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USE OF ALCOHOLIC AND WATERY EXTRACT OF *CUMINUM CYMINUM* L. IN CONTROLLING THE TWO SPOTTED SPIDER MITE ON *CUCUMIS SATIVUS* L.

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Abstract

In this study, the effect of alcoholic ethanolic extract and watery extract of Cumin seeds was investigated on the mortality percentage of motile stages (larvae, nymphs, adults: female and male) of the mite pest. The concentrations (0, 1, 2, 3, 4 and 5) % are used for the purpose of testing it using the direct spray method for each concentration and for each type of the extract. As well as, recording the mortality percentage for each stage of the motile stages separately, after (24, 48 and 72) hours from treatment .The highest mortality percentage was for the highest concentration used in the experiment , which is (5%) after 72 hours from treatment, which it achieved (100.00, 92.00%) for the larvae stage, and (98.00, 86.00%) for the nymphs stage. Furthermore, it achieved (98.00, 84.00%) for the adult male and (96.00, 82.00%) for the adult female of the extract (alcoholic and watery), respectively, while the lowest mortality percentage was for the comparison treatment 0%. It was observed that the alcoholic extract was superior over the watery extract of all concentrations and for all stages, as the mortality percentage in it were higher, the highest mortality percentage was in the larvae stage, while the lowest mortality percentage was for the adult females stage and for all concentrations for both solutions and for the three readings.

Key words: *Cuminum cyminum* L., The two-spotted spider mite, alcoholic and watery extracts.

Introduction

Cucumis sativus L. (Cucumber) belongs to the Cucurbitaceae family, and its original native is India and the African continent (Al-Sahaf *et al.,* 2011). Furthermore, the cucumber plants are cultivated inside Iraq in two methods, open and protected field agriculture, where the open field agriculture carries during spring and fall season it was grown in plastic greenhouses, tunnels, and glass greenhouses. Moreover, the area planted with cucumber plants in Iraq in 2005 amounted to (188381) dunums, and with a productivity rate of (431,868) tons (Central Statistical Organization, 2011). However, the cucumber plant is infected with many pests, including the mite pest, where the motile mite groups absorb the vegetable juice and weave the web, which leads to accumulating the dust on the plant and the filling the stomata for both the (cucumber water) and the (smake cucumber) (Mehdi *et al.,* 2017). This leads to a decrease in the rate of photosynthesis, as the symptoms of infection appear by yellowing the plant leaves, after which it dries up and consequently the fruits yield is reduced (Moraes and Flechtmann, 2008). *Tetranychus urticae* Koch. is a widespread pest in many countries of the world and causes economic losses to different plant families. Therefore, it was controlled with different types of chemical pesticides, which led to the emergence of the pesticide resistance characteristic (Ay *et al.,* 2005; Bostanian *et al.,* 2003). The characteristic of resistance developed very rapidly due to their multiplicity of generations formed during the year and its rapid reproduction rate, which increased the size and severity of the problem (Sato; 2003, Ashley *et al.,* 2009). This encouraged the researchers to find environmentally friendly natural compounds to control this pest, and plant extracts were the best alternative. The plant extracts have great benefits when used in pest control as an alternative to chemical pesticides, among the most important benefits are that they delay or prevent the appearance of the resistance characteristic in pests, including the mite pest, because the raw extract contains many active secondary compounds that found in the same plant. Among the active compounds present in plants are

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flavonoids, alkaloids, and terpenoids have many biological activities including killer for all pest stages, and growth regulator and repellent for pests (Rattan 2010). *Cuminum cyminum* L. was chosen because it contains many active compounds, which is belongs to the Umbelliferae family and is considered as one of the most important and famous condiments. Furthermore, it is a winter annual herbaceous plant, where it is original native Egypt, Iran and Turkestan and cultivated in vast areas in each of Iran, China, India and many other cities (Zargari, 1989). It is used in perfumery and the pharmaceutical industry, and its volatile oil is used in the pharmaceutical industry to add the distinctive smell, to sterilize medical threads that used in surgical operations, and to produce some veterinary medicines and agricultural pesticides, (Behera *et al.,* 2004). Alcoholic extract (80% methanol) for cumin seed has many active compounds including alkaloids, flavonoids, saponins, steroids, terpenoids, phenol, and glycoside (Prajapati *et al.,* 2019). These active compounds have many biological effects and their effectiveness in inhibition and killing many microorganisms that cause diseases and which cause damages to food and have proved to be a great success in this field (De *et al.,* 2003). Based on the foregoing, the cumin plant was chosen to test the effect of its alcoholic and watery extract on the mortality percentage of motile stages of the mite pest because it contains effective secondary compounds that have multiple and important biological effects.

