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Effect of the aqueous and alcoholic extract of *Mentha spicata* on the control of nymphs and adults of the *Bemisia tabaci* (Homoptera: Alyrodidae) on eggplant in laboratory

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Abstract

We conducted a laboratory study to evaluate the effect of the aqueous and alcoholic extract of *Mentha spicata* on some aspects of the live performance of B. tabaci. The results of the study showed that the alcoholic extract in concentrations of (1, 2, and 3) mg/ml. It had a significant effect on the non-cumulative mortality of the different roles of the insect, where the concentration of 3 mg/ml excelled, as it reached the highest percentage of the mortality rate in the nymphs and adults (81.3% and 76.0%), respectively, at a concentration of 3 mg/ml after 72 hours. While the mortality rate for nymphs and adults in the aqueous extract at the same concentration was (74.3% and 68.7%), respectively, after 72 hours. The results showed that there is a direct relationship between the concentration of the extract and the percentage of mortality rate.

Key words : *Bemisia tabaci, Mentha spicata*

The Solanaceae family is one of the most widely distributed families worldwide and includes about 90 genera and up to 2000 species spread in large areas of the world, but concentrated in Australia and South America[9]. Iraq occupies an important place in the cultivation of the eggplant (*Solanum melongena* L.) Its total production amounted to about 56.62 million tons, according to FOA data[6]. The eggplant crop is infected with many pests, such as mites and aphids, the most important of which is the white fly (Homoptera): Aleyrodidae: *Bemisia tabaci* (Genn.), which is one of the most important and dangerous pests in this regard. The crop and many vegetable crops and other ornamental plants in many regions of the world, including Iraq[3]. The white fly B. tabaci caused significant annual financial losses to plant production in different countries of the world as a result of the damage caused by the direct feeding of this pest. and the secretion of the honeydew, which encourages

the growth of black mold on plant parts, as well as its ability to transmit many viral pathogens of plants, which has an effect on reducing production in terms of quantity and quality, which leads to a decrease in marketing value and profits[4]. The frequent use of chemical pesticides by humans in pest control has caused the emergence of new strains that are resistant to the action of those pesticides that are repeatedly used in their control, and this naturally requires the continuation of finding new effective pesticides that soon lose their effect with repeated use Therefore, the mint plant was chosen in an attempt to invest it as a safe alternative to chemical pesticides, and due to the lack of studies on this plant, the research aimed to investigate its effectiveness in some aspects of the insect life performance of the white fly *B. tabaci*.

Plant samples collection and diagnosis: Samples of the *Mentha spicata* plant, plants were collected in September from Babylon province/ Al-Mussaib region for the year 2022. The sample was diagnosed in the University of Babylon / Herbarium of the College of Science for Girls, then the samples were dried in laboratory conditions and ground to get a vegetable powder. They were kept in a sealed bottle and placed in the refrigerator until use.

Preparation of an aqueous extract of the M.spicata plant: A cold water extract of the mint plant was prepared according to the method (Al-Mansour, 1995) based on Harborne[8]. Take 10 g of mint plant powder and put it in a 500 ml glass beaker containing 200 ml cold distilled water. Mix the plant material with a magnetic mixer for 15 minutes, then leave the solution for 24 hours (to get a better extraction) after tightly covering it to avoid impurities entering.

The solution was filtered with filter paper several times and the filtrate was taken. After that, we deposited the foreign materials using the Centrifuge at a speed of 3000 revolutions/minute for ten minutes to get dry residuals, which were kept in small glass bottles tightly closed and kept in the refrigerator until use.

Preparation of the alcoholic extract of the M. spicata plant: it followed the (Harpn, 1984) method in preparing the alcoholic extracts by taking 10 g of the dry matter powder of the mint plant and placed in a Soxolate appratory and 200 ml of ethyl alcohol was added to it. The extraction took place for 24 hours at a temperature of 45°C. A rotary evaporator and the container on the raw extracted materials of plants concentrated the extracted sample. They dried the material in the electric oven at a temperature of 40-45°C, after which the dry residuals were taken and placed in airtight glass containers with a known weight and kept in the refrigerator until use. it repeated the process several times to get the required quantity. To determine the biological activity of the crude alcoholic extract of the mint plant 4 g of dry residual was taken for each extract separately, as it was dissolved in 3 ml of ethyl alcohol and 3 ml of the dispersant material, then the volume was completed to 100 ml with distilled water, and the concentration of the basic solution became 4% or the equivalent of 40 mg/ml, and the concentrations were prepared from it (1 %, 2% / 3%) mg/ml. The control treatment was 3 ml of ethyl alcohol and 3 ml of the diffuser, then the volume was added to 100 ml of distilled water. Effect of Aqueous and Alcoholic Extract of *M. spicata*

Mint Leaves on the Percentage of Destruction of the nymphs and Adult Role of *B. tabaci*. We used a Petri dish with a diameter of 9 cm and put each of them sterile filter paper in order to put the leaves of the eggplant plant on them after wrapping their necks with cotton swabs moistened with water for the purpose of feeding the insect, and put in each repeater (10) nymphs of the whitefly at the rate of (3) repeaters per concentrate and sprayed the repeaters with concentrations of the extract (1%, 2%, 3%) and distilled water as a comparison treatment, by (3) ml / refined by hand sprayer and to ensure coverage was sprayed with a distance of 5 cm incubated dishes incubator at a temperature of 30± 2 m was calculated the percentage of destruction after (24, 48, 72) hours, where the same method was used when treatment with alcoholic extract except for a comparative treatment was 5 ml ethyl alcohol and 3 ml diffuser and completed the volume to 100 ml distilled water, the same method was followed for the adult role.

