International Journal of Agricultural Extension and Rural Development Studies

Vol.3, No.5, pp.1-9, October 2016

Published by European Centre for Research Training and Development UK (www.eajournals.org)

LEVEL APPLICATION OF CULTIVATORS FOR SCIENTIFIC RECOMMENDATIONS TO CONTROL TOMATO LEAF MINER, TUTA ABSOLUTA

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ABSTRACT. *The research aimed to determine level of application among growers for scientific Recommendations to control tomato leaf miner, Tuta absoluta in Rabiaa District generally, identify the relationship between the level of application and independent variables. The research included (94) growers, which they were selected randomly, and they represent (50%) of the total population (188) growers. Data collected by interview using a questionnaire method. The Data were analyzed for: means, frequencies, weighted percentage and spearman-rank correlation. The research revealed that the level of application was medium-low. The results showed that there was a significant relationship between level of application and each of fallowing variables (age, level of education, years of work in agriculture and annual income), Also the results showed that there were no significant relationship between level of application and each of fallowing variables (type of tenure, agricultural cultivated area, agricultural information sources).*

KEYWORDS: Level Application, Tuta Absoluta, Tomato

INTRODUCTION

Tomato is the second most important vegetable crop after potato in the world and Tuta absoluta related threat to world tomato production has drastically increased since 2006 (Desneux et al. 2011). Tomato crops are normally attacked by a variety of insects including the tomato leafminer. Tuta absoluta (Meyrick) are considered the most important tomato pest (Medeiros et al. 2005) in the South American. Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae) is an important pest, native to South America it courses a significant damage to tomato plants, both in the greenhouse and open fields (Gabarra et al. 2014).The larvae of Tuta absoluta feed on the mesophyll of leaves, stems, shoots, flowers and bore into tomato fruits, thus reducing yield and producing cosmetic damage to fresh market tomato (Le et al. 2014). In no control cases, the crop losses my reach up to 100% (Gabarra et al. 2014). This pest also attacks various plants as secondary hosts such as potato (Solanum tuberosum L.), sweet pepper (S. muricatum L.), eggplant (S. melongena L.) and various wild Solanaceous plants (Siqueira et al. 2000). The insect was able to spread out very quickly into different countries, such as Algeria, France, Italy, Morocco, Tunisia, Albania, Bulgaria, Cyprus, Germany, Malta, Portugal, Switzerland, The Netherlands and the United Kingdom (Desneux et al. 2010; Anonimous 2010).The pest has a high reproductive potential, with up to 12 generations per year and a female laying approximately 260 eggs during its life cycle (De Vis et al. 2001).The four larvae instars live in tunnels in the inner leaf where they feed and develop. Pupae are principally found in the ground but may also occur on the tomato plant. Female longevity is

between 10 and 22 days. The species needs 29–38 days to complete its life cycle, depending on temperature (Urbaneja et al. 2007). The tomato leaf miner Tuta absoluta was first reported in Iraq by (Razzak et al. 2010). The pest was found near Rabiaa, Nineveh Province northern part of Iraq, neighboring Syria, during autumn, 2010, on tomato. This newly introduced pest spread rapidly throughout the tomato growing areas in greenhouses and open field and is now well established in Iraq (Abdul-Rassoul 2014). In Iraq the tomato crops are grown to extensive areas of high nutritional value compared to other types of crops (ALbahash, Abdulla 2006). In Nineveh the area were tomato crop planted on in 2010 was about 39,66 donam*, which represents 39.89% of the total area as in 2011 amounted tomato crop acreage about 44 917 donam which is the first crop of vegetable crops in terms of area (Directorate of Agriculture Nineveh, planning Section, 2011) (AL-taie 2012) and led to the loss of hundreds of millions of Iraqi dinars in 2011 for growers who ruled the insect on their crops total elimination, and the farmers who worked on the sprayed and set pheromone traps have spent large sums of up to 1 250 000 dinars per donam and did not get what they did before the infestation as the percentage of loss in yield of tomato in half as male specialists in plant protection in people three agricultural in 2011 spread the insect in all regions of the province of Nineveh (Directorate of Agriculture of Nineveh, the Planning Section, 2012) (AL-taie 2012). And for this reason, this study aimed to:

1- determine level of application among growers for scientific recommendations to control tomato leaf miner, *Tuta absoluta* in Rabiaa District (Nineveh Governorate).
2- Rank order of the aspects scale of the scientific recommendations to control tomato leafminer *Tuta absoluta*.
3-Rank order of the items the scale according to Mean.
4- identify the relationship between the level of application for scientific recommendations to control tomato leafminer *Tuta absoluta* and each of the independent variables of growers (age, level of education, type of tenure, annual income, years of work in agriculture, agricultural cultivated area, and agricultural information sources).