Materials and Methods

Preparation of watery and alcoholic extract of cumin seeds

In order to prepare the alcoholic and watery extract of cumin seeds, dry seeds were crushed by an electric mill, where alcoholic extract was prepared according to (Ladd *et al.,* 1978) method. As for the watery extract, it was prepared according to the (Harborne, 1984) method, and the powder resulting from the watery extract and the alcoholic extract was kept in dark closed court glass cans and were placed in the refrigerator until the required concentrations were prepared.

Preparing the different concentrations of alcoholic and watery extract

Six concentrations of watery and alcoholic extract of cumin seeds were prepared of (0, 1, 2, 3, 4 and 5%) for each extract separately for the purpose of testing it on the motile stages of the mite pest which are (larvae, nymphs, adults: female and male) for each stage and for each concentration separately.

Breeding the two spotted spider mite

The mite pest was bred on seedlings of cucumber plants grown in small pots inside the greenhouse of the University of Baghdad / College of Engineering and Agriculture Science .which is an important plant that is easy to reproduce, and infected by the mite pest. The mite can be breed in vitro on cucumber plants throughout the year, and plant infection is carried out by placing the leaves of infected cucumber plants on the healthy cultivated plants in case there be adult females and males among the individuals to ensure laying eggs and the production of a new generation capable of producing other generations continuously. Moreover, females bear inappropriate conditions and can be distinguished from other stages (carbonaro *et al.,* 1986). The process was repeated every two weeks on new plants to obtain new individuals for the experiment. After that, 14 adult males and females (7 : 7) were transferred and the dishes were transferred to the incubator (25°C). Then, the breeding continued on this way for five generations for the purpose of purifying this line and making it sensitive to conducting the test of the extract effect on it.

Testing the effect of alcoholic and watery extract of cumin seeds

The stages were separated from each other, and transfer them to the leaves disk of the cucumber plant After obtaining the pure line of the mite pest. As four disks were put in a petri dish after putting a layer of cotton inside the dish, and the cotton was moistened with distilled water, then the disks of cucumber leaves were put in one dish so that the bottom surface of the leaf is to the top. Each dish was considered as a replicate and each disk contains 10 individuals from one stage, meaning that, the one dish contains four motile stages of the mite pest. Additionally, each disk was marked with a symbol indicating each stage by five dishes (five replicates) for each treatment, so the number of individuals for each stage of the one treatment becomes 50 individuals. The effect of different concentrations of alcoholic and watery extract of cumin seeds on the motile stages of the mite pest was tested using a leaf disk spray for cucumber plants in the test. The extract was sprayed with a small sprinkler after it was calibrated in this method, so that each sprinkle was 1 ml for each dish (Busvine, 1980). Similarly, the five dishes were sprayed for each treatment containing the motile stages of the pest with the required concentration and for each type of extract separately. Then, the dishes were kept in the incubator, the accumulative mortality percentage was recorded for each treatment and the motile stages with their replicates separately, and the readings were after 24, 48, 72 hours from the treatment. Finally, the experiment was carried

out according to the completely randomized design C.R.D. (stages × concentrations), where the mortality percentage was corrected using an equation of (Abbott, 1925) before the statistical analysis was performed. The Statistical Analysis System -SAS (2012) was used in data analysis to study the effect of different concentrations on the motile stages of the pest, and the significant differences between the averages were compared with the least significant difference (LSD) test with a 5% probability level.

