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Study of the Effect of *Citrullus Colocynthis* Fruit Extract on the Mortality of Date Moth Larvae *Ephestia Cautella*

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Abstract

This study was conducted in the postgraduate insect laboratory in the Department of Life Sciences, College of Education for Girls, to evaluate the efficiency of hot and cold extracts of Citrullus colocynthis fruits in killing the first and fifth instar larvae of the date moth Ephestia cautella. The results of the study showed a direct relationship between the concentrations used for the hot and cold extracts and the mortality rates of the larvae after (24, 72, 120, 168) hours after the infectious treatment, where the highest mortality rates of 100% and 86.7% were recorded for the first and fifth instar larvae, respectively, when the larvae were treated with a concentration of 40 mg/ml after 168 hours of treatment with the hot water extract of colocynth fruits, while the lowest mortality rates were 13.3% and 3.3% for the first and fifth instar larvae, respectively, when treated with a concentration of 10 mg/ml after 24 hours of treatment with the hot water extract of colocynthis fruits, while the highest mortality rates of 90% and 76.7% were recorded for the first and fifth instar larvae, respectively, when the larvae were treated with a concentration of 40 mg/ml after 168 hours of treatment with the cold water extract of colocynthis fruits, while the lowest mortality rates were 10% and 0%. For the first and fifth instar larvae, respectively, when treated with a concentration of 10 mg/ml after 24 hours of treatment with the cold-water extract of colocynthis fruits. The results of the study proved that the hot water extract of colocynth fruits was more efficient than the cold water extract in all concentrations used in the experiment, where the highest mortality rates for the first instar larvae were (100 and 90)%, while the highest mortality rates for the fifth instar larvae were (86.7 and 76.7)% when the larvae were treated with the hot and cold water extract of colocynthis fruits, respectively, at a concentration of 40 mg/ml after 168 hours of treatment.

Keywords: *Colocynthis*, *Citrullus*, *Ephestia cautella*, extract

INTRODUCTION

Dates are one of the oldest and most important food crops produced in Iraq. The palm tree and its fruits are affected by many insect pests. The time moth (*Ephestia cautella* (Walker) is the solitary of the greatest central creature pests that disturb epochs in orchards besides warehouse [1].

The danger of insect pests that affect palm trees and their fruits comes first through the economic loss they cause to them and thus affects the economics of the date industries in Iraq. These insects attack dry dates during their storage and during the stages of packaging and export and cause them severe damage [2].

The insects that attack dates in warehouses multiply throughout the storage period of dates, causing them damage and great economic loss. Therefore, these insects are controlled in several ways, including pressing dates [3].

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In addition to chemical methods using fumigation gases, such as Phosphine, methyl bromide and carbon tetrachloride, as methyl bromide gas is the only fumigants used to fumigate packaged dates [4] and due to the emergence of insect resistance to manufactured chemical pesticides, this encouraged researchers to search for other alternatives to manufactured chemical pesticides, including the idea of using natural products extracted from plants [5].

Phytocides are important because they are natural materials extracted from plants, as they may kill insects, repel them, inhibit egg laying, inhibit larval development or prevent mating [6].

Among these plants is colocynth, which is one of the Iraqi plants widely spread in Iraq, as colocynth is one of the important medicinal plants because it contains many active compounds, including alkaloids represented by the compound colocynth, which is attributed to the bitter taste of the plant, as well as other active substances [7, 8].

MATERIALS AND METHODS

Collection and Laboratory Preparation of the Date Moth *E. cautella*

The larvae and pupae of the date moth *E. cautella* were collected from infected dates of the Zahdi variety from the Abbasiya area and from shops and silos in the Kufa area. The larvae were conveyed to the creature test site of the Department of Natural life Sciences / College of Education for Girls / University of Kufa. The larvae were placed in sterile plastic bottles with a height of 12 cm and a diameter of 6 cm containing an artificial food container consisting of 81% crushed wheat, 12% glycerin, 6% molasses, and 1% dry yeast to obtain adults according to the method [9].

