International Journal of Engineering & Technology, 7 (4.37) (2018) 224-228

International Journal of Engineering & Technology

Website: www.sciencepubco.com/Index.Php/IJET

Research Paper

Laboratory and Field Evaluation of some Bio and Chemical Insecticides Against Nymphs and Adults of *Ceroplasts Rusci L.* (Coccidae: Hemiptera)

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Abstract

The present work including laboratory and field experimental test to evaluate the efficiency of different insecticides (systemic and biocides). Laboratory works including different concentrations for Mitrixin, Levo, Evisect, Polo and Actara for Ceroplasts rusci L. insect in leaf. Mortality percentage reading after two days. Field works were including the best concentration of insecticides achieved the highest mortality percentage for nymphs and adults of Ceroplasts rusci in the tree. The Mortality percentage reading after one, two, seven, fourteen days.

Laboratory results showed that the efficiency of insecticides significantly variant is depending to concentration and type of insecticides. The corrected Mortality percentage was increased by increasing the concentration and type of insecticides. The Mortality percentage (59.23, 53.94, 52.25) insect/leaf increase for insecticides (Mitrixin, Levo, Evisect) respectively. In a field study, the effect of insecticide toxicity for nymphs and adults of C. rusci L. (Coccidae: Hemiptera) was tested. The Results showed that the insecticides Mitrixin distinction in the after two weeks treatment and levo insecticide in after a day treatment and after two weeks treatment while the lethal rate is (64.32, 63.49, 58.73) insect/leaf in (Matrixin, Levo, Evisect), respectively.

Keywords: *Actara Ceroplasts rusci, Insecticides, Mitrixin,Nymph, Polo.*

1. Introduction

The fig wax scale *C. rusci L.* (Coccidae: Hemiptera) is the most important pest on fig trees in orchards, spread throughout the Mediteranean, Greece, and the Arab world. It is found in Iraq, Palestine, Syria, Lebanon, Egypt, and Libya. Tunisia, In particular, the figs infest other plant families such as the green bean in Turkey (Morsi and Mousa,2004: Ulgenturk and Canakcio,2003: Qin, and Gullan, 1995) as well as pistachios and ornamental plants. This insect spends the winter season as a nymph in the second stage. Rarely, in the adult insect stage in the area around Beirut, many die when leaves fall, as the autumn heat increases, the second stage nymphs begin to feed, grow and molting the Cuticle at the beginning of March until they become adults (Qin and Gullan,1995: Al-Hariri,1980). White females are placed after 8-15 days, In the middle of May, the nymphs creep under the cortex of the mother, roaming the leaves, and fruits for 3-8 days until finding a suitable place to stick to it and begin to feed and settle on the middle veins, and other veins and fruits(Al-Mallah, and NABIL, 2017). One generation in the spring takes 8-10 weeks, Crawlers show the summer generation at the beginning of August and completes its life cycle in 8 weeks (Morsi and Mousa, 2004). This generation puts eggs in October. This insect has three generations in the year, and perhaps part of the fourth on the Syrian and Lebanese coasts, causing economic damage by feeding the female nymphs and adults on the leaves, weakening the affected branches and fruits and increasing their effect secretion Honeydew, which grows black fungus.(Al-Mallah,et al, 2017: Abu- Huiege,1962).

The weakening of fig trees because of the feeding of this lesion expose them to the injury of stray fossils, the role of the formation of this insect is an important source of the transfer of the pest from one orchard to another through the transfer of infested seedlings for propagation (Al-Mallah, and NABIL,2017: Abu- Huiege,1962), there is no study of the extent of the damage in Iraq as well as the difficulty of combating traditional insecticides imported by the Food and Agriculture Organization International (FAO), as many failed attempts to control this lesion in many locations of Iraq, which this study to evaluate the efficiency of some biocides and systemic access to Which results in the possibility of applying the Integrated combat to control of this key Pest on figs in the orchards of Iraq.

