Testing the effect of alcoholic extracts of nettle leaves and cumin seeds on the mortality of second and fourth instar larvae of Cadra cautella

1ELAF Adnan Mahdi 2Yousif Dakheel Rashid
AL-Mussaiab Technical college / AL-Furat ALawsat Technical University.
Aylaf9308@gmail.com
com.usf@atu.edu.iq

Abstract

A laboratory experiment was conducted in the graduate studies laboratory at Al-Musayyab Technical College on the effect of the alcoholic extract of nettle and cumin on the second and fourth instar larvae of the date moth Cadra cautella. The results of the study showed that the effect of the concentrations of the alcoholic extract (0.25, 1) for nettle leaves and cumin plants showed that the highest rate of mortality of the second instar larvae for nettle reached 80.00 and the lowest percentage was 13.30, while the fourth instar larvae reached the highest percentage of 66.70 and the lowest percentage was 6.70 after a week of treatment. As for cumin seeds, the highest percentage at the same concentrations for the second instar reached 86.70 and the lowest percentage was 26.70, while the fourth instar had the highest percentage of 73.30 and the lowest percentage was 13.30 after a week of treatment, which indicates the possibility of introducing the alcoholic extract of nettle leaves and cumin seeds into integrated management programs For pests to control the insect C. cautella that infects stored dates and reduce its damage.

Keywords: C. cautella, nettle leaves, cumin seeds.

Introduction

Stored dates are exposed to infection by many types of mites belonging to the genus Ephestia which belongs to the Pyralidae family of the order Lepidoptera, and the infection appears after 7 days of the date falling and stored for one year, The infection increases gradually monthly, the dates are contaminated with the feces of the larvae with the presence of live or dead larvae, and the infection rate may reach 42.7% of the first generation [18]. C. cautella was discovered and first recorded in Iraq in 1920 by Buxton. The date moth is widespread in many countries of the world, especially in countries with hot and temperate climates. This insect is widespread in large areas of the globe, especially in Britain, Iraq, Japan, India, and others (Ress, 2007). In addition, this insect causes significant economic losses during the stages of storage, manufacturing, and export of Iraqi dates[4,5,19] . The date moth has many food families in fields and warehouses, as it infects many stored foodstuffs, most notably stored dates, in addition to feeding on many types of foodstuffs such as dried figs, raisins, tarshana, grains, and Legumes and other food families, and that this insect is one of the insects that cause significant economic losses in Iraqi dates from picking until marketing and mortality [11] especially in the central and southern regions, as it creates many problems facing the marketing of dates in local and foreign markets, so it has become necessary to find a way to control this pest and reduce its numbers [7]. Quick-acting methods have been followed to control stored materials, including

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the use of manufactured chemical pesticides, but these materials have many negative effects on human health and property [17]. Therefore, researchers have turned to finding safe alternatives that are less harmful and less expensive than chemical pesticides by acting as anti-nutrition, repellent, growth inhibitor, or lethal materials such as plant extracts [16] Therefore, the study aimed to use alcoholic extracts of cumin seeds Cuminum Cyminum and nettle leaves Urtica To control the stages of C. cautella

Materials and methods

- 1Experimental location

The experiment was conducted in the Graduate Studies Insect Laboratory for the year (2024 - 2025) / Department of Biological Control / Al-Musayyab Technical College / Al-Furat Al-Awsat Technical University

- 2Collection of insects.

The insect colony was obtained from the Graduate Studies Laboratory / Department of Biocontrol Techniques / Al-Musayyab Technical College. To obtain the larval stages, 10 pairs of adult date moth C. cautella (males and females) were isolated in plastic containers 10 cm high and 8 cm in diameter containing the artificial food medium consisting of (405 g of grits, 60 g of glycerin, 30 g of molasses, and 5 g of yeast) [2]. Then the larval stage was placed in smaller plastic containers perforated from the top for the purpose of treating with alcoholic extracts, with three replicates for each treatment, in addition to the comparison for each concentration.