The bottles were covered with tulle to prevent insects from escaping and to ensure good ventilation and were tightly tied with a rubber band for the purposes of breeding and propagation for several generations before the experiment was conducted on them. The insect was placed under normal laboratory conditions.

Collection and Diagnosis of *colocynthis* C Plant Samples

The fruits of *colocynthis*. C plant were collected by purchasing them from the local market in Najaf Governorate during October 2021, then transferred to the laboratory, cleaned of impurities, washed and left to dry for 7 days. They were banquet on strainer identifications in the gloominess with decent aeration in the test site, attractive into interpretation incessant exciting to avert fungal contagion until fully arid [10].

Preparation of Plant Extracts

Preparation for Cold Aqueous Extract of Colocynthis Fruits

The method of [11] was used to prepare the aqueous extract, weighing 20 g of dry powder of colocynth fruits and mixing it with 400 ml of cold distilled water. After that, we mix the mixture several times and leave the solution for 24 hours and filter the *colocynthis* solution in a cloth and then leave it in the laboratory until it dries, and we get the dry colocynth powder. We weigh the colocynth powder and dissolve the known weight powder in 100 ml of distilled water to obtain a standard solution. From this standard solution, multiple concentrations (40, 30, 20, 10) mg/ml were prepared using the law of dilution and volumes:

$$V1 \times C1 = V2 \times C2$$

Preparing the Hot Water Extract of Jujube Fruits

The hot water extract was prepared in the same way as above, except that the distilled water used in the preparation was boiled.

Effect of Cold and Hot Aqueous Extract of *colocynthis* Fruits on the Mortality Rate of First and Fifth Instar Larvae of Date Moth *E. cautella*

The first and fifth instar larvae were collected from the rearing bottles and distinguished based on size and shape. 10 larvae were taken, with 3 replicates for each treatment and for each of the first and

fifth instar larvae, and were placed in plastic dishes containing the food medium treated with the aqueous extract, each separately, using a hand sprayer at a height of 15 cm and at concentrations of (10, 20, 30, 40) mg/ml. As for the control treatment, it was sprayed with distilled water only. The experimental information was recorded on each replicate. The treated larvae were followed up continuously to record the mortality rates of the larvae.

Statistical Analysis

The results were analyzed according to the global experiments model and with a factorial experiment with completely randomized design. The slightest weight variance test (LSD) was castoff at the equal of 0.05 to demonstrate the implication of the fallouts [12].

RESULTS & DISCUSSION

Effect of Hot Aqueous Extract of *Colocynthis* Fruits on First and Fifth Instar Larvae of Date Moth *E. cautella*

The consequences of Boards (1 and 2) disclosed the influence of searing aqueous citation of *colocynthis* fruits at altered focuses on the passing of leading besides fifth instar larvae of period moth, for the first and fifth instar larvae, respectively, after 168 hours of treatment at a concentration of 40 mg/ml. The results of the current study are consistent with the results of [11], who treated the first and fifth instar larvae of the date moth with hot water extract of tobacco plant waste. The results of the study showed that increasing the time and increasing the concentration of the extract led to an increase in the percentage of Larval mortality, as the highest mortality rate of the first and fifth instar larvae reached (98, 90) % after 48 hours, respectively, at a concentration of 10%. Abdullah (2023) [13] found that when treating the adults of the grain beetle *Trogoderma granarium* with cold and hot aqueous extracts of the plant, the hot water extract was more effective than the cold-water extract, as the highest mortality rate of the adults was recorded at 86.6% at a concentration of 5% after 72 hours of treatment (Tables 1 and 2).

Table 1. The effect of hot aqueous extract of *colocynthis* fruits on the death of first-stage larvae of the date moth.

