.

Construct	Median	Interquartile range	Mean	Standard deviation
Risk perception	15	3	13.66	2.99
Outcome expectancies	19	7	19.18	3.43
Task self-efficacy	19	2	18.37	3.27
Behavioral intention	19	4	19.87	4.50
Action planning	4	2	5.05	3.03
Coping planning	5	0	5.65	2.97
Maintenance self-efficacy	3	0	2.48	1.83
Recovery self-efficacy	3	2	2.65	1.94

Table 4. Distribution of mean, median, and interquartile range of IPM items.

Preventive measures	Median	Interquartile range	Mean	Standard deviation
Greenhouse ventilation in a week	3	1	3.37	0.57
Regular monitoring to prevent and control pests	1	1	1.59	0.75
Removing plant debris and weeds	1	1	1.54	0.83
Removing plants around the greenhouse up to a distance of 3-9 meters	1	1	1.25	0.80
Using yellow pest traps	1	1	0.72	0.53
Using insect monitor cards	1	0	0.87	0.62
Planting and removal of infected plants	2	1	1.73	0.72
Insect netting	0	0	0.83	1.85
Installing lime water disinfection basin in front of the door	0	0	0.01	0.28

of constructs in the motivational phase were higher than the volitional phase. The median score for IPM was 12, the minimum of which was 6, and the maximum was 23 (Table 4).

Inferential Findings of HAPA Construct

The correlation coefficient between HAPA constructs was significant in most constructs. Action planning ($P< 0.1$, $r= 0.29$), coping planning ($P< 0.1$, $r= 0.33$), maintenance self-efficacy ($P< 0.1$, $r= 0.23$), and recovery self-efficacy ($P< 0.1$, $r= 0.23$)

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had a significant correlation with IPM (Table 5).

Regression coefficients obtained from SEM showed the effect of task self-efficacy construct on behavioral intention (Beta= 0.760), task self-efficacy on maintenance self-efficacy (Beta=.235), maintenance self-efficacy on coping planning (Beta= 0.608), coping planning on action planning (Beta=.423), coping planning on recovery self-efficacy (Beta= 0.431), and recovery self-efficacy on IPM (Beta=.596.). The model goodness of fit indices (RMSEA= 0.09, CFI= 0.9, NFI= 0.9, CMIN/DF= 1.55, TLI= 0.97) were calculated, all of which were acceptable (Figure 1).

DISCUSSION

The present study aimed to determine the factors related to the application of IPM to

Table 5. Spearman correlation coefficients between HAPA constructs and IPM.

Variable	Risk perception	Outcome expectancies	Task self-efficacy	Behavioral intention	Action planning	Coping planning	Maintenance self-efficacy	Recovery self-efficacy	IPM
Risk perception	1								
Outcome expectancies	0.50^{**}	1							
Task self-efficacy	0.27^{**}	0.19^{**}	1						
Behavioral intention	0.19^{**}	0.14^{*}	0.70^{**}	1					
Action planning	0.10	0.22^{**}	0.24^{**}	0.18^{**}	1				
Coping planning	0.08	0.23^{**}	0.19^{**}	0.15^{**}	0.73^{**}	1			
Maintenance self-efficacy	0.10	0.11^{*}	0.69	0	0.50^{**}	0.60^{**}	1		
Recovery self-efficacy	0.10	0.13^{*}	0.19^{**}	0.10	0.43^{**}	0.56^{**}	0.80^{**}	1	
IPM	0.07	0.15^{**}	0.11^{*}	0.07	0.29^{**}	0.33^{**}	0.23^{**}	0.23^{**}	1

