Efficacy of two biopesticides and two chemical pesticides against green peach aphid *Myzus persicae* (Sulzer) (Homoptera: Aphididae) under laboratory condition

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Abstract

This study was conducted to evaluate the effectiveness of the biopesticides Palazin and Tondxier and the chemical pesticides Thiamethoxam and Acetamiprid against the green peach aphid *Myzus persicae* in the autumn season of 2021.The study showed that the Thiamethoxam and Palazin had the highest efficiency in controlling of the green peach aphid. The percentage of mortality was 85.00% and 38.33% insect/applied respectively, followed by the pesticide Acetamiprid, which was effective in mortality rate of 33.33% insect/applied after 24 hours of treatment. Thiamethoxam and the Palazin were the most efficient in controlling green peach aphid. The mortality percentage was 93.33 and 71.66% insects/application respectively, followed by the pesticide Acetamiprid, in which the percentage of effectiveness reached 63.33% insects/application after 48 hours of treatment.

Keywords: Green peach aphid, Palazin, Thiamethoxam, alcoholic garlic extract.

Introduction

The green peach aphid *Myzus persica* (Sulzer) is one of the great agricultural important insects. Its origin was thought to be in the continent of Asia and spread later in most countries of the world. It has wide host range, where it attacks many plant species, belonging to 40 families [1]. In Iraq, it was mentioned [2] that the green peach aphid attacks 44 plant hosts and causing harmful damage by the absorption of plant juices. Furthermore, it produces abundant secretion, which causes dust accumulation leading to the impeding of the vital processes of the plant such as respiration, photosynthesis and transpiration [3]. It is also able to transmit many plant viruses that greatly decrease plant growth and its yield [4]. For example, it was reported that it transmits no less than 78 viruses, and the most important of them is the Potato Virus Y [3].

Aphid are usually combated by using various types of chemical pesticides. However, the negative risks associated with the application of these pesticides on human, animal and environment have leaded the researchers to find and develop other alternative methods that are safer. Among these approaches is application of plant extracts, because they are environmentally safe for non-target organisms when used alone and possibility preparing a safe and non-toxic (natural) insecticide (environmentally friendly). For incidence, the pesticide was prepared from the natural extracts of plants

by mixing corn oil with rosemary oil and used against insects. The results obtained indicated that the prepared pesticide had a clear effect on aphid, where the average number of total insects decreased to 25 insects after 24 hours of treatment, and later decreased to 4 insects after 48 hours of treatment, compared to the average number before spraying, which amounted to 144 insect [5]. Therefore, recent studies have tended to usage plant extracts to control insect pests, such as alcoholic garlic extract *Allium satium* that is one of the most vital species around the world and has been known to protect stored grains. Garlic also acts as an antioxidant and insect repellent [6]. Additionally, the *Eucalyptus* extract is a source of many secondary metabolic compounds that showed an influence on the biological activities of various insect pests [7]. The turpentine extract of *Eucalyptus* leaves at a concentration of 5% caused the mortality rate is 50% for cowpea beetle [8]. As a consequence of the usefulness of these replacement methods besides the successful application of the biological agents against insects including the aphides, this research aims to assess some chemical pesticides that are belonging to modern chemical groups and two of biopesticides against the green peach aphid.

Materials and Methods

Collecting and raising the insect

A green peach insect was collected from the research station of the Agriculture College, University of Kerbala in 2021.The various stages of the insect was obtained for the purpose of culturing it under laboratory conditions on pepper plants. The insect was scientifically identified using the available taxonomic keys [9].

Preparation of the biopesticides and the chemical pesticides

The two commercial biopesticides (Palazin and Tondxier) (Table 1) were prepared for the purpose of evaluating thier effectiveness on adults of green peach aphid *M. persicae*. Two concentrations were used the first 1 ml/L and the second 2 ml/L. The control treatment was distilled water only.

The commercial pesticide Thiamethoxam and Acetamiprid (Table 1) were applied at two concentrations the first was 0.25 while the second was 0.35 g/L of distilled water, while the control treatment was distilled water only. This was for the purpose of assessment their efficiency on green peach aphid *M. persicae* and comparing them with the biopesticides efficiency.

