EFFECT OF SOME INSECTICIDES ON APHID INSECT MYZUS PERSICAE (Sulzer) AND IT’S PREDATORS AND PARASITES

Juhina Adrees Mohammed Ali
Department of Plant Protection, College of Agriculture and Forestry, University of Mosul
E.mail: Juhina1234@yahoo.com

ABSTRACT

Present study aimed to determine the effects of three insecticides which were Actara, Match and Nimex on Myzus persicae (Sulzer) and on its both parasite Aphidius matricariae Haliday and predators Coccinella septempunctata L. and Coccinella novemnotata Herbst. Results showed that all three insecticides effected parasitic efficiency, of Aphidius matricariae and Nimex recorded highest mortality rate on Myzus persicae (Sulzer) which was 98.73. All three used pesticides (Actara, Match and Nimex) affected predatory and parasitic efficiency after direct exposure, while less effects on the same pesticides on predator efficiency of both C. septempunctata and C. novemnotata have been recorded after indirect treatment. Keywords: Coccinella septempunctata L. and Coccinella novemnotata Herbst.

Insecticides (Actara, Match and Nimex)

INTRODUCTION

The use of selective pesticides and safe methods which specific only there target (pest) doesn’t affect to natural enemies that highly efficient in reducing the number of prey specially aphids and other insect families that important to the biological control such as Coccinelled, including Coccinella septempunctata L., seven-spotted ladybird, and nine-spotted ladybird Coccinella novemnotata Herbst (Al-Mallah, and Al-Mikhafi, 2005). Pesticide such as trigard has direct impact on aphids and reduce it is number without affecting the efficiency of their biological enemies (Al-Mallah and Ali, 2007).

According to the previous study by Abdel-Wali, et al. (2007), which reported that 0.5% concentration of trigard had a fatal effect on seven-spotted ladybird, in mean of 47.3 and 43 insect for both male and female respectively. Many insecticides such as Sumicidin, Abamectin, Pirimicarb and Actara have been used against insect pest of peach specially Aphids which attacks 44 plant families (Palumbo, 2011).

However, other investigation proved that pesticide like trigard not affected the predatory efficiency of Coccinella novemnotata and parasitic efficiency of Aphidius matricariae (Fuentes-Contreras et al., 2007 and Saljoqi and Van Emdem, 2003). Actara pesticide which is derived from Benzoylphenylurea, considered as systemic insecticide it affects acetylcholine receptors in the central nervous system of insects (Silva et al., 2012).
Recently, Botanical insecticides or plant extracts such as neem oil have been shown to be very effective against insects in many ways, the ingestion of green pesticides by insect cause death, however they are harmless for human(Silva et al., 2012). The mode of action of Botanical pesticide have been explained by BaozhuZhong et al.(2017) and Fuentes-Contreras et al. (2007), that neem oil causes hormonal imbalance which prevent larval growth and cause death. Additionally, larvicidal effects of neem oil has been recorded against more than 200 insect species, also azadirachinewhich can be extracted from neem tree showed larvicidal activity by 60 to 70% after 3 to 14From treatment days(Palumbo et al., 2008).Secondary plant product such as tetranortriterpenoid from neem leaves or seeds has bitter test which inhibit juvenile hormone in insect and result in death of insect from all stages of their (larvae, pupae and nymphs), thus, immune system of insect cannot response(Zanuncio et a., 2016).

MATERIALS AND METHODS

The present study was conducted during 2018 _2017 at the department of Plant Protection - Faculty of Agriculture and Forestry University of Mosul, the investigation carried out under controlled laboratory condition (at an average temperature of 20+ 5º C and relative humidity 45+ 5%. This study includes the following points:

First: Insect Breeding

The different life stages of the Spotted ladybirdCoccinellaseptempunctata and Spotted ladybirdCoccinellanoemnotata predator were collected from infected potato fields. The eggs(over 350 eggs) were kept in sterile plastic petri-dishes with a diameter of 9 cm and observed daily until hatching while larvae and adults were isolated in small breeding cages (10 x 20 x 15 cm) and provided with leaves of infected potato with aphids. Specialized cages have been used for the collection of aphids Myzuspersicaf rom untreated field with pesticide for more than one season. All samples (ladybirds, aphids and parasite ) were sent for diagnosis at the Museum of Natural History in Baghdad.

