Effect of Microwave Extract of Asclepias Curassavica on Life Stages of Tribolium Castaneum

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Abstract

The current study was conducted to investigate the effect of microwave extract of Turkish oleander A. curassavica by direct and indirect spraying methods on the mortality rates of T. castaneum instars with concentrations of 0.100, 0.200, and 0.300 mg/ml for the microwave extract. The results showed the superiority of the direct method of spraying over the indirect method of the two extracts and for all stages of the insect, as the killing rate of the direct method of the microwave extract was 57%, and the concentration of 0.300mg/ml gave the highest killing rate of 66.1%.

Keywords: Medicinal plant, Tribolium castaneum, Asclepias curassavica extract

1. Introduction

The red flour beetle T. castaneum, which belongs to the family Coleoptera Tenebrionidae, is the most important pest of warm areas and has a global spread [1], and it causes great economic losses as a result of its rapid reproduction [2], and that the danger of this insect is due to the ability of the larval and adult stages to cause great damage to stored crops and that this type of insect does not infect whole grains, but infects broken grains that have previously been attacked by other insects, such as the Khabra beetle T. granarium, the adult males of this insect release the aggregation pheromone, which attracts the adults of this insect and changes the nature and taste of the grains [3]. This insect is mainly combated through chemical pesticides such as fumigation and sprays, but when used repeatedly and for a long time, leads to the emergence of resistant groups and thus becomes more harmful. In addition, the use of these pesticides has harmful effects on aquatic life. The materials treated by these pesticides, as well as their slow decomposition in the environment, are thus a source of concern because they affect human health and the environment [4], all of which requires a return to the use of alternative and safe methods such as the use of plant extracts.

Al-Alusi et al. [5] pointed out the effect of tobacco Nicotiana tobacum and Adhatoda vasica on the life of the red flour beetle, and they were more effective in the larval stage

2. Materials and Methods

Sample collection: T.castaneum was collected from infested flour and placed in plastic containers and the container mouth was covered with a boring cloth to prevent the insect from perishing. The containers containing the infected flour were placed in the laboratory of the College of Science-University of Anbar at a laboratory temperature of 25 +2°C, then the plant was collected, the A. curassavica from one of the gardens of the city of Ramadi during its flowering season on April.

Preparation of the microwave extract

The chloroform extract was prepared according to what was mentioned in the method [6], where fifty grams of plant powder were placed in a volumetric flask with a capacity of 1000ml, and 500ml of chloroform was added to it at a concentration of 80% and then placed in a vibrator for half an hour, and then it was placed in a water bath at a temperature of 37°C for 24 hours. The extract was filtered using a funnel and several layers of medical gauze. The filtrate was taken from it and placed in the electric oven at a temperature of 50°C. After obtaining the powder, it was kept in the refrigerator until used. The previously prepared chloroform extract powder was placed in 50g of water. 300ml of water was placed in the microwave (700 watts, 2.4 Hz) for 3minutes, and then dried with room air, and the concentrations of 0.100, 0.200, and 0.300 mg/ml were prepared from it.

The effectiveness of the microwave extract in the rates of insect mortality-direct method

Larvae of primary or late larval instars were placed in each 10 Petri dish with three replicates for each concentration of 0.100, 0.200, and 0.300 of the prepared concentrations. The dishes containing the larval instars were sprayed with the plant extract by a small hand sprayer, then left the dishes to dry a little and added each dish had 5g of semolina for each dish, then the dish was closed and left for 10 days. Destruction of the insect phases was followed up daily, and the results were recorded.

The effect of microwave extract on the mortality rates of red flour beetle adults: The same steps mentioned in the previous paragraph are followed in terms of the number of insects, replicates and concentrations, except that the larval stages are replaced by the adult insects.

Effect of microwave extract

In this method of treatment, the empty dishes are sprayed with a hand sprayer with the microwave extract. After spraying the dishes, we put 10 larvae of the primary

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or late larval instars in each Petri dish, with three replicates fo each concentration of 0.100, 0.200, and 0.300, then left the dishes to dry a little and add to each 5 grams of semolina to each dish. The dish was closed and left for 10 days. The destruction of the insect phases was followed up daily, and the results were recorded.

3. Results and Discussion

The results of table 1 to determine the effect of the microwave extract of A. curassavica leaves on the red flour beetle with three concentrations of 0.100, 0.200 and 0.300 mg/ml and by using the indirect and direct spraying methods and for the three stages, the first larval stage, the late larval stage, and the adult insect showed the highest killing rate in The direct method reached 76.7% for the first larval stage at a concentration of 0.300mg/ml, while the lowest killing rate in the direct method was 30.0% for the adult insect at a concentration of 0.100 mg/ml after 10 days of treatment, the highest killing rate in the indirect method was 73.3% for the first larval stage at a concentration of 0.300 mg/ml, the lowest killing rate in the indirect method was 23.3% for the adult insect at a concentration of 0.100 mg/ml after 10 days of treatment. The results of the statistical analysis in the table indicate there are significant differences at the level ($p<0.05$) of the binary interaction between the killing method and the phases. Killing also noted that there were no significant differences for the triple interaction between the method of killing, phases and concentrations after 10 days of treatment.

