

Effect Of Some Vegetable Oils On Life Stages Of The Two-Spotted Spider Mite *Tetranychus Urticae* Koch (Acari: Tetranychidae) On Eggplant

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Abstract

The study aimed to evaluate the effectiveness of some types of vegetable oils with different concentrations in affecting the phases of red mites with two spots. The results showed that the level of the effect differed according to the type of vegetable oil, as well as the effect of the concentration used was clear. With regard to the effect of oils on oyster eggs, the highest effect was in the treatment of olive oil, which recorded the lowest hatchability rate of 0.00%, followed by cannabis oil with hatchability of 1.67%, then clove oil, which recorded hatchability rates of 21.25% and 24.17 at concentration 2 and 5%, respectively. The best results were when treating olive oil compared with other oils, which led to the highest mortality rate of 96.05, 97.70 and 97.17% on all motile stages (larvae, nymphs and adults), respectively, while clove oil recorded the lowest mite mortality with values of 91.53 and 86.16 and 84.44%, respectively. In general, it was found that the increase in the concentrations of vegetable oils corresponded to an increase in the mortality rate of the mobile phases, as the higher concentration (5%) led to the highest mortality rates for all the mobile phases with significant differences from the other concentrations.

Keywords: Biological control, botanical oil, solanum, mites

INTRODUCTION

The two-spotted spider mite (Koch) *Tetranychus urticae* is a widespread worldwide pest infecting about 1200 species of plants, of which about 150 are of economic importance (Gauraha-Rashmi and Singh., 2011; Zhang-zhiQiang, 2003). The family of the common red mite, Tetranychidae, to which this type of mite belongs, is one of the most common mite families that causes damage to its families in central Iraq, and its presence was 55.12% of the total harmful plant mites (AL-Gboory, 1987). A two-factor mite has many local names, including the greenhouse mite and the simple red spider's nipple. It is considered one of the difficult species that can be distinguished outwardly due to geographical and environmental differences (Al-Mallah, 2009).

The symptoms of infection start at leaf base and blade next to the main veins in the form of pale green spots on the upper surface of the leaves, while the lower surface of the leaf containing mites at different life stages. As the infection becomes more severe, the spots turn red-violet. The mites spin sort of net tissue that protect them from vital enemies, rain

and pesticides. This tissue mostly leads to the accumulation of dust, so that the infected plants appear dusty (Hamida, 2001, Al-Mallah, 2009 and Wertheim, B, 2005). The eggplant, *Solanum melongena* L., is one of the main vegetable crops in Iraq. The cultivated area was of about 665 hectares with a productivity of 51.7 tons/ha (ICSO, 2018).

Pesticides are among the first methods used to control the two-spot mite. This use has accompanied the emergence of many problems, the most important of which is the development of pest resistance to the pesticide and the accumulation of pesticide residues in fruits ready for consumption (Taher.MM, 1992, Van et al. 2010) Kamel et al. (2007) and DHKemp and Kuns (1994) indicated the continuous emergence of resistance in the targeted pests, in addition to the negative effects of the residues of these pesticides on humans, the environment, and farm animals. The emergence of resistance, so the study aimed to test the effectiveness of olive oil, clove oil, and Afghan hashish oil with different concentrations in controlling the different stages of red two-spot mite, and evaluating the efficiency of using these extracts as alternatives to chemical control.

MATERIALS AND METHODS

Establishing permanent culture farm of *T. urticae*

The two-spotted red mite (*T. urticae*) was obtained from one of the fields planted with eggplant plants in Al-Najaf Governorate. Eggplant plants (Barcelona variety) were grown in 5 kg plastic pots containing sterile soil (2 soil: 1 peat moss) and placed in a growth chamber with the provision of growth requirements for mites growth at temperature of $25 \pm 2^\circ\text{C}$ and humidity of 5 ± 65 (%) (Al Nuaimi, 2007). A number of *T. urticae* at different life stages were transferred to eggplant plants after their molecular and phenotypic diagnosis in the mite laboratory - College of Agriculture - University of Karbala. It was taken into consideration to continue introducing healthy and newly grown plants (2-3 weeks old) into the growth chamber and excluding old plants to ensure obtaining mites for the duration of the study.

General procedure

Laboratory experiments were carried out in cages. Plastic tubes, each of 2 cm long, were installed inside a 20 x 10 cm plastic basin in the form of a line containing three tubes. The plastic basin was filled with water until the tubes inside it (panel) were submerged. Fresh uninfected eggplant leaves were used and fixed on plastic tubes, then the buds were transferred to the leaves (10 individuals/sheet). This method helped not to allow the mite to escape and to keep the plant leaves retaining moisture for as long as possible. Cages were used to study the effect of plankton and filtrate of some fungi, extracts and vegetable oils, and chemical pesticides, as well as the effect of different temperatures on the two-spotted spider mite.

The vegetable oil preparation (olive oil, clove oil, and cannabis (hemp) oil) was prepared. The vegetable oil was dissolved in 1000 ml of sterile distilled water with one ml of dishwashing liquid (Youns and Mohammed 2020) and the concentrations were obtained 0.0, 0.5, 1.0 and 2.0. and 5.0%. Five adult females were transferred to each replicate (eggplant leaf), and after 24 hours, the adults were removed, leaving 10 eggs for each replicate, and the excess eggs were destroyed. All leaves were sprayed until wet

using a hand sprayer. The control was treated by spraying the leaves of the plant with sterile distilled water only. The treatments were incubated at 5 ± 25 °C and the humidity was $65 \pm 5\%$. After 2 or 6 days of spraying, data were taken for the number of hatched eggs in each replicate (leaf).

