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Estimation insecticidal action of Abamectin and Neem oil against Tuta Absoluta insect (Lepidoptera: Glechiidaee)

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ABSTRACT: *Tuta absoluta* insect is one of the pests that has spread recently as a major pest for many species of the nightshade family especially the tomato crop, as it was recorded as an imported pest in Iraq in 2009. The harmful role of this insect is the larvae, as the larvae work mines as a result of their feeding on the mesophyll layer in the crop leaves, which affects the process of photosynthesis, in addition to the holes they make in the stems and fruits, which quickly become infected with mold as a result of the action of pathogens. Based on the above, this experiment was conducted to demonstrate the effectiveness of some biological control elements in management the tomato leaf miner *T. absoluta*, which may have an important role in reducing its spread. Laboratory bio-control tests indicated that significant difference among the treatments compared to control for all used pesticides concentrations and all-time durations also biocide abamectin was superior to the botaincal insecticide neem oil in mortality rates. Results showed that the relative effectiveness of pesticides increased with the increase in the concentration used for all pesticides, the highest mortality rates were at high concentrations of both pesticides used in the experiment also increased with increasing time period, larvae mortality at a concentration of 10% for neem oil was 68.55, and the larvae mortality at 0.50 concentration of abamectin was 67.50 after 24 hours of treatment, and this percentage began to increase until it reached (90% and 94.50%) for (neem oil and abamectin) respectively after 72 hours of treatment.

Keywords: Abamectin, neem oil, botanical insecticides, *Tuta*

1. INTRODUCTION

Tuta absoluta is considered one of invasive and dangerous pest of tomato crops in field and greenhouses due to speed of its spread and reproduction (1,2,3,4,5). young larva it grows through leaves, stems, tips, flowers, and immature fruits, producing obvious mines and galleries. Adult instars can also eat mature fruit. As the larvae increase in size, the mines and galleries also expand accordingly which causes damage to the process of photosynthesis, in addition to the fact that these mines are a favorite place for plant pathogens, all of these direct and indirect damages of the pest, as a whole cause serious damage to the tomato crop and thus are reflected in the quality of the crop (4).

According to the last studies, tomato crop invasion rate with *T.absoluta* increased from 3% to 60% over the worldwide (6,5).Therefore, yields can be reduced by more than 90% (7), and losses of 100% can occur if effective control methods are not used (8, 6, 5). Research on botanical insecticides has been conducted for many years and has been proven to not only reduce the negative effects of synthetic insecticides but also exhibit high performance in pest control (9, 16).

Coincidentally, various plants contain compounds with insecticidal properties, which can be utilized to manage various pests (9, 10; 16).Use of plants,in particular, neem azadirachta indica, consisting of azadirachtin, a complex of tetranortriterpenoids, showed efficacy as an toxic , anti-feedant, repellent without developing resistance. (11, 12,16). The increase in the risks of using chemical pesticides and their remaining impact on food and the environment, in addition to their harmful effect on natural enemies, useful animals,humans and other organisms, and the cost of their price and the emergence of strains resistant of pests to the pesticides, make investigating the toxicological efficacy of some biological agents, such as the pesticide abamectin and neem oil, a matter of great importance and the main goal of this experiment.

2. MATERIALS AND METHODS

2-1 Laboratory evaluation of the effectiveness of insecticides against *T. absoluta l*arvae

The leaves of infected tomato plants were collected and placed in plastic bags and transported to examine it under a microscope and detect insect larvae. After confirming the presence of the larvae in the mine inside the leaf by viewing and using a magnifying glass with a light source placed behind the mine, the mine is cut with an area un eaten from the leaf along the perimeter of the mine so that the larvae do not emerge and so that they feed on the uneaten area during the period of taking the readings using scissors that are sterilized every time you cut a leaf, after which 10 larvae (10 pieces of tomatoes leaves) were placed (each piece containing one larvae) in a petri dish with a filter paper inside (13).And use cotton moisten it with water and place it on the leaves to prevent the leaves from drying out and wilting. Then sprayed with insecticide (abamectin, neem oil) using a medical syringe were applied to the replicates at a rate of 2.5 ml of each treatment for each replicate. For each treatment, 30 larvae were divided into 3 replicates. As for the control treatment, it was sprayed with distilled water and the medical syringe was replaced with each treatment, then the petri dishes were kept in the incubator at a temperature of 25 + 1 C and a relative humidity of 65 ± 5% . readings was calculated according to the average number of dead insects ,(24, 48, 72) hour after the spray treatment. The mortality rates were corrected according to Abbott's equation (14).

$$mortality\ rate\% = \frac{\text{No. of living individual in control} - \text{No. of living individual in treatment}}{\text{No. of living individual in contro}}$$

2-2-Statistical analysis:

Statistical analysis was conducted using the statistical program SPSS version 20, All laboratory experiments were conducted according to a Completely Randomized Design (CRD), and the results were analyzed with the Least Significant Difference (LSD) test at the 0.05 level to test the significance of the results.