2. Materials and Methods of Work

1 - Study Location:

The study was carried out in 2017. Laboratory studies were carried out in the graduate laboratory of the Plant Protection Department at the Faculty of Agriculture / University of Tikrit under laboratory conditions.

Field trials were carried out in the fig orchards located in the Balad area, 90 km from Saladin Governorate. And about 50 km north of Baghdad has not been controlled by any insecticide or chemical and the age of trees in orchards ten years. Fifteen trees

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were selected randomly for study by three trees for treatment (treatments + treatment comparison). The results were analyzed according to the complete random design method (CRD) and the least important difference (L.S.D) was used to confirm the importance of the differences between the different transaction rates below 0.05 to compare the results.

Table 1: Insecticides used for relative toxicity against *C. rusci* L.

Registered trade name	insecticide common	Chemical Name	chemical group	Amount of consumed concentration (G or ml per liter)	Chemical Class	Company
ACTARA® 240SC	ACTAR	3-[(2-chloro-5-thiazolyl)methyl]tetrahydro-5-methyl-N-nitro-4H-1,3,5-oxadiazin-4-imine	Thiamethoxam	0.5 ml/liter	Neonicotinoid	Syngenta
Polo	Polo 500 SC 500 g/L (50% m/v)	6-di-isoprpyl-4-Phenoxyphenyl thiourea 1-tert-buty 1-3-2-6-di-isopropyl-4-phenoxyphenyl thiourea	Diafentiurom	500 mL/ha	insecticides	Syngenta
Matrixin Plus	Abamectin 5% w/w Oxymatrine 2.4 % w/w		AVERMECTIN	1- 0.8ml/1lt water	AVERMECTIN	Russell
Levo 2.4%	OXYMATRINE	C15H24N2O2	OTH	1- 0.7ml/1lt water	OXYMATRINE	SINERIA
EVISECT 50%	Thiocyclam	Thiocyclam Hydrogen Oxalate 50%	Thiocyclam	0.7 ml/liter	Nereistoxin	Arista life science

2.1. Experimentation of the Division of Some Biocides and Systemic In the Percentage of Deaths in Nymphs and Adults of C. Rusci L.

The efficiency tests of the insecticides mentioned above were carried out according to the concentrations mentioned in Table (1) where the recommended concentration was adopted, the lowest and the highest concentration to determine the best concentration in which the insecticide gives the highest percentage of kills. The laboratory experiment was carried out as the infested leaves were taken from trees and counting the number of nymphs and live adults before the control. The insecticide solution was sprayed on the infected leaves with dilute solution concentrations of the tested insecticides and by three replicates of the treatment.
The nymphs and adult insects were followed by the first moving gently with a small brush, and then the dead were examined with a needle that changed from the leaf easily and became black or brown.
The models were taken 24 hours before the control or after three days of control, and the Henderson, Tilton equation was used to find the percentage of efficacy of each insecticide in the control of the insect(Al- Mallah، and AL- Jabure,2014).

$$\%\ \boldsymbol{effectivness\ of\ the}\ \textbf{insecticide} = (\mathbf{1} - \frac{\boldsymbol{N1 \times N3}}{\boldsymbol{N2 \times N4}})\boldsymbol{x100}$$

whereas:
N1: Number of treated insects after spraying
N2: Number of treated insects before spraying
N3: Number of insects in comparison after spraying
N4: Number of insects in comparison before spraying
Data were recorded in a special book that was statistically analyzed using Excel and SAS software(AL- Samarrai, 2009).