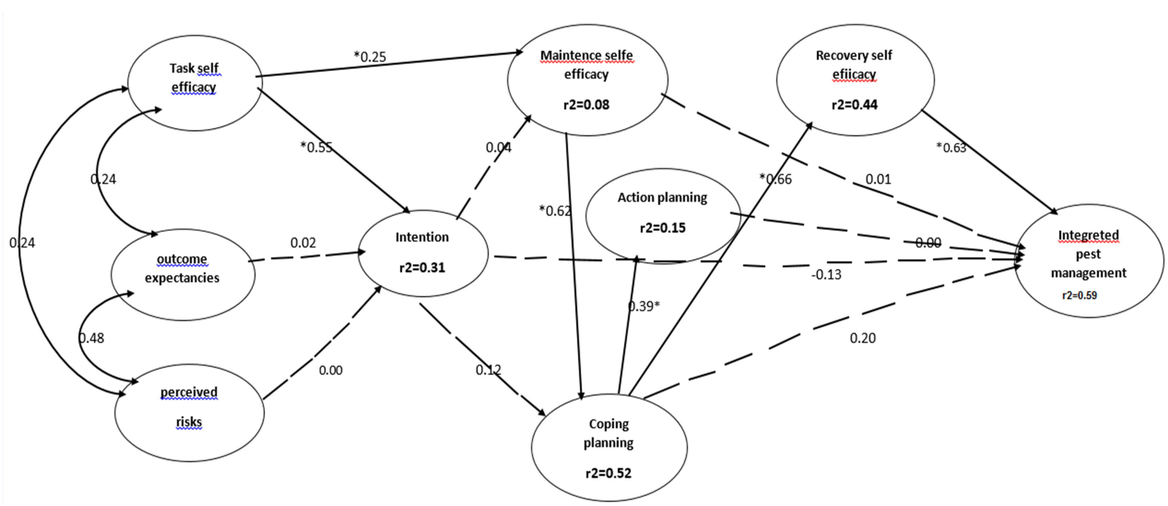

Figure 1. Path coefficients obtained from SEM between HAPA constructs and IPM (N= 300). (RMSEA= 0.09, CFI= 0.9, NFI= 0.9, CMIN/DF= 1.55, TLI= 0.97) (P< 0.5)*. Solid Lines= Path coefficient is statistically significant, Dashed lines= Path coefficient is not statistically significant.

reduce pesticide use by greenhouse farmers based on the HAPA.

Task self-efficacy, perceived risks, and outcome expectations were able to predict 31% of the variance of IPM. In addition, recovery self-efficacy, behavioral intention, and coping planning predicted 59% of IPM.

A number of HAPA relationships and assumptions were confirmed in this study, which is consistent with the results of many studies conducted on other health behaviors (Rohani *et al.*, 2018; Zhou *et al.*, 2013; Caudroit *et al.*, 2011; Steca *et al.*, 2017).

Therefore, at first glance, the results of this study emphasized the usefulness of the HAPA and its effectiveness in predicting the factors affecting the application of IPM in farmers. However, the exact results of this study can be discussed as follow:

The strongest correlation coefficients were observed between IPM and constructs of maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning. Constructs of risk perception, and behavioral intention were not significantly associated with the application of IPM. Some studies have reported that there are limited evidence for predictive power of intention on actual behavior and have found a gap between behavior and intention (Solhi *et al.*, 2016; Liobikienė *et al.*, 2016).

There was a direct significant relationship between task self-efficacy, maintenance self-efficacy, coping planning, and recovery self-efficacy with IPM.

In previous studies on other health behaviors, task self-efficacy, maintenance self-efficacy, and recovery self-efficacy directly or indirectly predicted physical activity behavior (Chiu *et al.*, 2011).

Intention is reinforced and supported by self-efficacy and is affected by barriers and facilitators such as social and economic support. In other words, self-efficacy is an influential factor referring to a certain perceived ability to perform a desirable behavior (Solhi *et al.*, 2016).

In this study, the intention and action planning did not predict the application of IPM. In a previous study, also action planning did not predicted the physical activity behavior (Scholz *et al.*, 2005).

It is likely that the intention and action planning of farmers in applying IPM is affected by other factors, such as farmer's self-efficacy, economic facilitators, and social support. These factors cannot predict IPM application.

A positive significant path coefficient between task self-efficacy and behavioral intention was one of the findings of this study, which is in line with studies conducted on other health behaviors. In previous studies on other health behaviors, the path between task self-efficacy and behavioral intention was positive and significant and task self-efficacy predicted 53% of intentional behavior (McKay *et al.*, 2016).

When an individual believes in his or her ability to do something, this factor can facilitate the intention to perform a behavior. In addition, people with task self-efficacy are more focused on failure and tend to procrastinate (Zhou *et al.*, 2013). In this study, farmers with more self-efficacy for IPM and less use of pesticides had, probably, a stronger intention to do so.

Outcome expectancies did not affect behavioral intention in this study. However, many studies have shown that by clarifying the outcomes of health behaviors, one can have a stronger intention to perform those behaviors (Barg *et al.*, 2012). One of the reasons for the non-discrepancy between the results of this study and other studies is that the nature of this behavior is different from other studies. Outcome expectancies of this behavior may not weigh enough to affect farmers' intentions to apply IPM.