Second: use of three insecticides against aphid insects:

Three different insecticides have been used against aphid insects, each with labeling recommended concentration which were Actara, Match and Nimexat concentration of 0.5, 0.4, 0.5 %, respectively. Five replications of each concentrationwere used for increased the rate of accuracy, each concentration prepared in 2mlwhile the control treatment was sprayed with 2 ml of distal water, each treatementincluded one refined 20 immature insect and placed on leafs of plant in a Petri dish was treated using 2 mlwhile the control treatment was sprayed with 2 ml of distal water. Finally, all readings recorded after 24 hours of incubation under laboratorycontrolled condition and results corrected by Abbott (1925). Third: Effects of three different pesticide according different treatment methods on aphid insects.
Table (1): Three used pesticide each with it is active ingredients and origins.

| Insecticides | Manufactured company | Groups                | Active ingredients          |
|--------------|----------------------|-----------------------|----------------------------|
| Actara       | Syngenta             | Neonicatinoid         | Thiamethoram 25/wg         |
| Match        | Syngenta switzerland | Benzoylphenylurean    | Lufenuron 5%               |
| Nimex        | JiangsRotam chemistry| Neem derived product  | Azadiractin 4.5 G/L        |

Three different types of treatment have been used for each pesticide Actara, Match and Nimex each with it is recommended concentration 0.05, 0.04, 0.05 m/1L, respectively. In order to determine the best efficiency, first treatment included leaf plant, second treatment included leaf plant with the aphids and third treatment included sprinkles of the plant leaf with both prey and predator. Each treatment which contains 100 insects (20 in each replicate) male or female 4 ml of pesticide prepared and hand sprayed. Five replications of each treatment increased the rate of accuracy and also for the purpose of comparison control treatment has been sprayed with 2 ml of distal water. Finally, all readings recorded after 24 hours of incubation under laboratory controlled condition. The death rate in ladybirds male and female were calculated after 5 days of treatment and the death rates were corrected by Abbott equation, longevity and death rate have been recorded after 5-10 days of parasitic infections. All results recorded and corrected by Abbott (1925). The results were analyzed using completely randomized design (CRD) and the Duncan test at a 5% probability level to determined the significant differences by using SAS program.

Efficiency predator = \( \frac{\text{No.Aphid.pred.}}{\text{total No.Aphid}} \) \times 100

RESULTS AND DISCUSSION

Present study aimed to determine the effects of three insecticides which were Actara, Match and Nimex on *Myzus persicae* and their natural enemies:

First: The effects of three insecticides on *Myzus persicae*. According to the results in the Table (2), Nimex recorded highest mortality rate which was 98-73 and followed by Actara and Match at the range of 96-71 and 87-63, respectively.

Table (2): Effects of Actara, Match and Nimex on *Myzus persicae*

| Pesticide | Mortality% |
|-----------|------------|
|           | Mean ± S.E | Range     |
| Actara    | 72.16 ± 5.7 C | 96-71     |
| Match     | 74.4 ± 5.0 B  | 87-63     |
| Nimex     | 82.8 ± 6.5 A  | 98-73     |
| Control   | 8.75 ± 4.2 D  | 25-0      |

* Numbers under the same letter or similar letters do not have significant differences according to Duncan polynomial test at a probability level of 5%.
Second: Effect of pesticides and different treatment methods on predatory efficiency of *C. septempunctata, C. novemnotata* and parasitic efficiency of *Aphidius matricariae*

The effects of three treatment methods each with three insecticides for both female and male of *C. septempunctata* and *C. novemnotata* have been recorded. Results in Table (3) showed that different insecticides and treatment methods had significant effects on efficiency of predator, also present result showed the effects of different treatment methods on both male and female separately.

