

Evaluation of the efficacy of Canfor oil and Bifenthrin on eggs and adults of red two-spot mite Acariformes: Tetranychidae (Kock) Tetranychus urticae on cowpea in laboratory.

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Abstract. Experiments were conducted to evaluate the efficacy of Canfor oil applied at rates of 0.5, 1, 1.5 and 2 ml/L and Bifenthrin applied at rates of 0.25, 0.5, 0.75 and 1 ml/L on the roles of adults and eggs of two-spot mites (Acariformes: Tetranychidae) Tetranychus urticae on the cowpea plant *Vigna unguiculata*. L. The results of the practical experiment showed that eucalyptus oil at concentrations 0.5, 1, 1.5 and 2 ml / L, respectively, caused the mortality of adult mites at a rate of 37.21, 67.43, 83.72 and 95.34 % after 72 hours of treatment. It led to a reduction in the egg hatching rate to 63.33, 43.33, 30 and 20% at the same mentioned concentrations, respectively, after 7 days of treatment, while the comparison treatment recorded a hatching rate of 100% after the same mentioned time period. As for Bifenthrin, at concentrations of 0.25, 0.5, 0.75 and 1 ml / L, respectively, it mortality Mite adult by 37.21, 93.02, 100 and 100% after 72 hours of treatment, and it reduced the hatchability rate of eggs to 63.33, 43.33, 40. and 26.66% at the same concentrations mentioned, respectively, after 7 days of treatment, The control treatment recorded a hatching rate of 100% after the same mentioned time period. The practical results indicated that the interaction between Canfor oil and Bifenthrin applied at an average of 0.75 ml/liter of oil + 2 ml/L of pesticide and 1 ml/L of oil + 2 ml/L of pesticide, respectively. It led to the Mite of T. urticae adults with a percentage of 97.77 and 100% after 24 hours of treatment, respectively, and it led to a reduction in the percentage of eggs hatching to 20 and 10% at the same mentioned concentrations, respectively, after 7 days of treatment.

Keywords: - red Mite with two spots - eucalyptus oil - Bifenthrin pesticide - cowpea

1.

Introduction

The cowpea plant *Vigna unguiculata* L. is one of the plants of the leguminous family Fabaceae, known for its high nutritional value.[5] mentioned that its grains contain a high percentage of proteins ranging from 43-17% of the weight of the grains for this reason, cowpea is sometimes called vegetable meat. The nutritional value of cowpeas is not limited to what it contains of proteins only, but also contains a high percentage of carbohydrates, fats, and mineral elements, such as iron, calcium and phosphorous[11]& [12] mentioned that cowpea cultivation is abundant in East Asia, West and Central Africa, and Central and Southern North America. The climate suitable for cultivation and growth of cowpea crop is the tropical semi-humid climate [16]Its cultivation began in West Africa, as it was planted with millet and corn, where Nigeria is the first country in the world in producing cowpea, followed by Mali and Burkina Faso[17]. In Iraq, it is cultivated in the center and the south, and the cultivated area in 2019 amounted to (19142) dunams, and the production rate is 31064 tons. Therefore, Iraq is included in the list of cowpea producing and consuming countries[19]. Cowpea is also one of the plants preferred by farmers, where . it contributes to increasing soil fertility through nitrogen fixation by bacteria that reside in its root nodes [13].The two-spot red mite is one of the important pests that affect cowpea plants, and it causes many problems. The mite sucks the plant juices. The depletion of chlorophyll and yellowing of the leaves, as well as the secretion of spiderwebs and the accumulation of dust, thus impeding the photosynthesis process and reducing the yield of cowpea crop. In the case of severe infection, the plants die. [7]showed that the red two-spot mite *T. urticae* infects the cowpea plant *Vigna unguiculata* and causes economic losses in production ranging between 70-80%, especially when the plant is early infected, and the two-spot red mite *T. urticae*. It is one of the most important and widespread species globally and has the ability to attack more than 1,100 plant species,

of which about 300 are of economic importance, including cowpea *Vigna unguiculata* [21, 19 , 15]. Vegetable oils and chemical pesticides were used in order to control this dangerous pest. Various types of chemical pesticides such as Chlorfenapyr, Naturall 40 and Abamactin were used alone or included in integrated management programs to control *T. urticae* [2& 10]Among the vegetable oils are chamomile, *Matricaria chamomilla*, *Coriandrum sativum*, and *Salvia rosmarinus*. and mint *Mentha* spp. Which proved its efficiency and to different degrees in combating the different roles (eggs, larvae, nymphs and adults) of the two-spot red mite *T. urticae* [14]