Results and Discussion

It is observed from Fig. 1 that the different concentrations of alcoholic extract of cumin seeds have a highly significant effect, as the LSD value (concentration × stage is equal to 5.95 ***) in the mortality percentage% of motile stages of two spotted spider mite after 24 hours from treatment. The treatment (5%) was superior over the rest of the treatments, as its mortality percentage reached (84.00, 68.00, 50.00 and 36.00%) for the motile stages (larvae, nymphs, adults: female and male), respectively. Additionally, the lowest mortality percentage was for the comparison treatment (0%), as the percentages were (2.00, 2.00, 0.00 and 0.00 %), respectively. Furthermore, the highest mortality percentage was for the larvae stage, as its mortality percentage for the different concentrations (0, 1, 2, 3, 4 and 5 %) were (2.00, 36.00, 50.00, 66.00, 76.00 and 84.00 %), and the lowest mortality percentage was the adults females stage (0.00, 18.00, 22.00, 28.00, 34.00 and 36.00 %), respectively.

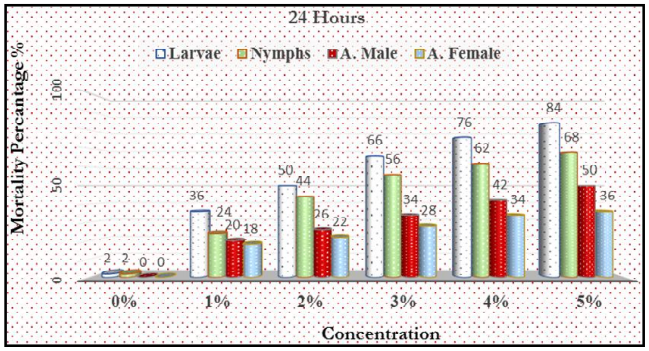

Fig. 1: The effect of different concentrations of alcoholic extract for cumin seeds on mortality percentage of the motile stages for the two-spotted spider mite using the method of leaf disk spray after 24 hours from treatment.

The results of Fig. 2 indicate that the treatment 5% was superior over the rest of the treatments included in the experiment, by giving the highest mortality percentage for different stages after 48 hours from the treatment. The percentages were (98.00, 86.00, 82.00 and 76.00%), While the lowest mortality percentage was for the comparison treatment, as it reached (2.00, 2.00, 0.00 and 0.00%) for stages (larvae, nymphs, adults: female and male) respectively. It can observe an increase in the mortality percentage for all stages and concentrations, with an increase in the exposure time from 24-48 hours after treatment. The differences between the treatments were significant, as the LSD value (concentrations × stages) was 6.12 ***.

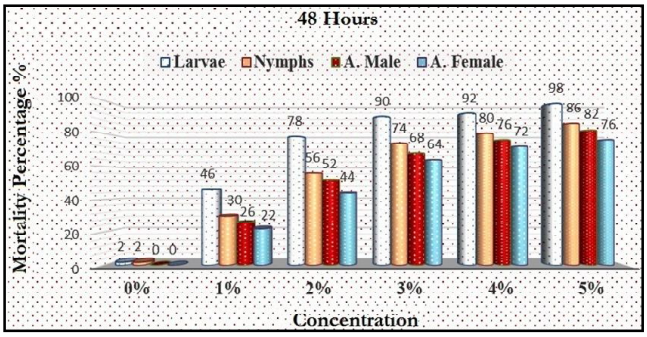

Fig. 2: The effect of different concentrations of alcoholic extract for cumin seeds on mortality percentage of the motile stages for the two-spotted spider mite using the method of leaf disk spray after 48 hours from treatment.