Table (3): Effects of Actara, Match and Nimex on predatory efficiency of *C. septempunctata, C. novemnotata*.

| Gender | Predators Treatment methods | Pesticides | C. novemnotata | C. septempunctata |
|--------|-----------------------------|------------|----------------|------------------|
|        |                              |            | Mean ± SE      | Range            | Mean ± SE | Range |
| Female | First                        | Actara     | 83 ± 2.7 b    | 70-94            | 88±3.4b   | 80-100 |
|        |                              | Match      | 84 ± 3.5 b    | 71-97            | 98±0.22 a | 91-100 |
|        |                              | Nimex      | 72 ± 4.2 c    | 65-88            | 90±1.7ab  | 87-100 |
|        | Second                       | Actara     | 72 ± 1.2 c    | 84-76            | 88±3.2b   | 83-100 |
|        |                              | Match      | 65 ± 4.2 d    | 82-57            | 82±3.4b   | 65-100 |
|        |                              | Nimex      | 72 ± 1.2 c    | 80-65            | 78±1.2c   | 61-100 |
|        | Third                        | Actara     | 57 ± 3.1 f    | 47-70            | 62±2.8ef  | 52-80  |
|        |                              | Match      | 31 ± 2.7 h    | 45-62            | 62±3.4fg  | 74-45  |
|        |                              | Nimex      | 43 ± 1.5 i    | 39-60            | 58 ±6.2f  | 40-61  |
| Male   | First                        | Actara     | 77 ± 1.9 c    | 61-90            | 86±4.2b   | 67-100 |
|        |                              | Match      | 81 ± 1.5bc    | 76-88            | 94±2.6a   | 84-100 |
|        |                              | Nimex      | 73 ± 2.4 c    | 62-79            | 82±3.4b   | 65-90  |
|        | Second                       | Actara     | 74 ± 1.5 c    | 63-81            | 72 ± 1.2 c | 65-92 |
|        |                              | Match      | 57 ± 4.1 f    | 54-68            | 78 ± 1.4 d | 62-88 |
|        |                              | Nimex      | 65 ± 3.5 d    | 39-72            | 66 ± 2.6 d | 41-88 |
|        | Third                        | Actara     | 48 ± 1.2 g    | 34-61            | 42 ± 6.4 i | 35-67 |
|        |                              | Match      | 49 ± 2.1 g    | 33-56            | 58 ± 2.6 f | 47-82 |
|        |                              | Nimex      | 35 ± 2.8 j    | 24-52            | 68 ± 1.2 d | 60-76 |

* Numbers under the same letter or similar letters do not have significant differences according to Duncan polynomial test at a probability level of 5%
Predator efficiency according to the interaction between insecticides and sex of *C. septempunctata* have been recorded regardless the methods of treatment, recorded result in male were 79.3, 77.3 and 75.3 for Actara, Match and Nimex, respectively. While recorded result in female were 66.6, 76.6 and 71 for Actara, Match and Nimex, respectively. As shown in Figure (1).

![Figure 1: The effect of interference between the pesticide type and the sex of the predator regardless of the type of treatment and on the predatory efficacy of the seven point ladybird.](image)

The recorded results for all three insecticides in both male and female were so close, as shown in figure (2).

![Figure 2: The effect of overlap between the pesticide type and the sex of the predator, regardless of the type of treatment, on the predatory efficiency of the ladybird *C. novemnotata*.](image)

Predator efficiency according to the interaction between treatment methods and sex of *C. septempunctata* have been recorded regardless to the type of insecticide, recorded result showed that all treatment affected the predator
efficiency, however third treatment had close affected in both male and female by 56 and 57.3, respectively, as shown in figure (3).

![Figure 3](image3.png)

**Figure (3):** The effect of interference between the type of treatment and the sex of the predator, regardless of the type of pesticide in the predatory efficiency of the ladybird *C. septempunctata*.

Predator efficiency according to the interaction between treatment methods and sex of *C. novemnotata* have been recorded regardless the type of insecticide, as shown in figure (4).