The path coefficient of risk perception and behavioral intention was not positive and significant. In some studies, perceived risk was not significantly related to behavioral intention (Zhou *et al.*, 2013; Radtke *et al.*, 2014); however, some studies have shown that perceived risk is an important motivational force for adopting health behaviors (Namadian *et al.*, 2016; McKay *et al.*, 2016; Rohani *et al.*, 2018). Regarding

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the non-discrepancy between the results of this study and other studies, there are likely to be important mediating factors for farmers creating such a gap between intention and risk perception. Risk perception in this behavior cannot be an important motivational force in farmers to apply IPM.

Therefore, just having a high level of self-efficacy, believing in the outcomes, and risk perception are not enough to perform and maintain IPM. The individual should plan for the behavior and use various self-efficacy strategies, such as maintenance self-efficacy and recovery self-efficacy. Farmers face barriers and difficulties in applying IPM. Therefore, the maintenance self-efficacy and recovery self-efficacy in the farmer, which are optimistic beliefs in overcoming barriers to maintain the behavior, can be very effective.

From the theoretical perspective of this approach, the constructs of risk perception, outcome expectancies, and task self-efficacy predict the intention, and maintenance self-efficacy and recovery self-efficacy predict the behavior. In this study, maintenance self-efficacy and recovery self-efficacy were related to IPM. In fact, people with high levels of self-efficacy and coping planning were more successful in IPM. It is due to the fact that high levels of coping self-efficacy and recovery self-efficacy through the planning construct affect the behavior (Steca *et al.*, 2017; Chow *et al.*, 2010; Keller *et al.*, 2016). Coping planning is considered as a predictor of behavior and is related to the concept of self- regulation (Sweet *et al.*, 2014). Therefore, farmers face barriers in applying IPM and reducing pesticide use; to overcome this problem, coping planning seems necessary.

This study had some limitations. First, it was descriptive and analytical; therefore, longitudinal studies are recommended to analyze and investigate the causal relationships of the constructs. Secondly, data collection was self-report, which, despite the accuracy of the data, is associated with bias.

CONCLUSIONS

Psychological variables, such as task self-efficacy, coping planning, maintenance self-efficacy, and recovery self-efficacy are related to the application of IPM to reduce the use of pesticides. Some constructs (task self-efficacy, coping planning, maintenance self-efficacy, and recovery self-efficacy) are more important than others, and need to be used as a framework for policymakers in planning projects to reduce pesticide use.

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عوامل موثر بر استفاده از مدیریت تلفیقی آفات در گلخانه های جیرفت کرمان

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چکیده

مدیریت تلفیقی آفات یکی از مولفه های مهم برای کاهش استفاده از آفت کش ها و در نهایت کاهش خطر آنها برای کشاورزان است. مطالعه حاضر با هدف تعیین عوامل مرتبط با به کارگیری مدیریت تلفیقی آفات برای کاهش استفاده از آفت کش در کشاورزان گلخانه دار بر اساس رویکرد فرایند عمل بهداشتی انجام شد . در مجموع ۳۰۰ کشاورز از شهرستان جیرفت در استان کرمان، در یک مطالعه مقطعی در سال ۲۰۲۱ با استفاده از نمونه گیری چند مرحله ای شرکت کردند . ابزار جمع آوری اطلاعات ، پرسشنامه شامل بخش های: اطلاعات دموگرافیک ، مدیریت آفات و سازه های رویکرد فرایند عمل بهداشتی (درک خطر ، انتظارات پیامد ، خودکارآمدی وظیفه ، برنامه ریزی عمل ، برنامه ریزی کنارآمدن ، خودکارآمدی بازیابی و نگهداری) بود . که ویژگی های روان سنجی آن مورد بررسی و تایید قرار گرفت. از آزمون کروسکال والیس و الگوسازی معادلات ساختاری برای تحلیل داده ها استفاده شد . بین برنامه ریزی عمل(r=0/29) ، برنامه ریزی کنارآمدن(r=0/33) ، خودکارآمدی نگهداری(r=0/23) و خودکارآمدی بازیابی(r=0/23) با مدیریت آفات همبستگی معنی داری وجود داشت. بر اساس نتایج مدل سازی معادلات ساختاری نیز ارتباط مستقیم و معنی داری بین خودکارامدی عمل ، خودکارآمدی نگهداری ، برنامه ریزی کنارآمدن ، خودکارآمدی بازیابی با مدیریت تلفیقی آفات دیده شد. پیشنهاد می شود رویکرد فرآیند عمل بهداشتی به عنوان چارچوبی برای مداخلات با هدف افزایش کاربرد مدیریت آفات و کاهش استفاده از آفت کش ها در کشاورزی استفاده شود.

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