

## THE EFFECT OF USING SOME PLANT EXTRACTS TO CONTROL DATE MOTH (BARACHEDRAMYDRAULA MEYRICK) ON DATE PALM

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### ABSTRACT

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This study was conducted in the laboratories of the Medicinal and Aromatic Plants Unit and Department of Horticulture and Gardening at the College of Agriculture - University of Basra to know the effect of using some plant extracts to control the infection of *Batrachedra amydraula* date palm cultivar Barhi. The field study was conducted in one of the Shatt al-Arab orchards. Palm trees were sprayed with plant extracts of Jujube leaves and olive leaves at the prepared concentrations (0, 80, 100)% of each extract using a pump. The vegetative growth were sprayed in the early morning until complete wetness with the use of a diffuser and at three times. The first spray was in January, before the appearance of pollen, and the second spray was ten days after the completion of the pollination process, and the third spray was at the beginning of the Hababauk stage. The results of the study showed the significant effect of the use of plant extracts of Jujube leaves and olive leaves in the control of date palm trees to the infection of the *Batrachedra amydraula* insect. The control treatment recorded the highest infection rate of 10.97% and 10.13% for both Jujube and olive leaf extracts. The interaction between Jujube leaf extract and olive leaf extract recorded the lowest infection rate of 0.05%, and the highest percentage of insect killing amounted to 73% for 100% treatment. The treatment of Jujube leaf extract at 100% concentration recorded the highest value of carbohydrates content of 21.69% of the fruits. While the treatment of olive leaf extract with concentration 100% recorded the highest value amounting to 20.90%. The control treatment also recorded the highest percentage of phenol content of fruits, which amounted to 2.45% and 2.39% for both Jujube and olive leaf extract, respectively. Treatment with these extracts also affected the anatomical characteristics of the fruits, as the interaction between Jujube leaf extract and olive leaf extract recorded the highest thickness of the epidermal layer in the fruits reached 19.65  $\mu\text{m}$  and the highest thickness of the epidermal layer reached 19.65  $\mu\text{m}$  for the 100% treatment.

### INTRODUCTION

The date palm, *Phoenix dactylifera* L., belongs to the palm Arecaceae family and to the order Arecales. It is one of the monocotyledons, where it spreads in subtropical areas between latitudes 10-30° north and extends to latitude 20° south of the equator [1]. The Arabian Gulf region is the most widely spread date palm area in the world. Palm cultivation spread from it to all areas with favorable weather mediated by navigators from the inhabitants of Darin Island, and palm cultivation extended from the Gulf to Basra and from there it spread to the rest of the countries [2]. The date palm, like other trees, is affected by many pests and insects that cause great losses if these pests are left undiagnosed or controlled. Therefore, knowing the type of pathogen and its effect on the date palm in general is essential. The disease is caused

by the small palm worm *Batrachedra amydraula*, which causes great losses in date palm orchards and is a major pest on immature date palm fruits [3]. The date palm beetle is one of the important insect pests that infect palm fruits, which spread in most palm-growing areas in Iraq, including Al-Saniyah district, Al-Diwaniyah district, It affects immature palm fruits, and the infection begins early in the season from the beginning of the decade, and continues until the later stages, and the damage occurs when the caterpillar feeds on most of the contents of the fruit, causing the fruits to dry and fall and turn red [4]. Excessive use of chemical and unnatural substances such as fungicides and insecticides, especially systemic pesticides, in combating plant diseases that affect trees, field crops and orchards, has led to harmful environmental pollution to humans, animals, plants, soil and air. In view of the severe infection of this insect on palm trees in Basrah province in recent years and the significant losses it causes in palm production, and the lack of studies on the use of plant extracts to treat this problem, this study was conducted.