Table (1): Commercial, Common name, Dosage and Company for biopesticides and chemical pesticides

Commercial name	Common name	Dosage rate /L.	Company
Actara 25 %WDG	Thiamethoxam	0.25 g 0.35 g	Syngenta
Wapkil 20 %SP	Acetamiprid	0.25 g 0.35 g	Biostadt
Palazin 65% SL	Eucalyptus extract	1 ml 2 ml	Kimia Sbaz
Tondxier 80% EC	Garlic &pepper extract	1 ml 2 ml	Kimia Sabaz

Assessment of the Palazin, Tondxier, Thiamethoxam and Acetamiprid on the mortality rates of green peach insect *M. persicae*

Plastic plates (9 cm in diameter) were used with three replicates for each concentration that werev1 and 2 ml / L for the two biopesticides. While the chemical pesticides were applied at 0.25 and 0.35 g/L. A filter paper was placed in each plate and a small healthy leaf of pepper plant that was not infested with any insect. The leaf was wrapped with cotton moistened with sugar solution to prevent the wilting for as long as possible. Afterthat,10 adults of green peach insect were transferred to these plates, and then they were treated with the above-mentioned concentrations of the biopesticides and chemical pesticides. On the other hand, the control treatment was sprayed with distilled water only. The treated dishes were then placed in the incubator at temperature of 25 ± 2℃ and a relative humidity of 60 ± 5%. The mortality rates were recorded after 24, 48 and 72 hours of treatment, and the results were corrected according to the Abbott equation [10].

Statistical analysis

The results were analyzed using the Completely Randomized Design (CRD), and the least significant difference (L. S. D) test was used at the probability level (0.05) to test for differences between the treatments [11]. Mortality proportions were corrected according to the Abbott Formula [10]. The percentages of corrected mortality were calculated according to the following equation:

$$\%\text{Abbott corrected mortality} = \frac{\%\ \text{mortality in the treatment} - \%\text{mortality in the control}}{\%\text{mortality in control}} \times 100$$

The corrected death percentages converted the values into an angle to be entered in the statistical analysis, and the results were analyzed using the SAS statistical analysis program [12].

Results and Discussion

Assessment of the Palazin, Tondxier, Thiamethoxam and Acetamiprid on the mortality rates of green peach insect *M. persicaein* after 24 hours of treatment

The results showed (Table 2) that there was a significant effect between the concentrations, type and interaction of the tested biopesticides and chemical pesticides after 24 hours of treatment on the green peach aphid *M. persicae*, where the second concentration of each pesticides achieved the highest mortality rate of 63.33% insect / petri dish whereas the lowest mortality rate was recorded in the second concentration as the mortality rate was 22.50% insect /petri dish. As well as, and the results illustrated a significant difference between the types of pesticides in the percentage of adult insect mortality. The chemical pesticide Thiamethoxam achieved the highest mortality rate of 85.00% insect/petri dish while the lowest mortality rate with the Tondxier that achieved 15.00% insect/petri dish. Additionally, the chemical pesticide Thiamethoxam at the second concentration was the highest in mortality rate that was 93.33% insect /petri dish. On the other hand, the lowest mortality rate was with the biopesticides Tondxier at the first concentration resulted 0.00% insect/petri dish. This result is in agreement with previous finding [13] that showed the two pesticides Joker and Actara were the most effective in controlling green peach aphid. The percentage of their effectiveness was 72.29% and 70.14% respectively, followed by the pesticide Joker (Acetampride), which had a percentage of effectiveness of 53.93%.