Statistical analysis: The experiments were analyzed according to the factorial experiment model and with a completely randomized design (C.R.D) and using the Least significant difference (L.S.D) test under the probability level (0.05) to show the significance of the existing differences. The percentage of mortality was corrected according to the equation[1].

Table-1 the alcoholic extract of the mint plant at a concentration of 3 mg / ml was excelled, as the highest mortality rate was 77.8%, while the lowest mortality rate was 59.1% at a concentration of 1 mg / ml, while the aqueous extract had the highest mortality rate at a concentration of 3 mg / ml. mm, it reached 72.2% and the lowest was 45.6% at a concentration of 1 mg / ml. It is also noted that there is a direct proportion between the time and the concentrations, as the time increases, the percentage of mortality rate increases, reaching 59.1%, 65.6%, and 77.8% in concentrations 1, 2, and 3 mg/ml after (24, 48, and 72) hours in the alcoholic extract. As for the aqueous extract, the percentage of mortality rate was 45.6%, 62.2%, and 72.2% in concentrations 1, 2, and 3 mg/ml after (24, 48, and 72) hours, respectively. As for the effect of the extract type factor, the alcoholic extract was superior compared to the aqueous extract by increasing the percentage of mortality, reaching 51.1% with the alcoholic extract and 45.0% with the aqueous extract. As for the interference, the highest percentage of the mortality rate was 81.3% in the concentration of 3 mg / ml after 72 hours and for both types compared with the control treatment, and the results of the statistical analysis showed that there were significant differences in the got results.

Table-2 shows the alcoholic extract of the mint plant at a concentration of 3 mg / ml was excelled, as the highest mortality rate was 73.3% and the lowest was 36.6% at a concentration of 1 mg / ml. As for the aqueous extract, the highest percentage of mortality was at a concentration of 3 mg / ml, which was 67.8%, and the lowest was 35.7% at a concentration of 1 mg / ml. It is also showed that there is a direct proportion between the time and the concentrations, as the time increases, the percentage of mortality rate increases, reaching 36.6%, 62.2%, and 73.3% in concentrations 1, 2, and 3 mg/ml after (24, 48, and 72) hours in the alcoholic extract. As

Table-1. Effect of concentrations of aqueous and alcoholic extracts of M. spicata on the percentage of the nymphal period of the whitefly *B. tabaci*

Extract type	The time period is in hours Concentration mg/ml	24	48	72	Concen-tration rate	Average extract type
Aqueous extract	0	0.00	0.00	0.00	0.00	45.0
	1	30.0	42.0	51.0	45.6	
	2	53.1	63.3	69.7	62.2	
	3	60.7	67.3	74.3	72.2	
Alcoholic extract	0	0.00	0.00	0.00	0.00	51.1
	1	49.3	60.0	70.0	59.1	
	2	56.7	66.7	75.3	65.6	
	3	63.4	75.7	81.3	77.8	
Average time periods		51.1	57.1	60.8	---	
LSD(0.05) value for Extract type		5.39				
LSD value (0.05) for the concentrations		8.41				
LSD value (0.05) for the time periods		2.83				
LSD (0.05) value for interaction		7.43				

for the aqueous extract, the percentage of mortality was 35.7, 55.9, and 67.8% in concentrations 1, 2, and 3 mg/ml after (24, 48, and 72) hours, respectively. As for the effect of the extract type factor, the alcoholic extract was excelled compared to the aqueous extract by increasing the percentage of mortality, reaching 46.8% with the alcoholic extract and 40.0% with the aqueous extract. As for the interaction, the highest percentage of the mortality rate was 76.0% in the concentration of 3 mg / ml after 72 hours for both types compared with the control treatment, and the results of the statistical analysis showed that there were significant differences in the results.

The study showed that the nymph was more sensitive to the action of the compounds, and the reason may be because of the presence of active compounds that have a toxic effect when entering the digestive system, the lack of thickness of the cuticle layer in the insect's body, and the penetration of toxic compounds present in the extract into the nymph's body, Or its effect on the efficiency of food conversion of treated nymphs. Some compounds that are extracted from some plants, including medicinal

Table-2. Effect of concentrations of the aqueous and alcoholic extract of the plant *Mentha spicata.* M in the percentage of the adult period mortality of the whitefly *B. tabaci*

Extract type	The time period is in hours Concentration mg/ml	24	48	72	Concen-tration rate	Average extract type
Aqueous extract	0	0.00	0.00	0.00	0.00	40.0
	1	22.7	36.7	47.9	35.7	
	2	46.7	57.3	60.0	55.9	
	3	55.0	61.7	68.7	67.8	
Alcoholic extract	0	0.00	0.00	0.00	0.00	46.8
	1	23.3	40.0	53.3	36.6	
	2	50.0	60.1	71.7	62.2	
	3	60.7	70.3	76.0	73.3	
Average time periods		43.1	50.4	56.7	---	
Extract type (0.05) LSD		5.24				
LSD value (0.05) for the concentrations		8.83				
LSD value (0.05) for the time periods		4.65				
LSD (0.05) value for interaction		5.49				

plants, affect the Protase enzyme in the middle alimentary canal, besides the level of sugar and protein in the blood of insects and that some of the active chemicals present in the plant extracts may unite with some fatty compounds, proteins and digestive enzymes, and thus form indigestible chemical complexes, which leads to an effect on the metabolism of the insect's body[5]. The results of the study conducted by the researcher Hamza[7] in 2017 showed the superiority of the ethyl alcohol extract of the dendritic plant Lantana camera over the extract of the cinnamon plant *Cinnamomnm zeylanicun* with a concentration of 1.5% on the bean *Aphis fabaes* It gave a mortality rate of 40.0% after 24 hours, while the comparison treatment, which amounted to 3.3%, was for the same period.

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