### **MATERIALS AND METHODS**

This study was conducted in the laboratories of the Medicinal and Aromatic Plants Unit and the Department of Horticulture and Gardening at the College of Agriculture - University of Basra to know the effect of using some plant extracts to control the infection of the date palm mite infection of the date palm Barhi cultivar. The field study was conducted in one of the orchards of the Shatt al-Arab, where 27 trees were selected for the studied cultivars, and homogeneity was taken into account as much as possible in terms of palm ages and service operations.

#### **1.1. Preparation of Plant Extracts**

10gm of Jujube *nummularia* leaves and *Olea europaea* leaves were weighed and placed in a 200 ml beaker, to which 20 ml of 95% ethanol was added. Then the sample is placed on a magnetic shaking device for 20-30 minutes, the water is removed by adding anhydrous sodium sulfate, then filtered by a Buechner funnel, then the filtrate is taken and placed in a rotary evaporator to evaporate the ethanol and dispose of it [5]. 3 concentrations (0, 80, 100)% of each extract were prepared, and all were kept in the refrigerator at 2° away from light for use in the treatment of palm trees prepared for this.

#### **1.2. Palm Trees Treatment**

Palm trees were sprayed with plant extracts in concentrations prepared using a pump, as the vegetative growth was sprayed in the early morning until complete wetness with the use of a diffuser and three times. The first spray was in January, before the appearance of pollen, and the second spray was ten days after the completion of the pollination process, and the third spray was at the beginning of the Hababauk stage, then the following traits were studied:

##### **1.2.1. Infection Percentage**

The infection percentage was estimated by knowing the manifestations of infection caused by this disease on the affected fruits. The total numbers of palms and affected palms were calculated and the infection rate was estimated from the following equation:

$$\text{Infection \%} = \frac{\text{number of infected palms}}{\text{Total number of palms}} \times 100$$

### 1.2.2. Percentage of Insect Death

The percentage of insect death was estimated by treating a number of insects collected from the infected fruits, and the percentage of insect death was estimated from the following equation:

$$\text{Insect death \%} = \frac{\text{number of dead insects}}{\text{total number of insects}} \times 100$$

### 1.2.3. Estimation of the Percentage of Carbohydrates in Fruits

The method of [6] was followed in estimating the carbohydrate content of fruits in the kemri stage, as 0.5 g of dried fruits were taken by means of an electric oven (Galenhamp) at a temperature of 40 ° C for a period of 72 hours. Then they were ground by an electric grinder, then placed in 90 ml glass tubes, and 70 ml of distilled water was added to each of the healthy and infected fruits. The samples were placed in a water bath at a temperature of 70 ° C for one hour, then left to cool to room temperature and filtered by means of filter paper. Then the method was completed after Preparation of standard solutions.

### 1.2.4. Determination of the Percentage of Phenols in Fruits

The method of [7] was followed in estimating the phenolic content of the fruits, as one gram of the dried plant sample was taken by means of the electric oven (Galenhamp) at a temperature of 40 ° C for 72 hours, then it was ground by an electric mill, then 80 ml of distilled water was added to it and placed in a bath. aqueous type (Memmert),

Take 1 ml of the prepared extract and add 1.5 ml of phenol reagent to it (diluted 10 times and after 5 minutes add 1.5 of sodium carbonate at a concentration of 6%). It has 1.5 ml of sodium carbonate at a concentration of 6%. The absorbance reading of the samples was taken by means of a spectrophotometer.

### 1.2.5. Anatomical Study of Fruits

The method of paraffin technique described in [8] was followed. Healthy and infested fruits of Al-Barhi cultivar were selected to know the effect of infection on the tissues of the fruits. The parts to be cut were buried in the wax mold after decantation and lamination, then they were cut by the microtom device to obtain the anatomical sections and placed on glass slides (slides) and their covers were glued using DPX and examined by a compound light microscope.

## 1.3. Statistical Analysis

The study was designed according to a completely randomized block design (C.R.B.D) as a factorial experiment. The averages were compared according to the L.S.D (Least Significant Differences Test) method under the 0.05 probability level [9].