Table (2): Effect of plant extracts and chemical pesticides concentrations on the mortality rates of green peach *M. persicae* after 24 hours of treatment

Pesticides	Concentration		Pesticides effect average
	First concentration	Second concentration	
Thiamethoxam	76.67	93.33	85.00
Palazin	10.00	66.67	38.33
Acetampride	3.33	63.33	33.33
Tondxier	0.00	30.00	15.00
Control	0.00	0.00	0.00
Pesticides effect average	22.50	63.33	
L.S.D 0.05	**Pesticides**	**Concentrations**	**The interaction**
	15.128	11.111	23.222

Assessment of the Palazin, Tondxier, Thiamethoxam and Acetamiprid on the mortality rates of green peach insect *M. persicaein* after 48 hours of treatment

The results demonstrated in Table (3) showed a significant influence between the concentrations, type and interaction of the tested commercial biopesticides and chemical pesticides after 48 hours of treatment on the green peach *M. persicae* insect. The second concentration also reached the highest mortality rate of 84.16% insect/petri dish. However, the lowest percentage of the mortality rate was recorded in the first concentration as the mortality rate was 50.00% insect/petri dish. The finding presented a significant difference between the types of pesticides in the percentage of adult insect mortality, the chemical pesticide Thiamethoxam also achieved the highest mortality rate of 93.33% insect/petri dish. However, the lowest mortality level was with the biopesticides Tondxier that achieved 40.00% insect/petri dish. The biopesticides Palazin at the concentration the second concentration was the maximum pesticides with mortality rate 100.00% insect/petri dish,whereas the lowest biopesticides Tondxier at the first concentration, which amounted to 20.00% insect/petri dish.

Table (3): Effects of plant extracts and chemical pesticides concentrations on mortality rates of green peach *M. persica* adults after 48 hours of treatment

Pesticides	**Concentration**		**Pesticides effect average**
	First concentration	**Second concentration**	
Thiamethoxam	93.33	93.33	93.33
Palazin	43.33	100.00	71.66
Acetampride	43.33	83.33	63.33
Tondxier	20.00	60.00	40.00
Control	0.00	0.00	0.00
Pesticides effect average	50.00	84.16	
L.S.D 0.05	**Pesticides**	**Concentrations**	**The interaction**
	16.572	10.718	21.436

Assessment of the Palazin, Tondxier, Thiamethoxam and Acetamiprid on the mortality rates of green peach insect *M. persicaein* after 72 hours of treatment

The results indicated in Table (4) that there was a significant effect between the concentrations, type and interaction of the tested commercial biopesticides and chemical pesticides after 72 hours of treatment on the green peach *M. persicae* insect. The second concentration achieved also the top mortality rate of 92.50% insect /petri dish. However, the lowest percentage of mortality rate was recorded in the first concentration that was 78.33%, insect /petri dish. Moreover, the chemical pesticide Thiamethoxam achieved the uppermost mortality rate of 98.33% insect/petri dish. On the other hand, the lowest rate occurred with the biopesticides Tondxier where it achieved 71.66% insect/petri dish. As well as, the biopesticides Palazin at the second

concentration was the utmost 100.00% insect /petri dish and the Thiamethoxam at the first concentration achived also the highest mortality rate reached 100.00% insect/ petri dish. However, the lowest death rate was the Tondxier at the first concentration that amounted to 63.33%. This result agrees with findings of previous studies that indicated to the efficiency of the two pesticides Acetampride and Thiamethoxam, which belong to the Neonicotinoid group, against sucking insects, including aphid-*Myzus persicae* [14; 15;16]. Furthermore, the effectiveness of the pesticide Acetampride against the cotton aphid *Aphis gossypii*, was recorded and mentioned that the mechanism of action of these pesticides by affecting the acetylchline receptors in the central nervous system of the insects because it is a systemic pesticide, as well as its effect through contact [17].

Table (4): Effect of concentrations of biopesticides and chemical pesticides on the mortality rates of green peach aphid *M. persicae* after 72 hours of treatment

Pesticides	**Concentration**		**Pesticides effect average**
	First concentration	**Second concentration**	
Thiamethoxam	100.00	96.67	98.33
Palazin	76.67	100.00	88.33
Acetampride	73.33	93.33	83.33
Tondxier	63.33	80.00	71.66
Control	0.00	0.00	0.00
Pesticides effect average	78.33	92.50	
L.S.D 0.05	**Pesticides**	**Concentrations**	**The interaction**
	9.0513	8.9850	16.8638

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