MATERIALS AND METHODS

50% (94 growers) of the total growers (188 growers) in Rabiaa District were randomly selected for the purpose of this study. Data were collected through questionnaire, which consisted of two parts. The first part included the independent variables, while the second part included scale to measure scientific recommendations adoption among local growers to control tomato leafminer, *Tuta absoluta*. Level of education included 7 levels the following: illiterate (1), read and write (2), graduate of an elementary education (3), graduate of a secondary (5), graduate of the Institute (6), graduate of college (7) certificate highest. Sources of agricultural information has been measured through (10) the sources of agricultural information and alternatives included the following indicators (often, sometimes, and do not use they were) given numeric codes (1, 2, 3 respectively). The second part were included scientific recommendations to control tomato leafminer has given one point if no application were used. Two points were given if the scientific recommendations applied at low level. Three points were given if the scientific recommendation applied at medium level. Four points were given if the scientific recommendations were applied at a high scale. Data were collected in the period between Feb to April 2013. The original data set included 41 paragraphs and the data were measured for validity and quality by specialist at the

Agricultural Extension Department and Horticulture and Landscaping Sciences Department, Based on the evaluation process, three of the paragraphs were removed. Also, 30 questionnaires were excluded after determining the data consistency (total reliability coefficient was 0.82) (Pallant 2005).

RESULTS AND DISCUSSIONS

Level of application among growers for scientific recommendations to control tomato leafminer, *Tuta absoluta* in Rabiaa District / Nineveh Governorate:

The results showed that the highest value to level of scientific recommendations application of for farmers were 152 numeric values and the lowest was 38 with an average of (68.41) with a standard deviation of (4.63) The growers were divided into three categories according to the level of implementation of the scientific recommendations. The first category was for the lowest level of the application (less than 75), with a mean (29.78%) and The second category at the application level average ranged between (76-113), with a mean of (56.40%) the Third category representing the high application-level (114 and more) with a mean of (13.82%) and this shows that the level of application of the farmers is the medium tends to low, as in the table 1.

Table 1: Level of application cultivators for recommendations scientific to control tomato leafminer, *Tuta absoluta* in Rabiaa District / Nineveh Governorate

%	Frequency	Level of application categories
29.78	28	Low (Less than 75)
56.40	53	Medium (113-76)
13.82	13	High (more than 114)
100.00	94	total

s.d = 4.63 =68.41 x

The Rank order of the aspects scale the recommendations scientific to control tomato leafminer, *Tuta absoluta*

The results in table 2. indicate that the level of application of the respondents in the aspect of the Insect life cycle was the highest with an average of (2.68%) and this demonstrates the possession of respondents, information and knowledge, This result might be due to the participation of many extension activities such as training courses, workshops and field days, while the aspect of Insect classification and its infection, respectively, and the lowest with an average of (2.21%) and this refers to the difficulty of diagnosing the symptoms and the infection because of its similarity with many other plant diseases (table 2).

Table 2: The rank order of the aspects control tomato leafminer, *Tuta absoluta*

Weighted percentage	The rank over	Mean	The aspects
67.00	1	2.68	aspect of Insect life cycle
66.50	2	2.66	aspect of Insect eradication/control
61.50	3	2.46	aspect of Protection from the insect
58.75	4	2.35	aspect of Type of damages the insect causes
55.25	5	2.21	aspect of Insect classification and its infection

Maximum score = 4 (*)

The rank order of the items the scale according to Mean

Table 3 shows the mean of items used in scale level of application the scientific recommendations to control tomato leafminer. and In order to give priority to the items related to level of application of respondents, coefficient of variation(CV) was used. Based on the results given in Table 3 the items " I use pesticides when the number of insects reach 10 and more/trap", " I repeat the pesticide application within two weeks ", and " I use phosphorus and pyrethrum pesticides to control the insect ", were given a ranking of 1, 2 and 3, respectively.

From the first three items it can be said that most of the respondents were use of the pesticides in order to control the insect in their farm, This may be due to increased amounts of pesticides used by farmers Regardless of the type of pesticides used in the search region as a result of ownership the farmers a large agricultural areas suitable for growing tomato crop. Also, results in Table 3 indicated that the low priority assigned to the items (I remove the extra branches and destroy them) and (I remove weeds from the field) This may be due to a lack of farmers knowledge on the benefits and importance of remove the extra branches and remove weeds or a lack of farmers knowledge on how application it in their farm.