As for the effect of the vegetable oils under study on the motile instars (larvae, nymphs and adults), the experiment was carried out in the same way in the case of eggs. Artificial infection of eggplant leaves with 10 individuals (larvae, nymphs or adults) of *T. urticae* was applied separately with three replicates for each treatment. Spraying was done with the same concentrations and incubation as previously mentioned with the eggs. The mortality percentages after 1, 2, and 3 days were calculated in each replicate within the same treatment. The corrected mortality ratio values were calculated according to Abbot's equation.

RESULTS AND DISCUSSION

The results showed that the vegetable oils (olive oil, Afghani cannabis oil and clove oil) used in this study had a clear effect in reducing the percentage of hatched eggs compared to the control treatment (Table 1). The olive oil treatment led to the lowest hatchability rate (0.00%), then hemp oil (1.67%) and clove oil (3.33%), which did not differ among each other, but all oils treatments differed significantly from the control treatment, which led to the highest hatching rate of 85.00%. . The results also showed that increasing the concentration of the used oil led to a higher reduction in the hatching rate of the two-spotted spider mite eggs. Generally, olive oil at all concentrations after 4 days of treatment recorded complete inhibition of hatching compared to the percentage of hatched eggs (93.33%) in the control and clove oil and cannabis oil at the two concentrations (1% and 2%) after the same period.

As for the mobile phases of the two-spot dream spiders, the results (Table 1) showed that the mortality rate increased with an increase in the oil concentration and the duration after treatment. Generally, for most concentrations, the period of 3 days after treatment showed complete mortality rate for the larvae of two-spotted spider mites. The lowest larval killing rate was 92% in the treatment of clove oil with the lowest concentration (0.5) ml / liter. In general, olive oil, regardless of the concentration used, had the highest effect and recorded a complete mortality rate (100%) after three days of treatment and without any difference from cannabis oil.

Similarly, treatments with vegetable oils affected the nymphs and adults of the two-spotted spider mites. In the case of the lowest concentration (0.5 ml/L), the highest mortality rate was with olive oil treatment after one day of treatment, which increased to 100% after three days after treatment, which did not differ from cannabis oil. While the lowest mortality rate was in clove oil, with a significant difference from the other two oils. Generally, regardless of the type of oil used, all concentrations higher than 0.5% and higher than 1% resulted in a complete mortality for nymphs and adults, after three days of treatment, respectively.

Table1. Effect of vegetable oils (olive oil, Afghani cannabis oil and clove oil) at different concentrations on different life stage of the two-spotted spider mites

Treatments (Plant oils)	Concentration ml.L ⁻¹	% of hatched eggs post treatment		Corrected % larvae mortality (days post treatment)			Corrected % nymphs mortality (days post treatment)			Corrected % adults mortality (days post treatment)		
		4 days	6 days	1	2	3	1	2	3	1	2	3
Control	D.W.	76.67	93.33									
Cloves	0.5	6.67	10.00	58.62	67.86	92.59	34.49	62.07	85.72	30.00	44.83	85.72
	1.0	3.33	6.67	89.66	100.00	100.00	79.31	89.66	100.00	80.00	89.66	100.00
	2.0	0.00	0.00	89.66	100.00	100.00	89.66	93.10	100.00	90.00	93.10	100.00
	5.0	0.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Olive	0.5	0.00	0.00	74.14	78.57	100.00	86.21	89.66	100.00	83.33	89.66	96.43
	1.0	0.00	0.00	100.00	100.00	100.00	96.56	100.00	100.00	96.67	100.00	100.00
	2.0	0.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	5.0	0.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Cannabis	0.5	3.33	3.33	68.97	76.78	100.00	75.87	86.21	96.43	80.00	86.21	96.43
	1.0	3.33	3.33	89.66	100.00	100.00	89.66	93.10	100.00	90.00	93.10	100.00
	2.0	0.00	0.00	100.00	100.00	100.00	89.66	96.56	100.00	90.00	96.56	100.00
	5.0	0.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	10.00	100.00	100.00
LSD (P≤0.05)		5.747		9.910			9.720			9.573		

The results showed that all vegetable oils (olive, cannabis and cloves) in this study had a clear effect on the eggs and different stages of the two-spotted mite even when used in relatively low concentrations. Lu (and Wn, 2010) found that the essential oils extracted from the plant *Altissima Ailanthus* were effective in repellent and lethal by contact and fumigation against four major insects of stored grain pests. It was also found that the use of summer oil with concentrations of 0.5 and 1% led to a reduction in the number of eggs laid for the tomato leaf miner *Tuta absoluta* by 59.45 and 76.95%, respectively (Horeya and Al-Hayek (2016). Al-Salihi (2018) indicated that the treatment of foliar spray using different concentrations) 0.25, 0.5, 1.0 % of neem oil was significantly better than the soil treatment in controlling the second-stage nymphs of the whitefly. The cannabis oil contains many active ingredients and other organic compounds due to the effective effect.

On the other hand, it was found that the use of olive oil and garlic cloves oil led to a high mortality rate for adults of rice weevil and *khabra* at the concentration of 1500 PPM (Sakr et al., 2018). Al-Essawi and Al-Omrani (2021) also indicated the effectiveness of the volatile oils of sweet and bitter orange peel in the laboratory in controlling the adults of the two-spotted spider mite, with a low effect on the predatory mite *Phytoseiulus persimilis*. The same study showed that the residual activity of these oils declines with time, and the study confirmed that volatile oils represent a promising alternative to chemical pesticides with the possibility of introducing them within the integrated management program.

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