Plant Archives Vol. 19 No. 1, 2019 pp. 1511-1514 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF THE WATER EXTRACT OF THE *CAPSICUM ANNUUM* AND THE INSECTICIDE (RELDDAN) IN SOME ASPECTS OF THE LIFE OF THE *TUTA ABSOLUTA*

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Abstract

The study included the study of the effect of both the water extract of *Capsicum annuum*ers and the insecticide on some aspects of the life of the matrix *T. absoluta*, As a result of the destructive damage caused by this pest to the tomato crop in Iraq, three concentrations were used for both the pepper extract and the insecticide (1, 2 and 4), and studied the effect of these concentrations on egg hatching and the highest rate of hatching suppression 96.7% when using the pepper extract at a concentration of 4% and after 24 hours of laying eggs, Followed by the use of the insecticide, which gave the hatching of the hatchery by 73.7% at the same concentration and the age of the eggs. The rate of inhibition decreased significantly at the age of 72 hours and at the same concentration and treatments to 73.7 and 70.0% for the extracts and insecticide treatments respectively. The effect of the extract and the insecticide was significant, with the highest mortality rate of 67.6% at 4% concentration followed by the use of an insecticide, which gave 61.4% at the same concentration. The duration of larval role in the treatment of the pesticide was 31.0 days at the same concentration and decreased to 28.6 days in the treatment extract at the same concentration.

Key words : *Capsicum annum*, *Tuta absoluta*, insecticide, pesticide, pepper extract.

Introduction

The *Lycopersicon esculantum* (Mill) was first produced in southern Mexico and spread to Europe after the exploratory expeditions of the American and European continents. It was cultivated in East and South Asia and then into the Middle East and Africa (Smith, 1994). The fruits of this tomato are consumed in different ways and can be eaten fresh without additives, as well as the entry of a key component in a number of food dishes, sauces and drinks, the plant is infected with many diseases and insect at all stages of development, which leads to a significant reduction in production and quality. The most important insects that affect the tomato and cause significant losses in quantity and quality in Iraq. It has many labels as the English label tomato borer. The pest has caused losses of up to 100% in some tomato farms in Brazil due to its high reproductive capacity. The adult female can put 250-300 eggs during her lifetime. The pest has 10-12 g/year at 30°C (EPPO, 2005) and has a high destructive ability due to its damage to the crop as it attacks the parts of the plant at all stages of its growth (Marchiori *et al*., 2004). The identification of the main life characteristics of the pest helps to develop effective methods to combat it, and due to the lack of studies related to this insect because of its recent entry into Iraq, which was first recorded in Iraq in 2010 (Abdul Razzak, 2010). The study examined the effect of both the water extract and the insecticide in some aspects of life of the insect, which included percentages of inhibition of egg hatching, percentage of larval killing and duration of the role larvae.

Materials and Methods

Source of the pest and method of breeding laboratory

The larval stages of the *T. absoluta* were obtained from the greenhouses belonging to the College of Agriculture/Al-Muthanna University and the planted with

the tomato crop for 2017, collected from infected plants and soil around them. The larvae were transferred to the laboratory for the purpose of breeding and obtaining the roles of the various lesions. They were placed in glass dishes 19 cm wide and 4 cm high. They were fed on the leaves of the young tomato plant and the dishes were covered with cloth to prevent larvae leaving. After completion, all 10 virgins were transferred to plastic containers 16 cm in diameter and 30 cm high. They represent breeding cages at the onset of adult age. Cages were provided with a cotton cloth saturated with a 20% sugar solution for the purpose of feeding adults and stimulating eggs.Black and green stripes were also placed in mating cages for the purpose of laying eggs on them by adult females and cages were covered with top-of-the-line. Adult insects were monitored daily and adult diets every 48 hours to prevent the growth of fungi. The eggs were transferred to new dishes and after hatching, larvae were transferred to other new dishes and reared in the previous manner in Binder incubators at 25 ± 2°C, 65 ± 5% relative humidity, 16 hours light and 8 hours darkness.

Preparation of water extract

Prepare the water extract by using the continuous solvent (Soxhlet). Pour 50 g of peppercorn powder and put in a 24 cm diameter filter paper, folded cone and placed in a 1000 mL glass flask, 400-300 ml of distilled water was added and left for 24 hours. The extraction was performed for 6 hours to remove the solvent by rotary evaporator with Vacuum. Rotation speed 100 cycles/min at 40°C Collect the extract and place in sealed glass containers and keep frozen until use.