Table 3: Rank order of the items in each aspect According to the Mean

No	The items	Mean	C.V	Rank order
1	I use pesticides when the number of insects reach 10 and more/trap	3.72	0.238	1
2	I repeat the pesticide application within two weeks	3.70	0.239	2
3	I use phosphorus and pyrethrum pesticides to control the insect	3.67	0.257	4
4	The insect produces 250-260 eggs each time	3.67	0.391	4
5	The insect hides between the leaves during daytimes	3.67	0.399	4
6	The insect complete its life cycle between 30-45 days	3.66	0.411	6
7	I use very fine nets to stop the insect from entering the greenhouse	3.64	0.424	7
8	The number of holes/window is 9 X 6/cm^2	3.60	0.486	8
9	I recognize the insect on the terminal buds	3.57	0.511	9
10	I recognize the insect through its feces on the plant	3.56	0.518	10
11	The insect penetrate the plant from the fruit base	3.54	0.522	11
12	I place 1 pheromone trap/greenhouse for monitoring	3.51	0.529	12
13	I place 4-5 pheromone traps/Hectare for monitoring	3.48	0.535	13
14	I use 2-3 water trap/hectare for monitoring	3.44	0.539	14
15	I place 1 pheromone trap/5 Donum to control the insects	3.39	0.550	15
16	I replace the pheromone traps capsules each 4-6 weeks.	3.38	0.559	16
17	I destroy the infected leaves and fruits immediately	3.36	0.566	17
18	I alternate the use of chemical pesticides to avoid increase resistance by the insect	3.33	0.574	19.5
19	The flies are active during night times	3.33	0.577	19.5
20	I make sure to use free of infection plants and seedlings	3.33	0.581	19.5
21	The insect doesn't go through dormancy in case of food availability.	3.33	0.589	19.5
22	I don't plant the Solanaceae family crops in the same location every year.	3.30	0.596	22
23	I grow crops that's resistant/tolerant to the insect	3.27	0.611	23
24	I plow the field to destroy the winter dormant phase of the insect	3.23	0.622	24
25	I use moderate irrigation methods.	3.21	0.633	25
26	The insect feeds on the middle layer of the leaves, causing white coloring of leaves	3.20	0.639	26
27	It infects all plants of the Solanaceae family	3.17	0.649	27
28	It causes irregular tunnels in the leaves	3.15	0.657	28
29	It causes yield damages between 80-100%	3.11	0.680	30
30	It feeds on all the plant parts	3.11	0.691	30
31	It causes many other infections to the plants	3.11	0.695	30
32	Recognize the insect eggs cylinder shape and creamy yellowish color	3.09	0.710	32
33	I find the insect eggs on the lower surface of the leaves	3.06	0.716	34
34	I recognize the creamy color with black head of the young insect	3.06	0.727	34
35	Mature insects length between 5-7 millimeter	3.06	0.739	34
36	The insect reproduce between 10-12 generations per year	3.72	0.238	36
37	I remove the extra branches and destroy them	3.70	0.239	37
38	I remove weeds from the field	3.67	0.257	38

Identify the relationship between the level of application among growers for scientific recommendations to control tomato leafminer, *Tuta absoluta* with each of the independent variables

1. Age: the results in table (4) indicates that's the higher age among the respondents was (58) years and lower age among the respondents was (22), The distribution of respondents

into categories, found that the percentage of the category (34-22) years was (30.86%) and the percentage of the category (46-35) years was (51.06%), while the percentage of the category (58-47) years was (18:08%) The previous results refer to the high percentage of young participant among the farmers and lower the elderly Spearman correlation coefficient was 0.19 (at 0.05 probabilities) for the relationship between the age of the participant and their application for the scientific recommendations.