## RESULTS AND DISCUSSION

### 1.4. Infection Rate

The results in Table (1) that the plant extracts had a significant effect in decreasing or increasing the percentage of infection with *Batrachedra amydraula* in date palm cultivar Al-Barhi, where the control treatment recorded the highest infection rate of 10.97% and 10.13% for both Jujube and olive leaf extracts, respectively. While the treatment of Jujube leaf extract at 100% concentration recorded the lowest value of

3.62%, while the treatment of olive leaf extract at 100% concentration recorded the lowest value of 3.91%. As for the interaction between Jujube leaf extract and olive leaf extract, the treatment recorded 100%, for each of them, the lowest infection rate was 1.12%. While the control treatment recorded the highest infection rate of 16.65%. This may be due to the effective role of plant extracts in reducing the rate of infection with this insect as well as reducing its effect on infected trees.

### 1.5. Percentage of Insect Death

It is clear from the results of Table (2) that the plant extracts have a significant effect in decreasing or increasing the percentage of death of the Date moth (*Barachedramydraula Meyrick*) insect in the date palm of the Barhi cultivar. The control treatment recorded the lowest killing rate of 21% and 24% for both Jujube and olive leaf extract, respectively, while the treatment of Jujube leaf extract with concentration 100% recorded the highest value of 56%, and the treatment of olive leaf extract with concentration 100% recorded the highest value for insect death. It reached 53.67%. As for the interaction between Jujube leaf extract and olive leaf extract, the treatment recorded 100% for each of them, the highest percentage of insect killing amounted to 73%. While the control treatment recorded the lowest killing rate of 8%. This may be due to the effective role of plant extracts in reducing the rate of infection with this insect as well as reducing its effect on infected trees.

**Table (1): Effect of plant extracts on the percentage of infection with Date moth (*Barachedramydraula Meyrick*) in date palm cultivar Barhi.**

Jujube leaf extract	Olive leaf extract			The effect of Jujube leaf extract
	%0	%80	%100	
%0	16.65	7.77	8.48	710.9
%80	6.36	4.23	2.14	4.24
%100	7.39	2.34	1.12	23.6
olive leaf extract average	10.13	4.78	3.91	
L.S.D.	Jujube=1.11	Olive=1.11	interaction =1.38	

**Table (2): Effect of plant extracts on the percentage of death of Date moth (*Barachedramydraula Meyrick*) insects in date palm Barhi cultivar.**

Jujube leaf extract	Olive leaf extract			The effect of Jujube leaf extract
	%0	%80	%100	
%0	8	22	33	21
%80	28	42	55	741.6
%100	36	59	73	56
olive leaf extract average	24	41	753.6	
L.S.D.	Jujube= 3.34		olive =3.34	Interaction= 7.24

### 1.6. The Percentage of Carbohydrates

It is clear from the results of Table (3) that the plant extracts have a significant effect on the carbohydrate content of fruits, as the control treatment recorded the lowest percentage of 13.95% and 14.94% for each of Jujube and olive leaf extracts, respectively. While the treatment of Jujube leaf extract at 100% concentration

recorded the highest value of 21.69%, while the treatment of olive leaf extract at 100% concentration recorded the highest value of 20.90%. As for the interaction between Jujube leaf extract and olive leaf extract, the treatment recorded 100% for each of them, the highest percentage of carbohydrates content of fruits amounted to 25.37%, while the control treatment recorded the lowest percentage of 12.28%. This may be due to the effective role of plant extracts in reducing the incidence of this insect, as well as reducing its effect on infected trees.

The difference in the percentage of carbohydrates in date palm fruits may be attributed to the difference in the infection conditions surrounding each treatment, which in turn affects the vital system and the construction of carbohydrates. It is noted that the percentage of carbohydrates in fruits increased in the treatments that recorded the lowest percentage of insect infection, and on the contrary for the treatments that recorded the highest percentage of infestation and that recorded the lowest percentage of carbohydrates (Table 1). Therefore, differences appeared in the percentage of carbohydrates [10,11].