LSD P < 0.05	Total Mortality Rate	hrs 168	120 h	72h	24h	Concentration/ mg/ml
	0	0	0	0	0	control
11.4	48.3	83.3	63.3	33.3	13.3	10
11.7	53.4	86.7	70	40	16.7	20
11.9	60	90	76.7	53.3	20	30
12.3	69.2	100	86.7	60	30	40
		90	74.1	46.7	22.5	Total mortality rate
		12.4	11.2	8.9	6.3	LSD P <0.05

Table 2. Effect of hot aqueous extract of *colocynthis* fruits on the death of fifth stage larvae of the date moth.

LSD P<0.05	Total mortality rate	168 hrs	120 h	72h	24h	Concentration/ mg/ml
	0	0	0	0	0	control
7.9	25.8	53.3	33.3	13.3	3.3	10
8.6	34.2	66.7	43.3	20	6.7	20
9.2	39.2	73.3	50	23.3	10	30
10.3	49.2	86.7	63.3	30	16.7	40
		70	47.5	21.7	9.2	Total mortality rate
		10.9	9.7	4.8	4.2	LSD P <0.05

The Effect of the Cold Aqueous Extract of *colocynthis* Fruits on the First and Fifth Instar Larvae of the Date Moth *E. cautella*

The results of Tables 3 and 4 showed the effect of the cold aqueous extract of colocynth fruits at different concentrations on the death of the first and fifth instar larvae of the date moth. The fallouts specified that there was a straight association amongst the deliberations used and the transience duties of the larvae. The increase in mortality rates in the treated larvae at all concentrations was significantly higher compared to their rates in control. There were also significant differences between the concentrations used, where the lowest mortality rate for the first and fifth instar larvae was recorded (0.10%), individually, after 24 hours of management at a concentration of 10 mg/ml, while the highest mortality rate was recorded (90.7%) for the first and fifth instar larvae, respectively, after 168 hours at a concentration of 40 mg/ml compared to the control treatments. The results of the current study are consistent with what was reached by [14] when he treated the larval stages of the date moth with cold water extract of tobacco plant waste. The results of the study showed that the first and second larval stages were more sensitive to the extract compared to the fifth instar, where the highest mortality rate for the first and fifth instar larvae was recorded (59.21, 90) % later one hour besides 48 hours, individually, at a concentration of 10%.

Table 3. The effect of cold-water extract of *colocynthis* fruits on the death of first-stage larvae of the date moth.

LSD P < 0.05	Daily Mortality Rate	168h	120h	72h	24h	Concentration /mg/ml
	0	0	0	0	0	control
8.2	33.3	63.3	36.7	23.3	10	10
9.5	40.8	70	46.7	33.3	13.3	20
10.3	53.4	86.7	60	50	16.7	30
12.2	60.9	90	76.7	56.7	20	40
		77.5	55	40.8	15	Total mortality rate
		13.3	10.8	9.6	5.5	LSD P <0.05

Table 4. The effect of cold-water extract of *colocynthis* fruits on the death of fifth stage larvae of the date moth.

LSD P < 0.05	Daily Mortality Rate	168h	120h	72h	24h	Concentration/ mg/ml
	0	0	0	0	0	control
6.1	19.2	46.7	20	10	0	10
8.8	25.8	50	33.3	16.7	3.3	20
9.4	32.5	63.3	40	20	6.7	30
11.3	42.5	76.7	56.7	23.3	13.3	40
		59.2	37.5	17.5	5.8	Total mortality rate
		10.9	9.1	5.3	3.6	LSD P <0.05

CONCLUSIONS

1. Date moth can be effectively reared on the laboratory medium.
2. The hot water extract of *colocynthis* fruits was more effective than the cold-water extract in killing the first and fifth instar larvae.
3. The first instar larvae are more sensitive to the extracts than the fifth instar larvae.

Recommendations

1. Conduct laboratory experiments on the effect of water extracts of colocynthis fruits on the rest of the other stages of life, pupae and adults.
2. Test the effectiveness of alcoholic extracts of colocynth fruits and their effect on the larvae of the date moth.

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