It was evident from Fig. 3 that the differences are highly significant, as the LSD value (concentrations × stages) reached 5.50***, the highest mortality percentage for the highest concentrations of alcoholic extract for cumin seeds was (5)% for all stages, reached (100, 98, 98 and 96%). While the lowest percentages for treatment 0% and their values (8, 8, 6 and 2) for the stages (larvae, nymphs, adults: female and male) respectively, and the treatment 4% also gave 100% mortality percentage for the larvae stage. From the previous Tables, it can be concluded that the different concentrations of alcoholic extracts for cumin seeds have a highly significant effect on the mortality percentage of the different stages of the two-spotted spider mite using the direct spray method. As well as, that the mortality percentage increase with increasing the period from 24-72 hours after treatment, and the mortality percentages increase with an increase

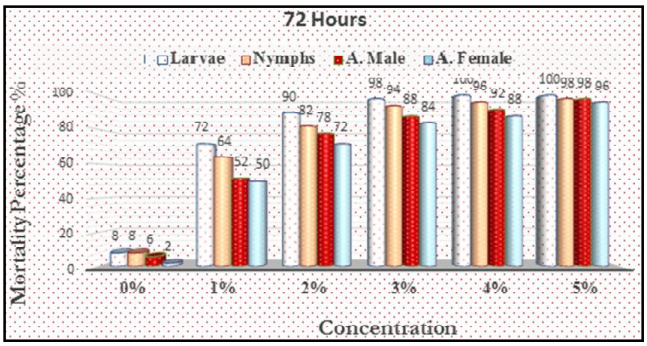

Fig. 3: The effect of different concentrations of alcoholic extract for cumin seeds on mortality percentage of the motile stages for the two-spotted spider mite using the method of leaf disk spray after 72 hours from treatment.

the extract concentration from 0% to 5%, and the larvae stage is the most affected stages of the extract as it gives the highest mortality percentages for all concentrations used in the experiment.

It was observed from Fig. 4 that the different concentrations of the watery extract for cumin seeds have no significant effect on the mortality percentage of motile stages of the two spotted spider mite after 24 hours from treatment (concentrations x stages). As for the effect of the concentrations only, the differences were significant and the averages concentrations were (1.00, 7.00, 12.50, 21.50 and 33.00%) for the concentrations (0, 1, 2, 3, 4 and 5%), respectively. The LSD value for the concentration was (3.08*), the differences are also significant for the effects of stages only, as the stages averages were (24.33, 19.00, 14.67 and 11.00%) for (larvae, nymphs, adults: female and male), respectively, and LSD value for stages was (2.52*).

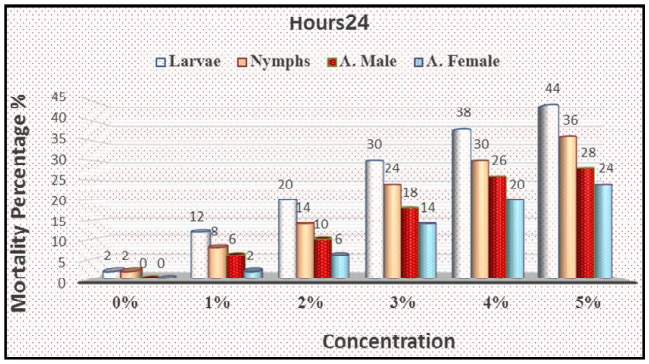

Fig. 4: The effect of different concentrations of watery extract for cumin seeds on mortality percentage of the motile stages for the two spotted spider mite using the method of leaf disk spray after 24 hours from treatment.

It can be observed from Fig. 5 that the different concentrations of the watery extract for cumin seeds have a highly significant effect, as the LSD value (concentration × stage is equal to 6.17 ***) in the mortality percentage of motile stages of the two-spotted spider mite after 48 hours from treatment. The treatment (5%) was superior over the rest of treatments, as its mortality percentage reached (82.00, 70.00, 68.00 and 62.00%) for the motile stages (larvae, nymphs, adults: female and male), respectively. The lowest mortality percentage was for the comparison treatment (0%), as the percentages were (4.00, 2.00, 0.00 and 0.00%), respectively. It can be observed that the highest mortality percentage was for the larvae stage, as its mortality percentage for the different concentrations (0, 1, 2, 3, 4 and 5%) were (4.00, 32.00, 50.00, 68.00, 76.00 and 82.00%), and the lowest mortality percentage was for the adults females stage (0.00, 12.00, 34.00, 42.00, 50.00 and 62.00%),

