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Full Length Research Paper

The perception of corn farmers about biological control of *Caradrina* by *Braconid* in Dezful Township, Khouzestan Province, Iran

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The purpose of this study was to analyze the perception of corn farmers about biological control of *Caradrina* by *Braconid* in Dezful Township, Khouzestan Province, Iran. The method used in this study was correlative descriptive and causal relation. A random sample of Dezful township corn farmers of Khouzestan Province, Iran (n = 350) was selected for participation in this study. A questionnaire was developed to gather information regarding perception of farmers on biological control of *Caradrina* by *Braconid* in corn farms of Dezful Township, Khouzestan Province. The questionnaire was pilot tested in Shoushtar Township, Khouzestan Province. Questionnaire reliability was estimated by calculating Cronbach's alpha. Reliability was Cronbach's alpha = 0.85. Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS). According to results of this study, there were significant correlation between perception of corn farmers about biological control of *Caradrina* by *Braconid* with work experience, social participation, level of education, income, technical knowledge and extension activity. The result of regression indicates that 38% of the variances in the perception of respondents could be explained by the social participation, level of education, income, technical knowledge and extension activity.

Key words: Biological control, *Caradrina, Braconid,* corn farmers, Dezful.

INTRODUCTION

Fundamental contributor to the Green Revolution has been the development and application of pesticides for the control of a wide variety of insectivorous and herbaceous pests that would otherwise diminish the quantity and quality of food produced. The use of pesticides coincides with the "chemical age" which has transformed society since the 1950s. In areas where intensive monoculture is practiced, pesticides were used as a standard method for pest control. Unfortunately, with the benefits of chemistry, there have also come 'disbenefits', some so serious that they now threaten the long-term survival of major ecosystems by disruption of predator-prey relationships and loss of biodiversity. Also, pesticides can have significant human health consequences (FAO, 2003). Chemical control of insect pests is the most dominant approach at present. It is responsible for many health hazards among people and livestock. Evidences of pesticide threats to human health and economic effects have been documented in several studies (Singh et al, 2008). However, it is evident, more than any time, that there is need for application of new technologies in the agricultural sector (Hosseini et al, 2010). Biological control, as new technology, is the use of one or more types of beneficial organisms, to reduce the numbers of another type of organism (Mahr et al, 2001). Also, it has been defined as "the intentional use by humans of parasitoid, predator, pathogen, antagonist, or competitor populations to suppress a pest population, thereby making the pest less abundant and damaging than it would be in the absence of these organisms" (Hoddle, 2004). Through biological control, it has been estimated that pests reduce global crop yields by 42% annually; pest management using biological methods is believed to provide 60% of the non-chemical control of these pests (Pimentel et al., 1997). Biological control is often divided into three categories. All of these can be part of an integrated pest management program. The three categories are: classical biological control, augmentative bio-

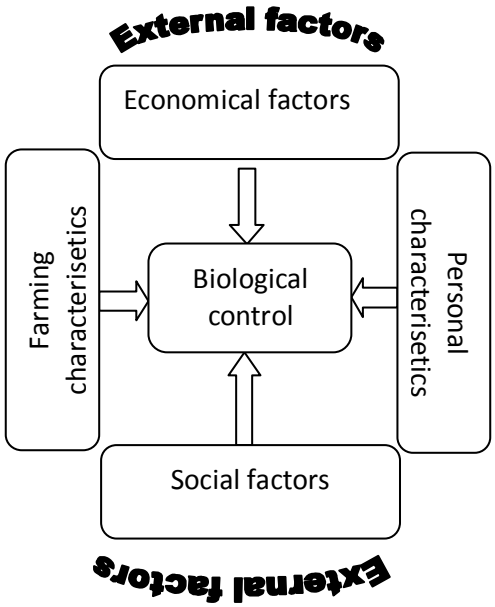

Figure 1. Theoretical framework.

logical control and conservation biological control. Abeydeera (1994) reported that biological control application decreases total control cost more than where no biological agent is used.