2- Materials and methods

2-1 Breeding the two -spotted red mite in the laboratory

The laboratory experiment was conducted using the Leaf Disc method of researchers and Takafuji Konodo (1985) with some simple modification conducted by [1] which is to take three discs from the edges of the upper leaves of the cowpea plant with a diameter of 4 cm. It is placed on its upper surface inside a plastic dish with a diameter of 9 cm and a height of 1.5 cm. It contains a layer of sponge previously moistened with water and covered with filter paper so that no opening is left between the edges of the cowpea leaves and pit for the repeater . Each repeater is made of cotton, with the repeats numbered as three, and the plastic cover is wiped from the outside with a layer of Vaseline to prevent the mites from escaping, with the outer cover of the dish being perforated by a danbos for the purpose of injecting water from time to time with a 5 ml medical syringe so that the paper remains for a longer period of time preserving its vitality.Then the pubescent females were transferred with 15 adult females on each paper disc and these replicates were numbered.

2-2

Effect of Canfor oil and bifenthrin on the roles of repeater laboratory

2-2-1 Effect on the rate of egg hatching

The vegetable oil used against red mites with two spots was prepared by dissolving the vegetable oil in an aqueous solution containing 1000 ml of sterile distilled water with one ml of dishwashing liquid (bright) for the purpose of dissolving oils in water [18], Five adult females were transferred to each replicate (paper) and after 24 hours the adults were raised and 10 eggs were left for each replicate and the excess eggs were destroyed by a medical syringe needle. All leaves were sprayed using a hand sprayer until completely wet with concentrations of 0.5, 1, 1.5 and 2 ml / liter, prepared by dissolving the mentioned concentrations in 99.5, 99, 98.5 and 98 ml of distilled water containing dishwashing liquid, and each separately. The chemical pesticide was tested at concentrations of 0.25, 0.5, 0.75 and 1 ml/L, as well as the interaction between vegetable oil and the pesticide at concentrations 2+0.75 and 2+1 ml/L. A control treatment was also carried out by spraying the leaves of the plant with sterile distilled water only. All treated papers were placed in an incubator with a temperature of $5 \pm 25^\circ \text{C}$ and a relative humidity of $65 \pm 5\%$. After 6 days of spraying, the results were taken by calculating the number of hatched eggs in each replicate (paper). Another section of your paper.

2-2-2 Effect on adults with red two-spot mites *T. urticae*

This experiment was conducted using the same method mentioned in the previous paragraph, through an artificial infection of cowpea leaves by transferring 10 adults to the red mite with two spots *T. urticae*, with three replications for each treatment by using a small needle and immersing it in water that helps to quickly adhere the mites without causing her any harm. I sprayed all the leaves bearing the adult mites with different concentrations of oil and chemical pesticide, as well as the interaction between them, according to the concentrations mentioned in the previous paragraph, and both individually and until the leaves were completely wetness. All treated leaves were transferred to the incubator to provide the optimum temperatures and humidity for mite growth ($5 \pm 25^\circ \text{C}$ and relative humidity of $65 \pm 5\%$, respectively) suitable for growth and development of mites. After 1, 2,

and 3 days have passed the mortality rate individuals was calculated in each duplicate within one treatment and the values were corrected according to the Schneider and Orell equation mentioned in [4].

$$\% \text{ Corrected for mortality} = \frac{\% \text{ death in treatment} - \% \text{ death in control}}{100\% \text{ death in control}} \times 100$$

2-3 Statistical data analysis

A completely randomized design (C.R.D) was used in the design of laboratory experiments. The results were analyzed using the Least significant difference, L.S.D test at a probability level of 0.05 and using the Genstat program [3]. The data of the results of experiments with the numbers of mortality were corrected according to the previously mentioned Schneider and Orell equation.

3- Results and discussion

3-1 Effect of different concentrations of Canfor oil and Bifenthrin on the numerical density of the hatching rate of *T. urticae* eggs in the laboratory.