Table 2: shows the insecticides and concentrations used in the experiment**.**

Insecticide	minimum concentration 1m/L	User concentration 1m/L	maximum concentration 1m/L
Matrixin	0.4	0.5	0.6
Levo	0.2	0.3	0.4
Evisect	0.9	1	1.1
Actara	0.2	0.3	0.4
Polo	0.3	0.4	0.5

2-The Evaluation's experiment of some biochemical and systemic insecticides in the percentage mortality of nymphs and for fig leaf insects. The efficiency of the tested insecticides was tested in the field using the recommended concentration during the period of the suspension of movement and the process of multiplication of the adult insect. The single replicator adopted one infested leaf of 5 leaves for each randomly selected tree. The trees and leaves were numbered, and the treatment was randomly selected in the selected trees, The data was recorded in a special record was taken first reading of the animals of the nymphs and adults insects 30/9/2017 and then sprayed with insecticides by a hand-made 2-liter tray Chinese-made, and on After day took readings of the nymphs and adults After two days and After one week, and After two weeks Percentages were extracted To kill according to the Henderson equation and then extract the corrected homicide ratio using the Abbott equation(Abbott, 1925).

3. Results & Discussion

First: Determine the relative effectiveness of insecticides used:
The results of the toxicity line diagram in Figure (1) showed that the Mitrixin insecticide affected the Mortality percentages of the nymphs and adults of the fig wax scale, noting that the corrected percentage of mortality increases with the increased of concentration used when treating nymphs and adults. The ratio was 22.003 insect ml/L (minimum concentration) and increased with increased concentration to reach a corrected percentage of 59.283 insect/leaf mortality in the 0.6 ml/L concentration treatment (maximum concentration).
Notice from Figure (1). Through the

Toxicity line, LC50 (lethal dose value for half of the test objects) or LD50 (Al- Mallah،.and AL- Jabure,2014) can be identified from the toxicity line equation:
Y=186.4X- 57.968
Y represents the value of sensitive individuals, and X represents the concentration. The LC50 value was 0.58 mm / L and from Fig. 2, 3, and through the toxicity line, the Levo and Asset isolates affected the corrected Mortality percentage of the nymphs and adults. The Mortality percentages increased with the highest corrected rate of 53.943, 52.247 insect/leaf In the concentration of 0.4, 1.1 mm/L respectively (the highest maximum concentration) and the toxicity line equation for both insecticides, the value of LC50 is 0.397, 1.1 mm / L respectively, and in Fig. 4, The percentage of mortality of nymphs, and adults from the rest of the insecticides was LC50 for them 0.55, 0.6 mm / l respectively, and these results agree with what he said (Ragab, 1995).
Figure (2) The toxicity line of concentrations of Levo and the rates of %mortality.
When the insecticide was used directly as the intensity of the fig leaf decreased, but the results were not at the required level.First: Determine the relative effectiveness of insecticides used: The results of

the toxicity line diagram in Figure (1) showed that the Mitrixin insecticide affected the Mortality percentages of the nymphs and adults of the fig wax scale, noting that the corrected percentage of mortality increases with the increased of concentration used when treating nymphs and adults. The ratio was 22.003 insect ml/L (minimum concentration) and increased with increased concentration to reach a corrected percentage of 59.283 insect/leaf mortality in the 0.6 ml/L concentration treatment (maximum concentration).

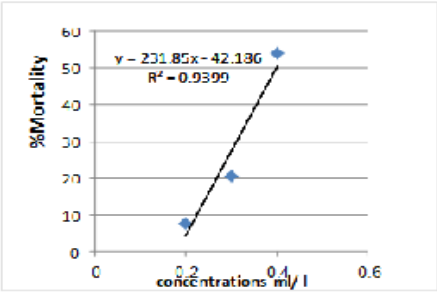

Fig. 1: The toxicity line of concentrations of Matrixin and the rates of %mortality

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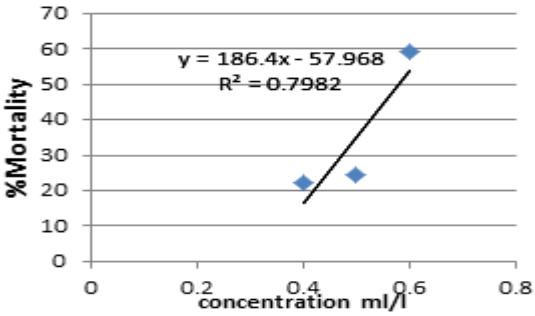

Fig.2: The toxicity line of concentrations of Levo and the rates of %mortality.