This study presents a single case study on effective social factors of adoption of biological control by rice farmer in north of Iran. According to Niyaki et al. (2010), the main important factors of adoption of biological control include education level, family size, experience in rice culture, rate of participation in educational-extensional activities.

The *Braconid* constitutes one of the most species-rich families of insects (Whitfield et al., 2004; Quicke et al., 1999). The majority of *Braconid* is parasitoids of other insects. They almost invariably kill their hosts, although, a few only cause their hosts to become sterile and less active. Both external and internal parasitoids are common in the family, and the latter forms often display elaborate physiological adaptations for enhancement of larval survival within host insects, including the co-option of end symbiotic viruses for compromising host immune defenses (Whitfield, 2002; Whitfield and Asgari, 2003; Whitfield et al., 2004).

One of the insects that were parasitized by *Braconid* is *Caradrina*. *Caradrina* attack various plants such as sugar beet, alfalfa and corn.

The purpose of this study was to analyze the perception of corn farmers on biological control of *Caradrina* by *Braconid* in Dezful Township, Khouzestan Province, Iran.

MATERIALS AND METHODS

The method used in this study was correlative descriptive and causal relation. A random sample of Dezful township corn farmers of Khouzestan province, Iran (n = 350) was selected for participation in this study. A questionnaire was developed to gather information regarding perception of corn farmers regarding biological control of *Caradrina* by *Braconid* in Dezful township of Khouzestan Province. The questionnaire was piloted and tested in Shoushtar Township. Questionnaire reliability was estimated by calculating Cronbach's alpha. Reliability was Cronbach's alpha = 0.85. Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS). Appropriate statistical procedures for description (frequencies, percent, means and standard deviations) were used. This study was carried out by survey during July and August 2010 (Figure 1).

RESULTS

Demographic profile

The first section described farmers' demographic profile in Dezful Township, Khuzestan Province of Iran. As seen in Table 1, approximately, 56% of respondents were between 36 to 50 years of age and 31.7% of them between 22 to 35 years of age (Table 1). Most respondents (46.6%) reported work experience, including 1 to 15 years and the vast majority of them were male (89.04%).

In reference to the frequency of respondents' social participation, 64% of farmers had moderate level. About 32% of corn farmers had reached primary school level. Based on the results of this study, the incomes of 68.9% of corn farmers were between ten million to one hundred million Rials in a year (Table 1 and Figure 2).

Perception of corn farmers on biological control of *Caradrina* by *Braconid*

In finding the perception of respondents and their attitudes towards biological control of *Caradrina* by *Braconid*, they were asked to give their perceptions of items of biological control on a five Likert scale (1 = strongly disagree, 2 = disagree, 3 = unsure, 4 = agree, 5 = strongly agree). Their answers to these items in combination led to their perceptions of biological control of *Caradrina* by *Braconid*. As can be seen, the highest mean number refers to the role of biological control in conservation of natural resources (mean = 2.911). As seen in Table 2, approximately, 40.6% of respondents agreed with role of biological control in conservation of natural resources (Table 2).

Correlation study

Spearman coefficient was employed for measurement of relationships between independent variables and dependent variable. Table 3 displays the results which showed that there is a relationship between perception of

Table 1. Personal, social and economical characteristics of corn farmers.

Characteristic	Frequency	Percent	Cumulative percent
Age			
20-35	111	31.7	31.7
36-50	196	56	87.7
51-65	40	11.4	99.1
66-80	3	0.9	100
Work experience			
1-15	163	46.6	46.6
16-30	159	45.4	92
31-45	26	7.4	99.4
46-60	2	0.6	100
Social participation			
Low	67	19.1	19.1
Moderate	224	64	83.1
High	59	16.9	100
Level of education			
Uneducated	40	11.4	11.4
Primary school	114	32.6	44
Secondary school	106	30.3	74.3
High school	90	25.7	100
Income (Million Rials)			
10-100	241	68.9	68.9
100-200	79	22.6	91.4
200-300	18	5.1	96.6
300-400	9	2.6	99.1
400-500	3	0.9	100

corn farmers on biological control of *Caradrina* by *Braconid* as dependent variable and personal, social and economical characteristics as independent variables.