![Figure 4](image4.png)

**Figure (4):** Effect of interference between the type of treatment and the sex of the predator, regardless of the pesticide type, in the predatory efficiency of ladybird *C. novemnotata*.

The results of present investigation showed that all three used pesticides (Actara, Match and Nimex) affected predatory and parasitic efficiency after direct exposure, while less effects of same pesticides on predator efficiency of both
C. septempunctata and C. novemnotata have been recorded after indirect treatment, less affects maybe due to the feeding strategies of predator which preferred uncontaminated prey with insecticide. The highest predator efficiency in seven pointed lady bird recorded which due to the size and needs of this insect. This finding agree with previous study done by (Abdel-Wali et al., 2007 and Zanuncio et al., 2016).

The effects of three treatment methods each with three insecticides on rate of parasitic infection, longevity and killing rate of Aphidius matricariae have been recorded and detailed result have been shown in Table (4).

### Table (4): The effects of three treatment methods each with three insecticides on rate of parasitic infection, longevity and killing rate of Aphidius matricariae

| Treatment | Insecticide | Parasitic efficiency | Emergent % | Longevity | Killing rate % |
|-----------|-------------|----------------------|------------|-----------|----------------|
|           |             | Mean±S.E             | Rang       | Mean±S.E  | Rang           | Mean±S.E | Rang |
| First     | Actara      | 89±3.8 b              | 60-100     | 16.4±0.2 a| 10-20          | 3±0.2 b  | 1-4  |
|           | Match       | 88±4.2 b              | 50-100     | 17.2±0.4 a| 10-18          | 3.2±0.2 a| 1-4  |
|           | Nimex       | 98±1.6 a              | 50-100     | 17.6±0.2 a| 10-18          | 2.4±0.2 c| 1-3  |
| Second    | Actara      | 45±5.1 f              | 30-75      | 6.8±0.8 e | 4-12           | 3.0±0.4 b| 2-4  |
|           | Match       | 60±1.6 d              | 40-80      | 1.4±0.2 f | 4-16           | 2.0±0.4 c| 1-4  |
|           | Nimex       | 76±3.8 c              | 40-90      | 14.6±0.4 b| 12-18          | 3.0±0.2 b| 1-4  |
| Third     | Actara      | 18±2.4 h              | 10-45      | 1.2±0.2 f | 0-3            | 3.0±0.2 a| 2-4  |
|           | Match       | 39±1.2 g              | 20-65      | 8.6±0.8 c | 4-10           | 2.0±0.4 c| 1-3  |
|           | Nimex       | 50±0.8 c              | 40-75      | 7.4±0.2 d | 7-12           | 1.6±0.4 d| 1-3  |

*Numbers under the same letter or similar letters do not have significant differences according to Duncan polynomial test at a probability level of 5%.

The interaction between effects of three treatment methods and three insecticides on rate of infection, emergent rate and killing rate have been recorded and detailed result have been shown in Table (4). Results showed that first treatment method was the safest way and killing rate not exceed 23.7 % which followed by second and third treatment methods.
دراسة تأثير بعض المبيدات الشائعة الاستخدام لمكافحة المُن على بعض أعداءها الحيوية الطفيلية والمفترسة

جهينة أديس محمد علي
قسم وقاية النباتات/كلية الزراعة والغابات/جامعة الموصل
E.mail:Juлина1234@yahoo.com

الطفيل

هدفت الدراسة إلى تحديد التأثير لكل من مبيدات أكتارا وماتش ونيمكس والتي تستخدم في مكافحة حشرات مختلفة ومنها المُن Myzus persicae الحشرة المن Aphis matricariae والدعاقة ذات السبع نقاط Coccinell septempunctata والدعاقة ذات التسع نقاط Coccinell anxemnotata، إذ تباينت كفاءة نسب التطفل ونسب النمو ونسب الموت في فئات الحشرات المختلفة، ل حين سجلت تأثيرات أقل في الكفاءة الاحتراسية لكل من إناث وذكور المفترسين (الدعاقة ذات السبع نقاط Coccinell septempunctata) والمبيدات عند العاملة غير المباشرة.