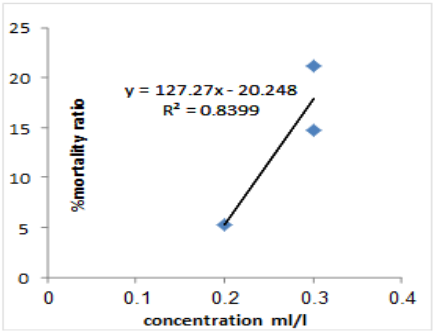

Fig. 3: the toxicity line of concentrations of Evisect and the rates of %mortality.

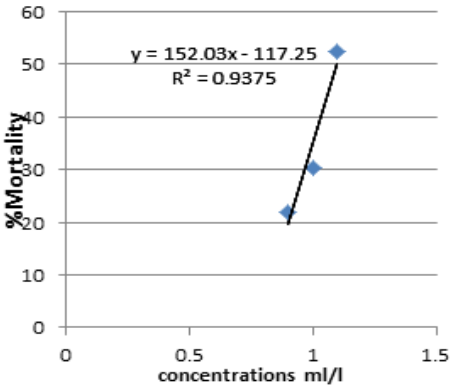

Fig.4: The toxicity line of concentrations of Actara and the rates of %mortality.

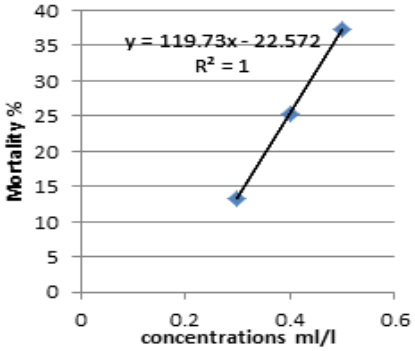

Fig.5: The toxicity line of concentrations of Polo and the rates of % mortalityAssessment of relative toxicity of some insecticides against nymphs and adults of C.s rusci L. in laboratory.

Table (3) shows that the average percentage of the effectiveness of the insecticides used in the study increased with increased concentration. The matrixin gave the highest relative efficacy in the nymphs and adults of the fig leaf at the concentration of 0.6 mm / l and reached 59.283 insect / leaf followed by the insecticide Levo and Evisect at 53.943 and 52.247, respectively, while the relative efficacy of the polo and acetra decreased by 37,827 33,638 insect/leaf and The decrease in toxicity was due to the nature of the effect of the insecticides and did not affect contact with the presence of the wax layer(Al-Mallah and NABIL, 2017).

(3): Field Evaluation of Some Bio and chemical insecticides against nymphs and adults of C. rusci L.

Table 3: Relative efficiency of different concentration of some bio and chemical insecticides in nymphs and adults of *C. rusci L* under laboratory condition

Insecticide	minimum concentration 1m/L	User concentration 1m/L	maximum concentration 1m/L	Mean Interference
Matrixin	22.003^{C-D}	24.13^{B-D}	59.283^{A}	35.23
Levo	7.57^{EF}	20.597^{C-E}	53.943^{A}	24.26
Evisect	21.843^{CD}	30.577^{BC}	52.247^{A}	36.619
Actara	5.207^{EF}	14.723^{D-F}	33.637^{BC}	17.85
Polo	13.380^{D-F}	25.257^{B-D}	37.827^{B}	25-48
Mean of L.S.D 0.05	For interface between the concentrations and insecticide. For Insecticide For concentrations			14.208 2.045 2.045

Table 4: Relative efficiency off some bio and chemical insecticides in nymphs and adults of *C.rusci* L. under field condition.

	efficacy % after one day, two day, one week, two weeks				
Insecticide	After day	After two days	one week	two weeks	Mean
Actara	35.2^{DE}	26.05^{E-F}	29.26^{E-F}	58.61^{AB}	37.26^{CB}