Table 1: The effect of microwave extract of A. curassavica on T. castaneum using direct and indirect spraying method

A1 killing method			A2 killing method			
The first method (indirect)			The second method (direct)			
first larval stage %	late larval stage %	Adult insect %	first larval stage %	late larval stage %	adult insect %	Concentration
40. 0	36.7	23.3	40.0	50.0	30.0	0.100
63.3	50.0	50.0	60.0	60.0	60.0	0.200
73.3	60.0	50.0	76.7	70.0	66.7	0.300
LSD 5% = NS S.E= 0.561						

It was shown in Figure 1 that there were significant differences at the level (p 0.05) between the two spraying methods, where the direct method gave the highest killing rate of 57.0%, while the killing rate of the indirect method reached 50.0% after 10 days of the laboratories.,

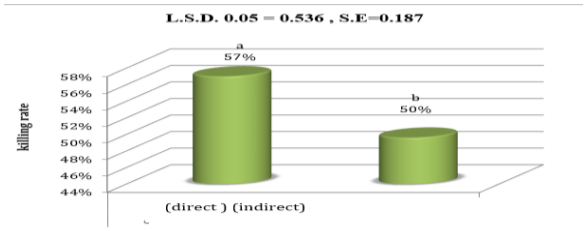

Figure (1): Average rates of killing by two methods of spraying using microwave extract on T. castaneum

It is also noted from the results of Figure 2 that there are significant differences at the level ($p<0.05$) in the rates of killing the three instars of the insect, where the highest killing rate reached 57.2% for the first larval stage, the lowest killing rate was 48.3% for the adult insect after 10 days of treatment. The reason may be that the larval stage is more affected than the adult insect because the adults are covered with a solid structure that protects them from the extract, which reduces of its effect on it, or the reason may be the slow feeding nature of adults and their tolerance of hunger, unlike the larvae, which are greedily fed. This is consistent with the results of Al-Rubaie et al. [7] that the alcoholic extract of pepper fruits had more effect on larvae than adults of the rusty flour beetle Tribolium castaneum.

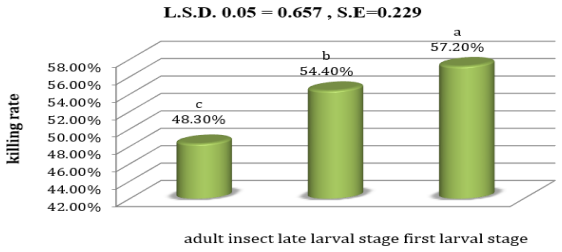

Figure 2: Effect of microwave extract on killing rates of the three insect instars.

As for the concentrations used in killing, it is noted from Figure 3 that there are significant differences at the level ($p<0.05$), where it was found that increasing the concentration used leads to an increase in the percentage of killing all insect instars. The highest percentage of killing insect instars reached 66.1% at concentration 0.300 mg/ml, while the lowest killing rate was 36.7% at the concentration of 0.100 mg / ml after 10 days of treatment.

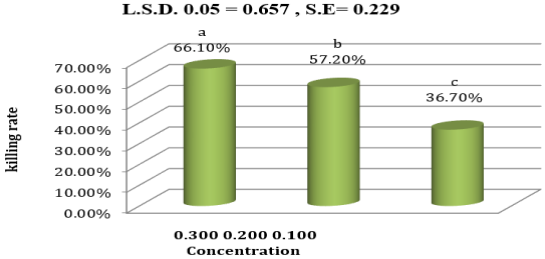

Figure (3): Average killing rates of the three concentrations of microwave extract on T. castaneum.

The cause of larval death at different concentrations is due to the damage of the midgut tissues of the larvae by the extract used, and thus the muscle layer loses its ability to work due to its separation from the intestine and not being utilized. From food and because of the decomposition that occurs in the epithelial tissue itself, they reported Cunat et al. [8] Containing Epithelial Cells

The intestines of insects contain a group of enzymes called microsomal oxidase. These enzymes neutralize the toxic effect of the natural compounds in the plant they feed on. Therefore, any compound that affects these enzymes leads to the poisoning of the tissues of the digestive system of the insect and thus its death, or the cause may be due to the union of the existing fatty substances. In the digestive system of the insect with the active substances contained in the plant extract and thus excrete fatty substances without benefiting from them [9].

Several studies have been conducted to evaluate the efficacy of microwave plant extract on the red flour beetle T. castaneum, including the study of Agha et al. [10] By exposing the larval stage of a red flour beetle and experiment to microwave radiation at different energy levels including 280 and 840 for different periods of time where mortality was 90% at 840 power level for 50 s, there was a direct relationship between mortality and concentration increase.

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