3. RESULTS AND DISCUSSION

Results in Tables (1,2) showed that the relative effectiveness of pesticides increased with the increase in the concentration used for all pesticides, larvaes mortality average treated with neem oil and the bio-insecticide (Abamectin) was 35.66,34.30% respectively after 24 hours of treatment, while the larvaes mortality average treated with neem oil and the biocide abamectin was 45.20,52.25% respectively after 48 hours., and after 72 hours of treatment, larvaes mortality average increased until they reached 50.68% for neem oil and 58.30% for abamectin, the bio-insecticide abamectin was superior to neem oil in its effect on larvae.

As for the concentrations of these biological agents, the concentration of the bio-insecticide abamectin 0.50% recording the highest larvae mortality average of 83.50%, with a significant difference from the rest of the other concentrations tested, while 0.06 concentration of abamectin recorded the lowest larvae mortality average, which amounted to 38.25. Also 10% concentration of neem oil recorded highest mortality average reached 79.92% in insect larvae compared to the concentration1% recorded the lowest mortality average reached 33.54%.

As for the interaction between the type of the insecticide and the concentration, results in Table (1) it indicates that the effect of neem oil in the insect larvae increases with the increase in the concentration used, as larval mortality increased with increasing concentration. It was lowest at the concentration1% reached 24.92% after 24 hours of treatment and began to increase with increasing concentration until it was highest at concentration 10% reached 68.55% during the same time period.

While, The results are listed in a Table (2) showed the larva mortality at the abamectin concentration of 0.06 was 23% after 24 hours of treatment, then it began to increase with increasing concentration until it reached 67.50% at the abamectin concentration of 0.50 for the same period of time.

Table (1): Larvicidal efficacy of neem oil in *Tuta absoluta* insect

Mortality%				
Neem oil concentrations	Hour after treatment			average
	24h	48h	72h	
control	0	0	0	0
1%	24.92	34.70	41.00	33.54
3%	34.89	49.38	54.65	46.31
5%	49.92	60.70	67.77	59.46
10%	68.55	81.20	90.00	79.92
average	35.66	45.20	50.68	-
L.S.D (0.05)		concentration	time	Concentration*time
		2.54	1.97	4.40

Each value represents an average of three replicates

The results shown in Table (1,2) also showed that larva mortality at a neem oil concentration 1% was 41% After 72 hours of treatment and began to increase with increasing concentration until it reached 90% at a neem oil concentration 10% for the same period of time, while the larva mortality at a abamectin concentration 0.06 was 50% after 72 hours of treatment, it began to increase with increasing concentration until it reached 94.50 at a abamectin concentration 0.50% for the same period of time.

The results show the importance of the time factor in influencing the larvae mortality when treated with biological agents (Abamectin, neem oil). It is noted that larvae mortality at neem oil concentration 1% reached 24.92 and larvae mortality reached 23% at abamectin concentration 0. 06 after 24 hours of the treatment, this percentage increased for the same concentrations of pesticides 72 hour after the treatment until it reached 41% at neem oil concentration 1% and 50% at 0.06 abamectin concentration, respectively.

While the larvae mortality at a concentration of 10% for neem oil was 68.55, and the larvae mortality at 0.50 concentration of abamectin was 67.50 after 24 hours of treatment, and this percentage began to increase until it reached (90% and 94.50%) for (neem oil and abamectin) respectively at same concentrations after 72 hours of treatment.

Table (2): Larvicidal efficacy of Abamectin in *Tuta absoluta* insect

Mortality%				
Abamectin concentrations	Hour after treatment			average
	24h	48h	72h	
control	0	0	0	0
0.06	23.00	41.75	50.00	38.25
0.13	33.00	60.00	69.50	54.17
0.25	48.00	71.00	77.50	65.50
0.50	67.50	88.50	94.50	83.50
average	34.30	52.25	58.30	-
L.S.D (0.05)		Concentration	time	Concentration*time
		1.50	1.16	1.59

Each value represents an average of three replicates

Our results come in line with finding (15). High efficiency was recorded for both abamectin and neem oil in reducing the population density of tomato leaf miners larvae, also insecticide Abamectin was superior to neem oil in its effect in *Tuta absoluta* larvae. Study by (16) revealed significant difference among the treatment compared to control for three consecutive sprays for neem oil on tomato plants infested with this insect.
The results of our study are identical to the results reached by (17), as he demonstrated the effectiveness of neem oil as a good insecticide and an inhibitor of feeding (anti- feedant impact) for insect larvae. (15) reported the effectiveness of using neem oil as an insecticide and synergist to increase abamectin activity to control *T. absoluta* and reduce abamectin resistance.
These results are consistent with results conducted by (18), reported the effectiveness of the pesticides used: Triflumuron, Abamectin, Chlorfenapyr in the mortality of tomato leaf miner larvae reached more than 65% after 12 days of treatment.
(19) they mentioned that effect's general mean of abamectin on tomato leaves infected with *T.absoluta* , 24 hours after field treatment in Iraq reached 62.15%.

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