**Table (3): The effect of plant extracts on the percentage of carbohydrates in the fruits of date palm, Barhi cultivar.**

Jujube leaf extract	Olive leaf extract			The effect of Jujube leaf extract
	%0	%80	%100	
%0	12.28	13.79	15.77	513.9
%80	15.25	19.44	21.55	518.7
%100	17.29	22.42	25.37	21.69
olive leaf extract average	14.94	18.55	9020.	
L.S.D.	Jujube= 2.35	Olive= 2.35	interaction =3.43	

### 1.7. The Percentage of Phenols

It is clear from the results in Table (4) that the plant extracts have a significant effect on the content of phenols in the fruits, where the control treatment recorded the highest percentage of 2.45% and 2.39% for each of Jujube leaf extract and olive, respectively, while the treatment of Jujube leaf extract with a concentration of 100% The lowest value was 1.57%. While the treatment of olive leaf extract with a concentration of 100% recorded the lowest value of 1.55%. As for the interaction between Jujube extract and olive leaf extract, the treatment of 100% recorded for each of them the lowest percentage of fruits content of phenols amounting to 1.40%, while the control treatment recorded the highest percentage of 3.33%. This may be due to the effective role of plant extracts in reducing the incidence of this insect, as well as reducing its effect on infected trees. It is noted that the percentage of phenols in the fruits increased in the treatments that recorded the highest percentage of insect infection, and on the contrary for the treatments that recorded the lowest percentage of infection and that recorded the lowest percentage of phenols (Table 1) The reason for the high percentage of phenols in the affected fruits may be due to the effect of the insect on the plant, which leads to an increase in phenolic substances, which are

one of the natural chemical defenses present in the plant. Plant phenols reduce the effect of plant pathogens [8].

**Table (4): The effect of plant extracts on the percentage of phenols in the fruits of date palm cultivar Barhi.**

Jujube leaf extract	Olive leaf extract			The effect of Jujube leaf extract
	%0	%80	%100	
%0	3.33	2.25	1.77	2.45
%80	1.96	1.75	1.49	1.73
%100	1.88	1.44	1.4	1.57
olive leaf extract average	2.39	1.81	1.55	
L.S.D.	Jujube 0.16=	olive 0.16=	0.23= interaction	

### 1.8. The Thickness of the Cuticle Layer

The results of the microscopic examination of tissue sections of the fruits of the date palm cultivar Barhi healthy and infected with the Date moth (*Barachedramydraula Meyrick*) insect (Table 5 and Fig. 1 and 2) showed that the plant extracts had a significant effect on the thickness of the cuticle layer of the fruits of the date palm cultivar Barhi. The control treatment recorded the lowest thickness of 6 and 6.06  $\mu\text{m}$  for both Jujube and olive leaf extracts, respectively. Whereas, treatment of Jujube leaf extract at 100% concentration recorded the highest value of 8.91  $\mu\text{m}$ , while treatment of olive leaf extract at 100% concentration recorded the highest value of 8.89  $\mu\text{m}$ . As for the interaction between Jujube leaf extract and olive leaf extract, the treatment 100% recorded for each of them the highest thickness of cuticle of fruits reached 11.23  $\mu\text{m}$ , while the control treatment recorded the lowest thickness of 5.12  $\mu\text{m}$ .

**Table (5): Effect of plant extracts on the thickness of the cuticle layer in the fruits of the date palm cultivar Barhi.**

Jujube leaf extract	Olive leaf extract			The effect of Jujube leaf extract
	%0	%80	%100	
%0	5.12	6.67	6.21	6
%80	6.88	7.13	9.23	57.7
%100	6.17	9.34	11.23	8.91
olive leaf extract average	66.0	7.71	8.89	
L.S.D.	Jujube 1.11=	olive 1.11=	1.79 = interaction	