-3Collection of plant samples

Cumin seeds and nettle leaves were obtained from local markets in Babylon province / Al-Musayyab District, dried and ready for use. The seeds and dry leaves were ground separately in an electric grinder and turned into a coarse powder and stored in plastic bags in the refrigerator until use.

-4Preparation of alcoholic extracts of cumin seeds (Cuminum Cyminum) and nettle leaves (Urtica dioica.(

The method of [15] was followed in preparing the alcoholic extracts by taking a weight of 10 grams of dry powder of each of the cumin seeds and nettle leaves separately and placing them in the Soxhlet extractor device and adding 200 ml of ethyl alcohol to it. The extraction was carried out for 24 hours at a temperature of 45°C. The extracted sample containing the raw extracted materials of the plants was concentrated. The process was repeated several times to obtain a sufficient quantity, then the material was dried in an electric oven at a temperature of 40-45°C. After that, the dry dregs were taken and placed in tightly sealed glass containers with a known weight and kept in the refrigerator until use.

- 5Preparing the concentrations of the experiment

The basic solution was prepared by dissolving (5) grams of each plant extractin (5) ml of ethyl alcohol with a concentration of (99.7)% with the addition of 3 ml of the spreading substance, Tween 20, and the volume was completed to 100 ml with distilled water, so the concentration of the solution became (5)% or equivalent to (50) mg / ml, and from it the concentrations were prepared (0.25, 0.50, 0.75, 1)%, while the control treatment was (5) ml of ethyl alcohol and the volume was completed to ((100 ml of distilled water [3..[

- 6The effect of different concentrations of alcoholic extracts of nettle leaves and cumin

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seeds on the mortality of the second and fourth larval stages of C. cautella

Five larvae were taken at a rate of Three replicates for each of the larval stages (second and fourth) were placed separately in plastic boxes perforated for ventilation from the top, where they were treated with concentrations (0.25, 0.50, 0.75, 1)% each separately at a rate of 0.5 ml for all treatments and left to dry for 2 minutes, and the previously prepared artificial food was placed, while the control treatment was with distilled water with alcohol only, after which these replicates were transferred to the incubator at a temperature of 2 ± 25 °C and the numbers of dead larvae were taken after (1, 3, 5, 7) days of treatment. [10[

- 7Statistical analysis The results were analyzed using the statistical analysis program Genstat (2015) and a completely randomized design (CRD) according to the factorial experiment model. The significance was tested using the Least Significant Difference (L.S.D) test at a probability level of 0.05 to indicate the significance of the result[6] . The percentage of insect mortality was calculated and corrected using the Abbott equation [1.[

Results and Discussion

-1Effect of nettle leaves extract on the mortality of the second and fourth instar larvae of the date moth C. cautella

Table (1) indicates the effect of the concentrations of the alcoholic extract of nettle leaves and the time period on the percentage of mortality rate of the second and fourth instar larvae of C. cautella, where the highest mortality rate for the second larval instar reached 80% at a concentration of 1% after 7 days of treatment, while the fourth larval instar reached 66.70% at a concentration of 1% after 7 days of treatment, while the lowest mortality rate reached 13.30% and 3.30% at a concentration of 0.25% for the second and fourth larval instars, respectively, after 7 days of treatment. The result of the statistical analysis indicates that there are significant differences between the treatments. The reason for the variation in the percentage of mortality for the second and fourth larval instars when using the alcoholic extract of nettle leaves may be attributed to the difference in concentration Extract, time period and active compounds in the extract [9].This study agrees with[12] which showed that nettle significantly reduces the density and presence of aphids compared to treatment with water only.

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Table (1) Effect of different concentrations of alcoholic extract of nettle leaves on the mortality of the larval stages of the date moth.