The results of Table 1 showed that there were no significant differences in the effect of the active substance (Canfor oil and Bifenthrin) on the percentage of *T. urticae* hatching eggs, which amounted to 34.332 and 35.498, respectively. As for the interaction of Canfor oil and Bifenthrin, and the time period in the percentage *T. urticae*. The results showed that the highest effect rate of the different concentration factor was at the concentrations of 2 ml / L of oil and 1 ml / L of the pesticide, as the hatchability rate of eggs reached 13.33 and 17.49, respectively, and that the least effect was in the control treatment, as the hatchability rate of eggs reached 62.50%. As for the time effect factor, there are significant differences between days 1, 3 and 5, and there are no significant differences between days 5 and 7. As for the interaction effect of concentrations of 2 ml / L of oil and 1 ml / L of pesticide and time. It gave the highest rate of effect on egg hatching after 7 days of treatment, reaching 20 and 26.66, respectively, and thus significantly excelled on the rest of the concentrations in all time periods.

3-2 Effect of different concentrations of Canfor oil and Bifenthrin on the population density of *T. urticae* in laboratory

The results in Table 2 indicate that Bifenthrin was significantly excelled on Canfor oil

The average effect of the active substance on the mortality of adult *T. urticae* adults was 76.00 and 66.57, respectively. As for the interaction effect of Canfor oil and Bifenthrin pesticide and the time period on the percentage of mortality of *T. urticae* adults, the results showed that the highest effect rate of the different concentrations factor was at the concentrations of 2 ml / L for oil and 1 ml / L for the pesticide, with a mortality rate of 93.86 and 99.24%, respectively. As for the factor of the effect of the time period, the time period of 3 days was significantly excelled on the time period, Where the percentage of mortality was 76.74% compared to the time periods of 1 and 2 days, where the percentage of mortality reached 65.05% and 72.08%, respectively. As for the effect of the interaction, the concentrations of 2 ml / L of oil and 1 ml / L of the pesticide gave the highest mortality rate after 3 days of treatment, which reached 95.34 and 100, respectively. Thus, it excelled on the rest of the concentrations in all the time periods. Where [7] found that vegetable oils affect the treated eggs through several mechanisms, including encapsulation of the egg shell and preventing gas exchange, as well as the oil works to harden the egg shell and therefore the embryo cannot exit. The effect

may also be through the entry of vegetable oil into the egg and the effect on the protoplasm and thus the mortality of the embryo. It was found that the use of olive oil and garlic oil at a concentration of 1500 parts per million (ppm) gave high efficacy in controlling the adults of the rice weevil *Sitophilus oryzae* and *Trogoderma granarium* [8]. [22] also found a high effectiveness of the volatile oils in the peels of sweet and bitter orange in the control of the adults of the red mite with two spots in the laboratory. [9] found that olive oil is the most efficient compared to other vegetable oils (cloves and Afghani hashish) in reducing the number of hatched eggs and increasing the mortality of the different roles of the red two-spotted mite. The pesticide Abamectin 18 g/L + Hexethiasox 50 g/L showed high efficiency compared to other pesticides (Pyridabine 25% + Spirodiclofen 5% and Abamectin 18 g/L). Where it gave a significant effect in reducing the number of hatched eggs and increasing the mortality of the moving roles of the red mites with two spots, and this efficiency may return because it contains more than one effective substance as well as the efficiency of those active substances. It was found that the insecticide Abamectin caused 100% of the motile and egg-destruction of *T. urticae* within 3 hours of treatment [20]. It was also found that Abamectin and Chlorfenapyr are effective in reducing the density of *T. urticae* [6].

Table (1) Effect of different concentrations of Canfor oil and Bifenthrin on the numerical density of the hatching rate of *T. urticae* eggs in the laboratory.

Concentration rate ml/L	The average of active substance	The percentage of eggs hatched during the time period (day/				Concentration ml/L	The active substance type
		7	5	3	1		
62.50	34.33	100	100	50	0	0	Canfor oil
44.16		63.33	63.33	50	0	0.5	
29.99		43.33	43.33	33.33	0	1	
21.66		30	30	26.66	0	1.5	
13.33		20	20	13.33	0	2	
62.50	35.49	100	100	50	0	0	Bifenthrin
43.33		63.33	63.33	46.66	0	0.25	
26.66		43.33	43.33	20	0	0.5	
27.50		40	40	30	0	0.75	

17.49		26.66	26.66	16.66	0	1	
		53.298	53.298	33.664	0	Average time period effect	
active substance=2.041 Concentration = 3.227 time period = 2.886interaction = 4.563							L.S.D _{0.05}

Table (2) shows the effect of different concentrations of Canfor oil and Bifenthrin on the numerical density of *T. urticae* in the laboratory.