Concentrations preparation

The concentrations of 1, 2 and 4% of the water extract of pepper and insecticide (DuPont reeldan and commercial names Indoxacarb Insecticide belong to Oxadiazine group were obtained by a stock solution) that took 5 g of extract, 1 ml of pesticide and 95 ml distilled water separately.

Treatment of eggs of the pest

Black and green stripes were placed inside the cage and after the white eggs were placed on them, these strips containing eggs were taken at the age of 24 and 72 hours and were transferred to glass dishes 9 cm in diameter on a filter paper and 100 eggs per dish and three replicates per concentration. The eggs were treated directly with the micropipette with 1/4 ml of each dish and then left to dry. The comparison treatment was sprayed with 4/1 ml of distilled water. The dishes were covered with cloth and bound with a rubber band to prevent the larvae from leaving. By calculating the number of eggs exceeded to the total number in each dish and corrected hatching rate using the Abbott equation (1925).

Treatment of larvae

Isolated 30 larvae and they were treated with 5 µl / larvae of the above concentrations for each extract and insecticide separately. The comparison treatment was treated with distilled water only, The larvae were treated separately using a Micropipette. Five micro liters were placed in the chest area of the larvae. The larvae were treated to dishes with tomato leaves for feeding and the dishes were covered with cloth. Corrected the percentage of death based on the Abbott equation (1925).

Treatment of larval food

The leaves of the tomato plant were sprayed with the previously mentioned concentrations of both extract and insecticide separately and left to dry for the purpose of feeding late larval larvae while the comparison treatment was sprayed with distilled water only. Two larvae were treated separately after larvae were collected for treatment. They were left without food for at least 6 hours. The larvae were then fed to the treated plant leaves for 24 hours (temporary exposure treatment) and were then fed with untreated plant leaves until impossible, In the second treatment, the larvae were fed on continuously treated plant leaves (treatment of continuous exposure) until it was impossible. By changing the food daily, each treatment was repeated three times at a rate of 10 larvae per repeater and each concentration. The percentage of larval death was recorded and corrected based on the Abbott equation (1925).

Results and Discussion

Effect of Pepper extract and insecticide in *Tuta absoluta* eggs

The results of the statistical analysis in table 1 showed that the age of eggs treated with different concentrations of pepper extract and insecticide had an effect on the percentage of egg hatching, which was directly proportional to the concentrations used and vice versa with the age of the eggs treated as 24-hour eggs were more affected by the extract from the eggs at the age of 72 hours with a rate of inhibition of 96.7 and 73.7% for both ages respectively, as well as treatment with insecticide where gave the highest rate of inhibition hatching, which reached 93.0 and 70.0%, respectively.

It may be attributed to the inhibition of the ratio of eggs hatching in the treatment of pepper extract to the oils in the extract, which is the effect of the formation of

Table 1 : Effect of different concentrations of pepper extract and Insecticide in Percentage of Inhibition of Egg Hatching *Tuta absoluta*.

Hatching percentages			Treatment	Age of eggs
Concentrations				
4 %	2 %	1 %		
96.7	87.7	77.7	Pepper Extract	24 Hours
93.0	80.0	69.7	Insecticide	
73.7	61.0	46.4	Pepper Extract	72 Hours
70.0	54.4	39.7	Insecticide	
75.4	60.4	44.7	mean	
85.72	72.46	59.92	Mean of consternation	
3.61			4.44	L.S.D 0.05

Table 2 : Effect of different concentrations of pepper extract and insecticide in percentage of larvae killing *Tuta absoluta*.

Mean of extract	The percentage of killing			Treatment	Role
	Concentrations				
	4 %	2 %	1 %		
59.2	67.6	59.7	50.2	Pepper Extract	Larval
39.0	61.4	32.4	23.3	Insecticide	
49.1	64.5	46.0	36.7	mean	
7.3	5.52			9.63	L.S.D 0.05

Table 3 : Effect of different concentrations of pepper extract and insecticide in the duration of larval role *Tuta absoluta*.