Based on the results there is significant correlation between perception of corn farmers on biological control of *Caradrina* by *Braconid* with work experience, social participation, level of education, income, technical knowledge and extension activity.

Regression analysis

Table 4 shows the result for regression analysis by stepwise method. Independent variables that were significantly related to the perception of corn farmers on biological control of *Caradrina* by *Braconid* were entered. The result indicates that 38% of the variances in the perception of respondents could be explained by the social participation, level of education, income, technical knowledge and extension activity.

DISCUSSION

According to the results of this study, there is significant correlation between perception of corn farmers on biological control of *Caradrina* by *Braconid* with work experience, social participation, level of education, income

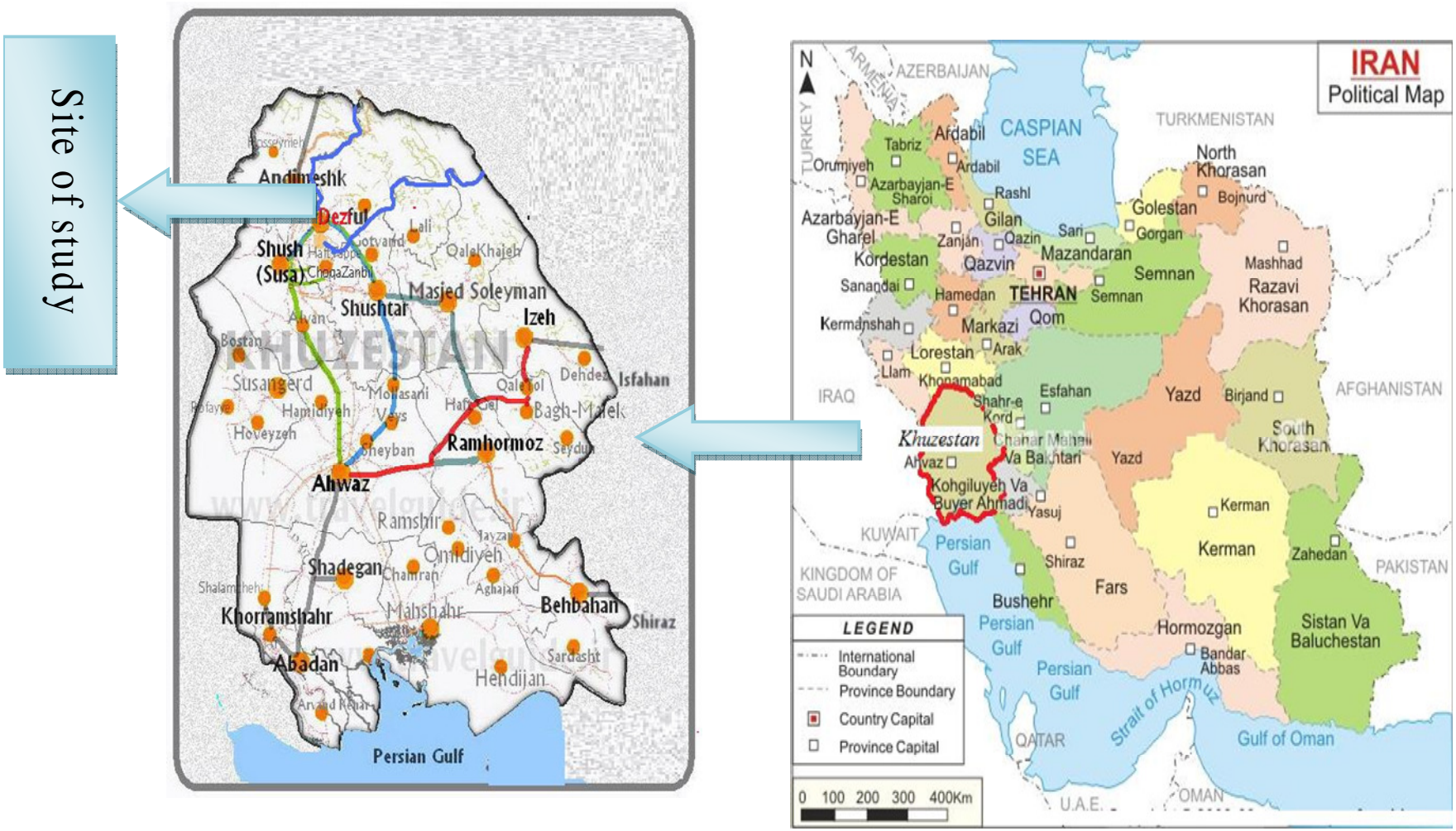

Figure 2. Site of study in south of Iran.