Second instar						**Fourth instar**					
Concentration %	**Period**				**average**	**Concentration%**	**Period**				**average**
	24 hour	48 hour	72 hour	7 days			24 hour	48 hour	72 hour	7 days	
0	0.00	0.00	0.00	0.00	0.00	**0**	0.00	0.00	0.00	0.00	0.00
0.25	0.00	0.00	6.70	13.30	5.00	**0.25**	0.00	0.00	6.70	6.70	3.30
0.50	6.70	20.00	26.70	26.70	20.00	**0.50**	0.00	20.00	20.00	20.00	15.00
0.75	13.30	26.70	40.00	53.30	33.30	**0.75**	13.30	13.30	26.70	33.30	21.70
1	20.00	40.00	46.70	80.00	46.70	**1**	20.00	26.70	33.30	66.70	36.70
average	8.00	17.30	24.00	34.70		**average**	6.70	12.00	17.30	25.30	
LSD0.05		**Concentration**	**Period**	**interaction**		LSD0.05		**Concentration**	**Period**	**interaction**	
		6.39	5.71	12.78				6.39	5.71	12.78	

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Testing the effect of concentrations of alcoholic extract of cumin seeds on the mortality of the second and fourth instar larvae of the date moth C. cautella

Table (2) indicates the effect of concentrations of alcoholic extract of cumin seeds and the time period on the percentage of mortality rate of the second and fourth instar larvae of C. cautella, where the highest mortality rate for the second larval instar reached 0 86.7% at a concentration of 1% after 7 days of treatment, while the fourth larval instar reached 73.30% at a concentration of 1% after 7 days of treatment, while the lowest percentage reached 26.70 and 13.30% at a concentration of 0.25% for the second and fourth larval instars, respectively, after 7 days of treatment. The result of the statistical analysis indicates the presence of significant differences between the treatments. From the results in the table, it is clear that the second larval instar is more sensitive than the fourth instar, due to several reasons, including the thinness or thickness of the cuticle layer or because of A large amount of the extract enters during feeding because the second-stage larvae need a large amount of food for the purpose of their growth and development, thus causing poisoning to the larvae or the death of the larvae may be due to lack of nutrition as a result of the plant containing compounds that prevent feeding [8,13].This study agrees with what was found by [14] that the cumin seed extract is superior in all concentrations, as it gave the highest mortality rates for the Khabra hairy grain moth (Trogoderma gramarium.(

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Table (2) Effect of different concentrations of the alcoholic extract of cumin seeds on the mortality of the larval stages of the date moth.

Second instar						**Fourth instar**					
Concentration %	**Period**				**average**	**Concentration%**	**Period**				**average**
	24 hour	48 hour	72 hour	7 days			24 hour	48 hour	72 hour	7 days	
0	0.00	0.00	0.00	0.00	0.00	**0**	0.00	0.00	0.00	0.00	0.00
0.25	0.00	6.70	13.30	26.70	11.70	**0.25**	0.00	0.00	6.70	13.30	5.00
0.50	13.30	20.0	33.3	33.3	25.00	**0.50**	6.70	20.00	26.70	33.30	21.70
0.75	20.00	26.70	53.30	66.70	41.70	**0.75**	20.00	26.70	33.30	53.30	33.30
1	33.30	46.70	60.00	86.70	56.70	**1**	20.00	33.30	60.00	73.30	46.70
average	13.30	20.00	32.00	42.70		**average**	9.30	16.00	25.30	34.70	
LSD0.05		**Concentration**	**Period**	**interaction**		LSD0.05		**Concentration**	**Period**	**interaction**	
		8.25	7.37	16.50				6.73	6.03	13.47	

Conclusions

This study showed that the second instar larvae were more sensitive in the mortality rate of the fourth instar larvae in both extracts. The results showed that the alcoholic extracts of nettle leaves and cumin seeds had an effect on the mortality rate of the second and fourth instar larvae of the date moth. The alcoholic extract of cumin seeds was superior in the mortality rate to the alcoholic extract of nettle leaves. The mortality rate increases with increasing concentration.

Recommendations

The possibility of introducing alcoholic extracts of cumin seeds and nettle leaves into integrated management programs for stored pests in the future and reducing the use of chemical pesticides.Testing the studied extracts against other pests. Isolation and identification of active compounds and conducting tests on them.

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