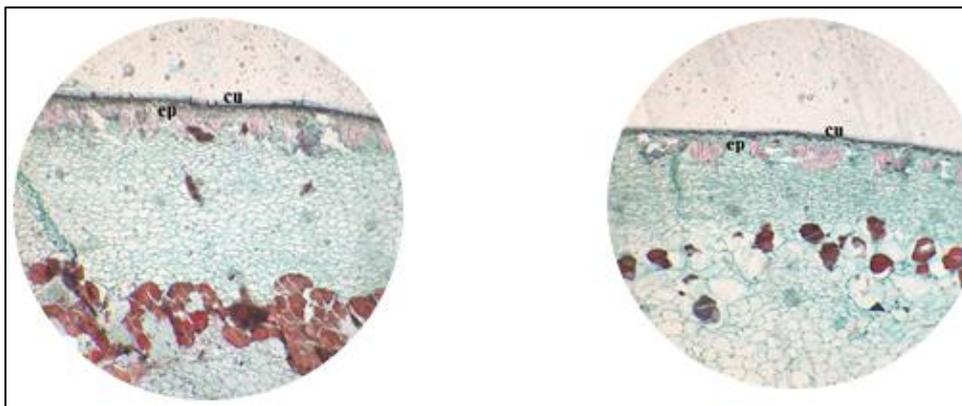
### 1.9. Epidermal Layer Thickness

The results of the microscopic tests of tissue sections of the fruits of date palm cultivar Barhi healthy and infected with Date moth (*Barachedramydraula Meyrick*) (Table 6 and panels 1 and 2) showed that the plant extracts had a significant effect on the thickness of the epidermal layer of the fruits of the date palm cultivar Barhi. The

control treatment recorded the lowest thickness of 10.27 and 10.35  $\mu\text{m}$  for both Jujube and olive leaf extracts, respectively. While the treatment of Jujube extract at 100% concentration recorded the highest value of 16.46  $\mu\text{m}$ , while the treatment of olive leaf extract at 100% concentration recorded the highest value of 16.21  $\mu\text{m}$ . As for the interaction between Jujube leaf extract and olive leaf extract, the treatment 100% of each recorded the highest thickness of the epidermal layer in the fruits amounting to 19.65  $\mu\text{m}$ , while the control treatment recorded the lowest thickness of 8.57  $\mu\text{m}$ . It has been observed that the cuticle layer ruptures and merges with the epidermal cells because the cuticle layer consists of chitin. It is known that some plant pathogens, including the *Batrachedra amydraula*, secrete pectinase and cellulase enzymes[12] by the action of the pectinase enzyme secreted by the insect. It leads to the fold of the cuticle layer and the walls of the epidermal cells, thus dismantling them and thus separating them from each other[13]. It is noted that healthy fruits have a thick and healthy cuticle, and the skin cells are also healthy because they are thick and contain chitin and lignin[14]. It was also observed that the epidermal cells separated from each other in the infected fruits, due to the decomposition of the middle lamella, which is made of pectin, due to the secretion of ketones by the insect.

**Table (6): Effect of plant extracts on the thickness of the epidermal layer in the fruits of date palm, Barhi cultivar.**

Jujube leaf extract	Olive leaf extract			The effect of Jujube leaf extract
	%0	%80	%100	
%0	8.57	10.14	12.11	10.27
%80	10.11	14.43	16.88	13.81
%100	12.36	17.36	19.65	16.46
olive leaf extract average	10.35	13.98	16.21	
L.S.D.	Jujube =2.12	olive =2.12	interaction =2.89	



**Figure (1): Across section of an intact data palm fruit of the Barhi cultivar showing cu-cuticle intact ep-epidermal cell intact.**



**Figure (2):** Across section of an intact date palm fruit of the Barhi cultivar showing cu-cuticle smashed ep-epidermal smashed.

### Conclusion

The control treatment had the highest fruit phenol concentration, 2.45% for Jujube and 2.39 for olive leaf extract. Treatment with these extracts changed the morphological properties of the fruits, as the interaction between Jujube leaf extract and olive leaf extract recorded the maximum epidermal layer thickness at 19.65 m.

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