income, technical knowledge and extension activity.

According to Niyaki et al. (2010), the main important factors of adoption of biological control include education level, family size, experience in rice culture, rate of participation in educational-extensional activities. Singh et al. (2008) have shown that technology awareness through formal crop-specific IPM training provided by farmers' field schools is extremely important for wider adoption of IPM in the study area. Hence, investment in IPM education through these programs will have long-term beneficial impact.

Based on the results, 43% of respondents agreed with the role of biological control in

Table 2. Perception of corn farmers about biological control of *Caradrina* by *Braconid*.

Dimension	1		2		3		4		5		Mean	sd
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
Reduce dependency to pesticides	6	1.7	38	10.9	53	15.1	180	51.4	73	20.9	2.788	0.952
Increase quality of crops	6	1.7	46	13.1	49	14	158	45.1	91	26	2.805	1.022
Increase crop yield in long time	3	0.9	54	15.4	6	18.9	151	43.1	76	21.7	2.694	1.004
Conservation of natural resources	10	2.9	47	13.4	29	8.3	142	40.6	122	34.9	2.911	0.379
It is economically feasible	23	6.6	73	20.8	45	12.9	116	33.1	93	26.6	2.522	1.263
It is socially acceptable	9	2.6	66	18.9	67	19.1	140	40	68	19.4	2.548	1.082

1 = Strongly disagree, 2 = disagree, 3 = unsure, 4 = agree, 5 = strongly agree. Sd, standard deviation.

Table 3. Correlation measures between independent variables and perception of corn farmers about biological control of *Caradrina* by *Braconid*.

Variable 1	r	p
Age	0.019	0.632
Work experience	0.032**	0.541
Social Participation	0.312**	0.000
Level of education	0.412**	0.000
Income	0.378**	0.000
Technical knowledge	0.416**	0.000
Extension activity	0.451**	0.000

Variable 1: Perception of corn farmers about biological control of *Caradrina* by *Braconid*. *p < 0.05; **p < 0.01.

Table 4. Multivariate regression analysis.

Multivariate regression analysis	B	Beta	T	Significance
Constant	2.564	-------	4.329	0.000
Technical knowledge	0.171	0.198	2.769	0.000
Social Participation	0.341	0.319	2.731	0.000
Level of education	0.193	0.338	3.901	0.000
Income	0.213	0.561	3.908	0.000
Extension activity	0.301	0.490	2.009	0.000

$R^2 = 0.381$, $Y = 2.561 + 0.171X_1 + 0.341X_2 + 0.193X_3 + 0.213X_4 + 0.301X_5$.

increasing crop yield for a long time. Hoddle (2004) noted that farmers may adopt biological control practices if they result in reduced costs for agrichemicals, labor and specialized equipment.

According to the results, 60% of respondents agreed that biological control is economically feasible. Cullen et al (2008) noted that farmers must perceive biological pest control innovations to have economic advantages at an acceptable level of risk when compared to the relatively simple conventional agrichemical control methods. Thekey finding of this study is that biological control innovations must be developed in a manner which gives consideration to the realities at the farm level.

Based on the results, farmers have a favorable attitude toward biological control of the pest. According to the obtained relationship between variables, extension and education classes should be in the field of biological control to be held. Emphasis on training needs must be considered. Necessary background to develop technical knowledge and skills of farmers should be provided. Considering the devastating impact of chemical pesticides and due to favorable attitudes towards biological control, there have been a wide efforts in its dissemination in order to provide healthy living conditions.

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