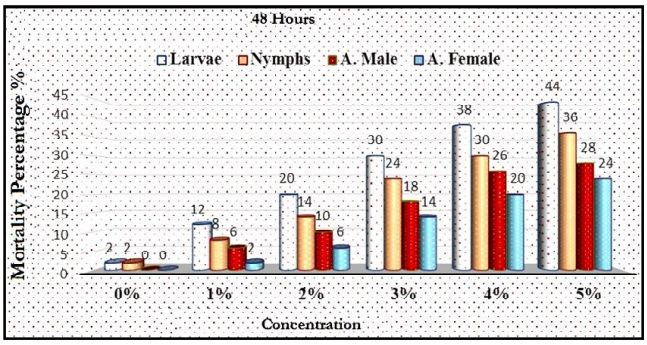

Fig. 5: The effect of different concentrations of watery extract for cumin seeds on mortality percentage the motile stages of the two-spotted spider mite using the method of leaf disk spray after 48 hours from treatment.

respectively.

Fig. 6 indicates that there are no significant differences in the effect of interaction between the concentrations of the watery extract for cumin seeds and the motile stages of the two spotted spider mite (concentrations × stages) after 72 hours from treatment. As for the effect of concentrations only, it was a significant effect and the LSD value for concentrations was (3.24*) and the averages concentrations were (5.00, 42.00, 56.50, 65.00, 77.50 and 86.00) for the concentrations (0, 1, 2, 3, 4 and 5%) respectively, and the LSD value for concentration was (3.24 *).The differences are also significant for the effect of stages only, as the averages stages were (63.00, 55.33, 53.33 and 49.67%) for (larvae, nymphs, adults: female and male) respectively, and the LSD value for stages was (2.64 *).

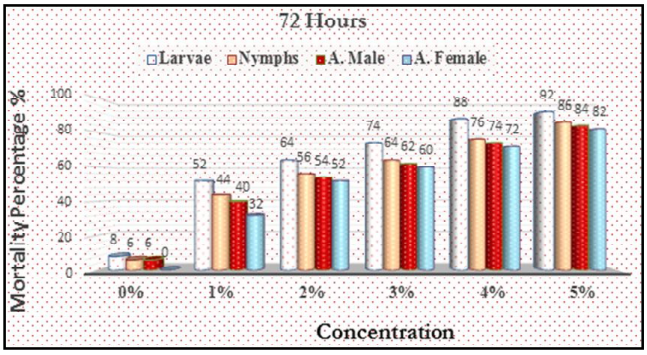

Fig. 6: The effect of different concentrations of watery extract for cumin seeds on mortality percentage of the motile stages for the two spotted spider mite using the method of leaf disk spray after 72 hours from treatment.

It was observed from Fig. 7 that the alcoholic extract has a greater effect on the mortality percentage of the motile stages of the two spotted spider mite compared to the watery extract, as the average mortality percentage of the alcoholic extract reached 54.33, and the average mortality percentage of the watery extract reached 37.92.

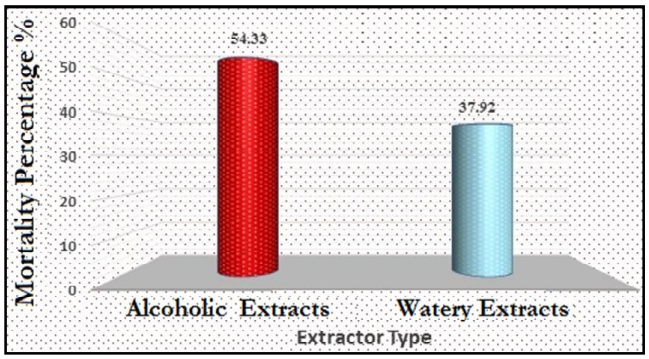

Fig. 7: The effect of different concentrations of alcoholic extract, watery extract for cumin seeds on mortality percentage of the motile stages for the two-spotted spider mite using the method of leaf disk spray.

The reason for the efficiency increase of the alcohol extract may be that the concentration of active secondary compounds present in it is greater than that of the watery extract because of its greater solubility in alcohol compared to water.

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