Levo	61.45^{A}	43.47 ^{CD}	42.77 ^{CD}	63.49^{A}	52.7^{A}
Polo	20.96 $^{E-F}$	14.85 ^{G}	30.67 $^{E-F}$	56.49 $^{C-B}$	30.74^{C}
Matrixin	22.65 $^{E-F}$	16.99 $^{F-G}$	19.86^{EGF}	64.32^{A}	30.96^{C}
Evisect	30.04 $^{E-F}$	30.36 $^{E-F}$	43.47 $^{B-C}$	50.74^{B-C}	39.15
(Mean)	34.44^{B}	26.27^{C}	33.21^{B}	58.73^{A}	38.16
L.S.D 0.05	Reading interface Insecticides Reading and insecticide interface				6.826 7.63 15.269

Table (4) shows that there is a difference in the average Mortality percentages for nymphs and adults of the fig leaf according to the type of insecticide used and the intervals of the field Mortality percentages, as the insecticide exceeded the matrix and gave the highest effect in the last reading after two weeks for the remaining insecticides, Which gave the highest effect in the percentage of Mortality percentages of nymphs and insects after two weeks after two weeks reaching 64.32 insect/leaf, the results of the statistical analysis showed that there was no significant difference between the previous treatments and the treatments of the Levo after two weeks and after day, with the highest result of this insecticide in all readings, reaching 63.49, 61.45 insects/ leaf respectively Followed by the effect of the treatment of the Actara insecticide in reading after two weeks is 58.61 insect/leaf and polo were eliminated at the same time as 56.4 insects/leaves. The Mortality percentage in the first readings of insecticides dropped to 16.99-14.85 ppm/sheet for the polo and Levo insecticides respectively.

In the same table, it is noted that the values of mortality increased according to the increase in the period of exposure of the insecticide, as the last readings gave the highest rates of overlap of the type of insecticide and the statistical analysis noted that the highest rate of mortality was in the last readings of the total insecticides as in the reading after two weeks the rate of mortality 58.73 insect/While other insecticides came in less than 34.45, 33.21 and 26.27, respectively. A study by (Al-Awamleh,2009) in Jordan on the effect of some traditional insecticides on fig California on fig trees of the vegetable variety in Balqa Governorate in 2006-2007 and The study included the effectiveness of the addition of winter and summer oil was the result of the effectiveness of spraying winter oil with tasidine, confedor, Dorspan that achieved death ratio 8.5, 92.2, and 78.2% respectively. Actara, dorspan, and Patron insecticides in summer oil. In Iraq studied(Hamarassh,2007) the evaluation of some of the systemic insecticide Actara against the fig leaf at a concentration of 100 ml / L. The results of the study conducted by (Al-Barzanji,2017), With the results of the study, due to the relative efficiency of spraying with levo and Evisact in the mortality rate of *Phyllocnistis citrelle* Stainon, which gave the highest percentage of the mortality 100% after two weeks. This corresponds to (Tarek,2008), which found that percentage of the mortality of the first stage of the whitefly *Aleuroclava jasmine* treated with Oxymatrine was 64.5% and 35.5% and 31.5% in the second and third stages respectively,The study achieved success in combating the pest and led to And the protection of the trees for a month from the infection of the moving course (the development phase in the beginning of spring as well as the effect of the insecticide on the crawlers for a period of up to a month or polo insecticide had a direct impact in reducing the numerical density of nymphs is due to incomplete wax layer in stages The first penetrates. The insecticide breaks the body to the influencing target within the insect body

4. Conclusions

The study concluded that:

1-Livo can be used at a concentration of 0.3% during the activity of the insect. This concentration can reduce the insect density to more than 50%.

2-The Materxin insecticide has succeeded in reducing the density of the pest to more than 60%.

3-Actara recommends to use as an insecticide in the control of the insect at the time of tree growth has succeeded in reducing the numerical density of the pest by more than 50%, preferably in the integrated pest management (IPM) of the sub-lethal concentration with other control operations.

4- Studying the effects of Levo, Matrixin Plus in the biological enemies of the insect in the field.

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