الكلمات المفتاحية: الدعاقة ذات السبع نقاط والدعاقة ذات التسع نقاط والمبيدات الحشرية (أكتارا، ماتش، نيمكس).

REFERENCES

Abdel-Wali, M. ; Mustafa,T. and Al-mazraawi, M.S.(2007). Toxicity of selected insecticides to green Aphid, Myzus persicae (Homo.: Aphididae) and its
parasitoid, *Aphidius matricariae* (Hym.: Aphidiidae). *American-Eurasian Journal of Agricultural and Environmental Sciences*, 2(5): 498-503

Abbott, W.S. (1925). A method of computing the effectiveness of an insecticides. *Journal of Economic Entomology*, 18: 265-267.

Al-Mallah, Nizar Mustafa and Fahd Abdo Al-Mikhlaifi (2005). The effect of trigard insect growth inhibitor and the type of food host on some biometrics of the Southern Cowpea Beetle. *Tech Magazine*, 36: 18-45.

Al-Mallah, Nizar Mustafa and Juhina Adrees Muhammad Ali (2007). The complementarity between the insect growth inhibitor Trigard and the seven-point ladybird in the fight against black beans. *Mesopotamia Journal of Agriculture*, 35(3): 139-144.

Anonymous, (2002). SAS. The Statistical Analysis System. SAS Institute, CARY, NC, USA.

Baozhu Zhong, Chaojun Lv, and Weiquan Qin (2017). "Effectiveness of the botanical insecticide Azadirachtin against *Tirathabarufivena* (Lepidoptera: Pyralidae). *Florida Entomologist* 100(2), 215-218.

Fuentes-Contreras, E.; Basoalto, E.; Sandoval, C.; Pavez1, P.; Leal1, C.; and Cristian Muonz, R.B. (2007). Evaluation of efficacy, residual and knock down effects of pretransplant applications of nicotinoid and nicotinoid-pyrethroid insecticide mixtures for the control of *Myzus persicae*nicotianae (Hemiptera: Aphididae) on tobacco. *Agricultura Tecnica (chile)* 67(1): 16-22.

Zanuncio J.C, Abreu M, Luis C, Martínez, C Frederico W, Francisco S. Ramalho, Angelica Plata-R, Marcus. A, and José Eduardo S (2016). Toxic effects of the neem oil (Azadirachtaindica) formulation on the stink bug predator, *Podisus nigrispinus* (Heteroptera: Pentatomidae). *Sci. Rep.*, 6: 30261.

Palumbo, J.C. (2011). Assessment of insect losses and insecticide use on Arizona head lettuce, 2004-2010. *Yuma agricultural center, VegIpm Update*, 2, (8).

Palumbo, J.C, Al Fournier, K.N. and Ellsworth, P (2008). Insect Crop Losses and Insecticide Usage for Head Lettuce in Arizona: 2006/2007. *Vegetable Report (P152)*: 86-95

Saljoqi, A.U.R. and Van Emdem, H.F. (2003). Differential susceptibilities of peach-potato aphid, *Myzus persicae* (Homoptera: Aphididae) and its parasitoid, *Aphidius matricariae* (Hymenoptera: Aphidiidae) to foliar insecticides on partially resistant and susceptible potato cultivars. *Pakistan Journal of biological science*, 6(4) 386-393.

Sheet, J. J., Karr, L. L. and Dripps, J. E. (2000). Kinetics of uptake, clearance, transfer and metabolism of match by eastern subterranean termites (Isoptera: Rhinotermitidae). *Journal Of Economic Entomology*, 93(3): 871-877.

Silva, A.X., G. Jander, H. Samaniego, J.S. Ramsey, and C.C. Figueroa (2012). Insecticide Resistance Mechanisms in The Green Peach Aphid *Myzus persicae* (Hemiptera: Aphididae) I: A Transcriptomic Survey. *PLos One*, 7(6): e36366. (doi:10.1371/ .0036366).