Concentration rate ml/L	The average of active substance	The percentage of eggs hatched during the time period (day/			Concentration ml/L	The active substance type
		3	2	1		
33.86	66.57	37.21	32.56	31.82	0.5	Canfor oil
59.31		67.43	62.79	47.72	1	
79.27		83.72	81.39	72.72	1.5	
93.86		95.34	95.34	90.91	2	
25.44	76.00	37.21	20.93	18.18	0.25	Bifenthrin
84.70		93.02	88.36	72.72	0.5	
94.65		100	95.34	88.63	0.75	
99.24		100	100	97.72	1	
		76.74	72.08	65.05	Average time period effect	
active substance = 0.002 Concentration = 0.003 time period = 0.002 interaction = 0.008						L.S.D _{0.05}

3-3

Effect of different concentrations of the interaction of Canfor oil and Bifenthrin on the numerical density of the hatching rate of *T. urticae* eggs in the laboratory.

The results in Table 3 indicate the interaction effect of Canfor oil and Bifenthrin, as well as the time duration on the percentage of hatching of *T. urticae* eggs. The results showed that the highest effect rate of the different concentration factor Canfor oil + Bifenthrin was at the concentration of 2 ml / L of oil +1 ml / liter of the pesticide, where the hatchability rate of eggs was 5%. The least effect was in the control treatment, which amounted to 63.75%. As for the influence factor of the time period, there are significant differences between the time periods 1, 3 and 5, and there are no significant differences between the time periods 5 and 7. As for the effect of the interaction, the concentration of 2 ml / L of oil +1 ml / L of the pesticide gave the

lowest percentage of eggs hatching after 5 and 7 days of treatment, which amounted to 10%, and thus it significantly excelled on the rest of the concentrations in all time periods.

3-4 Effect of different concentrations of the interaction of Canfor oil and Bifenthrin on the population density of *T. urticae* in laboratory .

The results of Table 4 indicate the effect of the interaction of Canfor oil and Bifenthrin pesticide, as well as the time period on the percentage of mortality of *T. urticae* adults, as the results showed that the highest effect of Canfor oil + Bifenthrin was at a concentration of 2 ml/L of oil +1 ml. / L of the pesticide, as the death rate was 100%. As for the factor of the effect of the time period, there are significant differences between the time periods of 1 and 2 days, and there are no significant differences between the time

periods of 2 and 3 days. As for the effect of the interaction, the concentration of 2 ml / L of oil and +1 ml / L of the pesticide gave the highest mortality rate after 2 and 3 days of treatment, which amounted to 100%, which is significantly excelled on the rest of the concentrations in all time periods. The interaction or synergy between the factors works to affect the pests more than if they

were used alone, as [9] found that the interaction between most of the control factors caused an increase in the mortality rate of adults with red mites with two spots, which reached 100%. The interaction between Abamectin 18 g / l + Hexithiasox 50 g / l + olive oil recorded the highest mortality rate of 100%.

Table (3) Effect of different concentrations of mixed concentrations of Canfor oil and Bifenthrin on the numerical density of the hatching rate of T. urticae eggs in the laboratory.

Concentration rate ml/L	The average of active substance	The percentage of eggs hatched during the time period (day/				Concentration ml/L	The active substance type
		7	5	3	1		
63.75	27.083	100	100	55	0	0	Canfor oil + Bifenthrin
12.5		20	20	10	0	2+0.75	
5		10	10	0	0	2+1	
		43.33	43.33	21.66	0	Average time period effect	
Concentration = 0.944 time period = 1.090 interaction = 1.887							L.S.D _{0.05}

Table (4) Effect of different concentrations of the interaction of camphor oil and Bifenthrin on the numerical density of T. urticae in the laboratory.

Concentration rate ml/L	The average of active substance	Percentage of adults morality during the time period (day/			Concentration ml/L	The active substance type
		3	2	1		
99.25	99.62	100	100	97.77	2+0.75	Canfor oil + Bifenthrin
100		100	100	100	2+1	
		100	100	98.885	Average time period effect	
Concentration = 0.333 time period = 0.333 interaction = 0.578						L.S.D _{0.05}

4-

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