2. Level of education: The distribution of respondents into categories based on their education level is shown in table (4) The percentage of illiterate reached (6.38%) read and write was (9.57%), graduates of primary and secondary, school was (11.70%) and (17.02%), respectively. The percentage of respondents who have a certificate of an institute and higher education was (25.55%) and (23.40%) respectively The percentage of participant who have a graduate degree was (6.38%) The spearman correlation coefficient was 0.172 (at 0.05 probabilities) between the level of application of the Scientific recommendations among farmers and the level of education.
3. Type of tenure: the results in table (4) indicate that the percentage of respondents who own land was (24.46%) and those who rent the land reached (21.29%) while the participation was (23.40%) The percentage of respondents who with a type of possession of the land contracts were (30.85%) The Spearman correlation coefficient was 0.042 between, the level of application of the scientific recommendations among farmers and type of tenure the correlation was insignificant, which indicates that this type of acquisition has no effect on the application level.
4. Annual Income: Distribution of the respondents into categories based on their annual income is shown in the table (4) that the highest percentage of the respondents fall within the medium category (58.51%) High income category percentage was (23.40%), while the percentage of the low income category was (18.09%). The results show that the annual income for farmers is relatively good. Spearman correlation coefficient between the level of application among farmers for the scientific recommendations and their annual income was (0.190) at a 0.05 probability level.
5. Years of work in agriculture: table (4) shows that the percentage of respondents who have a number of years of work in agriculture between (4-16 years) was (23.40%) and the percentage of respondents who work for (17-29 years) was (36.18%), while the percentage of respondents who work in agriculture for (30-42 years) was (40.42%), The results show that three-quarters of the respondents were working in agriculture for long period of time. Spearman correlation coefficient for the level of application among the farmers for the scientific recommendations and years of work in agriculture was 0.179 at 0.05 probability level. The correlation value here indicates that the increase in the number of years of work in agriculture have a significant impact on the accumulation of experience related to the agricultural practices and may raise their adoption of the scientific recommendations.
6. Agricultural cultivated area: Table (4) shows that the highest percentage of respondents who have an area of land between (32-56 acres) was (43.61%) and the percentage of respondents who have an area of land between (7.31 acres) was (29.78%), while the percentage of respondents who have an area of land between (57-81 acres) was (26.61%), The Spearman correlation coefficient between the level of application of the scientific recommendations among farmers and cultivated land was (0.124).
7. Agricultural cultivated area: Table (4) shows that the highest percentage of respondents who have an area of land between (32-56 acres) was (43.61%) and the percentage of respondents who have an area of land between (7.31 acres) was (29.78%), while the percentage of respondents who have an area of land between (57-81 acres) was

(26.61%), The Spearman correlation coefficient between the level of application of the scientific recommendations among farmers and cultivated land was (0.124).

8. Agricultural information sources : The results presented in table (4) expressed that the highest numeric value to agricultural information sources was 30 and the lowest value was 10, The distribution of the respondents according to the categories of sources of agricultural information showing that the respondents who fall within the low category were making the highest percentage (44.68%), while the percentage of farmers in the category of medium level were (35.10 %), and the percentage of high-level reached (20.22%). To find the relationship between the level of application among farmers for the scientific recommendations and agricultural information sources used correlation coefficient of Spearman and amounted to (0.098), The insignificant value might be due to the insufficient information that were provided for the farmers regarding the control of these insects.

Table 4. The correlation between some variables and level of application cultivators

The significance	Rs Value	%	Frequency	The variables
Age				
**	0.308	30.86	29	Year (34-22)
		51.06	48	Year (46-35)
		18.08	17	Year (58-47)
Level of education				
**	0.172	6.38	6	illiterate
		9.57	9*	Read and write
		11.70	11	Primary school
		17.02	16	Secondary school
		25.55	24	Institute
		23.40	22	College
		6.38	**6**	High certificate
Type of tenure				
Not significant	0,042	24.46	23	Owned
		21.29	20	Rented
		30.85	29	Contract
		23.40	22	Participation
Annual income				
*	0.190	18.09	17	million (4.5-2) dinars
		58.51	55	million (7.5-5) dinars
		23.40	22	million (10.5-8) dinars
Years of work in agriculture				
*	0.179	23.40	22	year (16-4)
		36.18	34	year (29-17)
		40.42	38	year (42-30)
Agricultural cultivated area				
Not significant	0.124	29.78	28	Donum (31-7)
		43.61	41	Donum (56-32)
		26.61	25	Donum (42-30)
Agricultural information sources				
Not significant	0.098	44.68	42	Low (16-10)
		35.10	33	Medium (23-17)
		20.22	19	High (30-24)

* Indicates that the value of morale at the level (0.05).
** Indicates that the value of morale at the level (0.01)

CONCLUSIONS

1. Level of application among farmers for scientific recommendations to control tomato leafminer, *Tuta absoluta* is the medium tends to low may be due to the newness of the insect in the search area.
2. The farmers possess the knowledge and skills in the aspect of the life cycle of the insect more than the rest of other aspects.
3. There was a significant relationship between level of application among farmers for scientific recommendations to control tomato leafminer, *Tuta absoluta* with some variables (age, level of education, annual income and years of work in agriculture), while there was no significant relationship between level of application among farmers for the scientific recommendations to control tomato leafminer, *Tuta absoluta* and variables (type of tenure, agricultural cultivated area and agricultural information sources).