Mean of extract	The percentage of killing			Treatment	Role
	Concentrations				
	4 %	2 %	1 %		
27.5	28.6	28.3	28.0	Pepper Extract	Larval
28.6	31.0	29.3	29.0	Insecticide	
28.0	29.8	28.8	28.5	mean	
0.7	0.29			9.63	L.S.D 0.05

a thin layer around the egg prevents the exchange of gases and thus lead to the fetal choking or cause deformation in the eggshell as well as the penetration through the opening hole causing poisoning and death Pre-hatching embryos Older eggs are more resistant to plant extracts due to fetal maturity, which hinders the entry of external products (Abd El-Aziz and Ezz El Din, 2007), these results correspond to El-Hosary (2007) that cotton leaf worm eggs were more susceptible to treatment with plant extracts and found that the acetone extract of the pansyana seeds and the petroleum ether extract of mustard and pansyana seeds had the most effect in reducing the newly hatched egg hatch as it reached 0% followed by eggs at the age of 24, 48 and 72 hours, as for the pesticide, it may be attributed to the inhibition of egg hatching to Oxadiazine, a toxic compound that kills the fetus inside the egg by affecting the vital enzymes responsible for embryonic development and growth (Tavares *et al*., 2011).

Effect of different concentrations of pepper extract and insecticide in the percentage of killing *Tuta absoluta* larvae

The results of table 2 shows that the type of treatment and concentrations used have a clear and significant effect on the rate of killing of *Tuta absoluta* larvae. The overall mortality rate of larvae was 49.1%, where the concentration caused the highest percentage of larvae killing at 67.6% and 61.4% larvae when treated with pepper extract and insecticide, respectively.

The results of the statistical analysis showed that there were significant differences between the percentage of larval larvae for the different concentrations used for peppers extract and insecticide. The same table indicated that the highest percentage of larval killing was when using the water extract of the pepper and the concentration of 4% followed by the use of the insecticide which gave the highest rate To kill the larvae when using the same concentration.

The cause of the effect of the pepper extract may be attributed to the different types of chemical groups contained in the extract and the method of effect and work of each compound within the body of the insect, Where pepper contains a number of compounds piperidine and pyrrolidine amides and that piperine is the most abundant amides and high concentrations, which kill many insects, especially in the larvae because it contains the methylene dioxy phenyl (MDP) in the molecular structure of the amides in the peppers are active High against many insects (Scott *et al*., 2003). As for the insecticide, the effect of the deadly effect of the *Tuta absoluta* larvae may be due to the inhibition of the group of oxidation enzymes inside the insect and thus the activation of the enzyme Runnerase inhibitor, as well as the effect on the outer surface of the insect by reducing the thickness of the layer of the cattle and thus the active substance poisoning the cells lining the lining of the channel. The

central digestive tract of the insect on toxic compounds, and the effect of these cells on the secretion of digestive enzymes that remove the toxic compounds, leading to the death of the insect (Fan *et al*., 2011). Gladys *et al*. (2012) showed a positive relationship between the concentration used and the time of treatment and the percentage of third-stage larvae of *Spodoptera frugiperda* treated superficially when using the ethyl and methyl extract of *Piper tuberculatum* implanted in the laboratory with 90% mortality after 24 hours of treatment with extract Methanol, while 100% of the ethanol extract after 72 hours of treatment was 0.185 mg/microliter.

Effect of different concentrations of pepper extract and insecticide in the duration of larval role in *Tuta absoluta*

The results of table 3 showed that the surface treatment with pepper extract and insecticide resulted in a longer period of growth of the larvae. The larval growth rate was 27.5 days and 28.6 days. There was a significant increase in the duration of the larval stage, and with the increase of the concentration of the extract or the insecticide. The larvae was the longest growing period when treated with insecticide at a concentration of 4%. The duration of larval role was 31.0 days, followed by pepper extract and 28.6%, which averaged 28.6 days.

The reason for the increase in larval role may be due to flavonoids. Mesbah *et al*. (2007) pointed to the role of plant flavonoids, which are found in many plant extracts, and their effect on the behavior of the tamarind fossils represented by the increase in their growth and development. Secondary levels in pepper extracts to contain flavonoids (Nahak and Sahu, 2011). Fagoonee (1981) and Lauge (1981) explained that the surface treatment with methanolic extract of neem led to lengthening in the growth period of *Crocidolomia binotalis* larvae, as is the case with the use of insecticide at a high rate which increased the duration of larval role and may be due to the active substance in the pesticide may work In the effect on enzymes and growth hormones and thus negatively affected the growth of larvae Thus increasing the duration of the larval role, while these results differ from those of Fan *et al.* (2011) by limiting the growth and development of the second phase larvae of the *Spodoptera litura* when using the black hexane extract for black pepper with a growth duration of 14.5 days while in the comparison treatment 16 days.

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