RECOMMENDATIONS

1. There is a need for more workshops, fields days, and training courses for farmers regarding leafminer and *Tuta absoluta* insects to avoid the risk of yield loss.
2. The Department of Agriculture in Nineveh Province needs to increase knowledge and awareness among the local farmers by using the media (video and audio) channels regarding leafminer, *Tuta absoluta*.

REFERENCES

ALbahash N., Abdulla A. (2006). Information and guidance on the production of tomato (2006). Iraqi Agriculture Magazine 1, 16.

Anonimous. (2010). European and Mediterranean Plant Protection Organization (EPPO) 2010. Archives of the EPPO Reporting Service. http://archives.eppo.org/EPPO/Reporting/Reporting_Archives. html. Accessed 1 Aug 2012.

De Vis R., Fuentes L., Escobar H., Lee R. (2001). Manejo integrado de plagas Enfermedades? En: Produccio´n de Tomate bajo Invernadero. Capı´tulo 5. Universidad de Bogota´ Jorge Tadeo Lozano, CIAA, Colciencias, Bogota´, 59–90.

Desneux N., Luna M.G., Guillemaud T., Urbaneja A. (2011). The invasive South American tomato pinworm, *Tuta absoluta*, continues to spread in Afro-Eurasia and beyond: the new threat to tomato world production. J. Pest . Sci. 84, 403–408.

Desneux N., Wajnberg E., Wyckhuys K.A.G., Burgio G., Arpaia S., Narva´ez-Va´squez C.A., Gonza´lez-Cabrera J., Ruescas D.C., Tabone E., Frandon J., Pizzol J., Poncet C., Cabello T., Urbaneja A. (2010). Biological invasion of European tomato crops by *Tuta absoluta*: ecology, history of invasion and prospects for biological control. J. Pest. Sci. 83, 197–215.

Gabarra R., Arno´ J., Lara L., Verdu´ J.M., Ribes A., Beitia F., Urbaneja A., Te´llez M.M., Molla´ O., Riudavets J. (2014). Native parasitoids associated with *Tuta absoluta* in the tomato production areas of the Spanish Mediterranean Coast. BioControl 59, 45–54.

Lee M.S., Albajest R., Eizaguirre M.A. (2014). Mating behavior of female *Tuta absoluta* (*Lepidoptera: Gelechiidae*): polyandry increases reproductive output. J. Pest. Sci., http:/www……., 1-11, DOI: 10.1007/10340-014-0576-4.

Medeiros M.A., Villas Boas G.L., Carrijo O.A., Makishima N., Vilela N.J. (2005). Manejo integrado da traça-do-tomateiro em ambiente protegido. Embrapa hortaliças, Circular Técnica 36, 10.

Mohajan H.K., Islam J.N., Moolio P.(2013). Optimization and social welfare in economics. Indus Journal of Management and Social Sciences

Mohammad. S., Abdul-Rassoul Mohammad S. (2014). A new host record for tomato leaf miner *Tuta absoluta* (Meyrick, 1917) in Baghdad province, Iraq. Bull. Iraq Nat. Hist. Mus. 13 (1), 15-18.

Pallant J. (2005). SPSS survival manual a step by step guide to data analysis using SPSS for Windows (Version 12), 130-132.

Razzak A., Al-Yasiri A.S., I.I., Fadhil, H.Q. (2010). First record of tomato borer (tomato moth) *Tuta absoluta* (Meyrick) (*Lepidoptera: Gelechiidae*) on tomato crop in Iraq. Arab and Near East Plant Protection Newsletter 51, 31.

AL-taie S.K.G.(2012). The knowledge level of tomato farmers in field of protection from tomato *Tuta absoluta* (Meyrick) insect/ Nineveh province. University of Mosul College Agriculture and Forestry in Agricultural Extension. Master work, Mosul, 1-3**.**

Siqueira H.A., Guedes R.N., Picanco M.C. (2000). Insecticide resistance in populations of *Tuta absoluta* (*Lepidoptera: Gelechiidae*). Agric. For. Entomol. 2, 147–153.

Urbaneja A., Vercher R., Navarro V., Porcuna J.L., Garcı´a M.F. (2007). La polilla del tomate, *Tuta absoluta*. Phytoma Espan˜a 194, 16–23.