

Effect of using Some Plant Extracts to Control the Inflorescence Rot Disease of Palm Pollen

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Abstract: This study was conducted in the laboratories of the Medicinal and Aromatic Plants Unit and the Plant Protection Department of the College of Agriculture - University of Basra to know the effect of using some plant extracts to control Inflorescence Rot disease of male date palm pollen cultivar Al-Ghanami green. The field study was conducted in one of the orchards of Shatt Al-Arab. Three concentrations (0, 50, 70) % of each of the aqueous extract of mint and castor were prepared. The trees were sprayed on two dates, where the first spray was in late January before the appearance of the pollen, and the second spray was at the beginning of the emergence of pollen (February). The results of the study showed the significant effect of using plant extracts in the control of date palm trees to Inflorescence Rot disease, where the results of the study showed that the use of mint at a concentration of 70% with castor extract at the same concentration caused the percentage of infection to be reduced to 0.05% While the infection rate was 2.27% in trees not treated with plant extracts. The results also showed that the interaction between the two extracts at a concentration of 70% for each of them caused an increase in the carbohydrate content of 21.37% in male pollen and a decrease in phenolic substances in it by 0.39%. The anatomical study of the male flowers in the healthy pollen showed that its cells have healthy walls in the parenchyma and wood and are not decomposing, and the distribution of the tannin cells is small in size. As for the parenchymal cells in the affected pollen tissue, it was observed that they ruptured and merged with each other, and the distribution of large tannin cells was irregular.

Key words: plant extracts, disease, Inflorescence Rot pollen, date palm

1. INTRODUCTION

The date palm, *Phoenix dactylifera* L., belongs to the *Arecaceae* family and to the order *Arecales*. It is one of the monocotyledons, spreading in subtropical areas between latitudes 10-30° north and extending to latitude 20° south of the equator (Al-Jubouri, 2002). The Arabian Gulf region is the most widely spread date palm area in the world. Palm cultivation spread from it to all areas with favourable 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 (Ibrahim and Khalif, 2004). The date palm needs many service operations, the most important of which is the process of pollination of the female flowers carried on female palm trees known as inflorescences by the male flowers carried on palm trees known as male palms, so date palm trees are called Dioecious and Monogamous (Unisexual) with cross-pollination (Matter, 1991).The date palm, like other

trees, is affected by many pests that cause significant 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. Inflorescence Rot of male date palm pollen disease is one of the most important diseases spread among date palm trees, and this disease is caused by the fungus *Mauginiella scaettae* Cav. (Hilal and Abbas, 2004). Excessive use of chemical and unnatural materials such as fungicides and insecticides, especially systemic pesticides, to control plant diseases that affect trees, field crops and orchards, has led to harmful environmental pollution for humans, animals, plants, soil and air. In view of the severity of the disease 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.

2. MATERIALS AND METHODS

This study was conducted in the laboratories of the Medicinal and Aromatic Plants Unit and the Plant Protection Department of the College of Agriculture - University of Basrah to know the effect of using some plant extracts to control the disease of palm pollen of the male cultivar Ghanami green. The field study was conducted in one of the orchards of the Shatt al-Arab, where 27 trees were selected for the studied cultivars. They were as homogeneous as possible in terms of date palm ages and service operations. The study samples were collected in the third and fourth weeks of the month of March.

Preparation of plant extracts

The quantity of 100 g of each of the leaves of the mint plant and the leaves of the castor plant was weighed and placed in a glass beaker containing 200 ml of hot distilled water without boiling point (Kayode, 2006). The plant material was mixed with water by means of an electric mixer for 10 minutes, and the mixture was left to soak for 24 hours, then filtered using filter paper. The resulting sediment was completed to 200 ml and 3 concentrations (0, 50, 70)% of each extract were prepared, and all were kept in the refrigerator at ± 2 °C away from light for use in the treatment of palm trees prepared for this purpose palm trees treatment. The palm trees were sprayed with plant extracts in concentrations prepared using a pump, where the growing top (the head of the palm only) was sprayed in the early morning until complete wetness and on two dates. The first spray was at the end of January, before the appearance of the pollen, and the second spray was at the beginning of the appearance of the pollen (the month of February). Then the following traits were studied:

1- infection rate

It was estimated that the percentage of infection of Inflorescence Rot of male date palm pollen disease caused by the fungus *M. scaettae* was estimated. By knowing the manifestations of infection caused by this disease on the infected pollen, The total numbers of palms and infested palms were calculated and the infection rate was estimated from the following equation:

$$\text{Inflorescence Rot pollen infection\%} = \frac{\text{number of infection palms}}{\text{Total number of palms}} \times 100$$

2- Estimation of the percentage of carbohydrates in pollen

The method of Dobius et al. (1965) was followed in estimating the carbohydrate content of pollen, as 0.5 g of dried date palm pollen was taken and placed in 90 ml glass tubes, and 70 ml of distilled water was added to it, with three replicates for each cultivar of healthy and infected pollen. The samples were placed in a water bath at a temperature of 70 °C for one

hour, after which they were left to cool to room temperature and filtered by means of filter paper. Then, the method was completed after preparing the standard solutions.

3- Determination of the percentage of phenols in the pollen

The method of Melo et al. (2005) was followed in estimating the phenolic content of date palm pollen, as one gram of dried plant sample was taken by means of an electric oven (Galenhamp) at a temperature of 40o 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 water bath (Memmert type), 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.

4- Anatomical study of flowers

The method described in Al-Najjar et al. (2021) was followed. Two flowers were selected from the healthy and infected pollen cluster of Ghanami green variety to know the effect of the pathogenic fungus on palm pollen tissues, at a distance of 10 cm from the base of the healthy and infested pollen, with three flower clusters for each pollen. Use the Freezing Microtome Reichert-Jung model Frigocut-2700 at -10°C to make the cutting dies. The parts to be cut are embeded in the mold using freezing, Special cutting blades were used to obtain the anatomical sections, and they were placed on glass slides (slides) at room temperature, and the models were tested directly by means of a compound light microscope.

Statistical analysis

The study was designed according to a The Randomized Complete Block Design (RCBD) as a factorial experiment, the means were compared according to the method of least significant difference (L.S.D) (Least Significant Differences Test) under the probability level of 0.05. (Al-Rawi and Khalaf Allah, 2000).

3. RESULTS AND DISCUSSION

1- Infection rate

It is clear from the results in Table (1) that the plant extracts have a significant effect in decreasing or increasing the percentage of infection with Inflorescence Rot of male date palm pollen disease, where the control treatment recorded the highest infection rate of 1.48%.Whereas, treatment of mint extract at 70% concentration recorded the lowest value of 0.26%, while the treatment of castor extract at 70% concentration recorded the lowest value of 0.31%.As for the interaction between peppermint extract and castor extract, the treatment recorded 70% for each of them, the lowest infection rate was 0.05%, while the control treatment recorded the highest infection rate, which was 2.27%. This may be due to the effective role of plant extracts in reducing the incidence of pathogenic fungi as well as reducing its effect on infected trees.

Table (1) Effect of plant extracts on the percentage of infection with Inflorescence Rot disease of male date palm pollen

mint extract	Castor extract	mint extract effect
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	%0	%50	%70	average
%0	2.27	1.37	0.80	1.48
%50	0.49	0.10	0.08	0.22
%70	0.60	0.13	0.05	0.26
Castor extract effect average	1.12	0.53	0.31	
L.S.D.	0.07= interaction		0.01= Castor	0.01= mint

2- The percentage of carbohydrates in the pollen

The results in Table (2) that the plant extracts have a significant effect on the pollen content of carbohydrates, where the control treatment recorded the lowest percentage of 8.95%. Whereas, the treatment of mint extract with a concentration of 70% recorded the lowest and the highest amounted to 17.03%. The treatment of castor extract at 70% concentration also recorded the highest carbohydrate value of 16.23%. As for the interaction between peppermint extract and castor extract, the treatment recorded 70% for each of them, the highest percentage of carbohydrates in pollen amounted to 21.37%, while the control treatment recorded the lowest value of 7.28%. The difference in the percentage of date palm pollen from carbohydrates to date palm pollen may be due to the difference in the infection conditions surrounding each treatment, which in turn affects the vital system and the construction of carbohydrates, It is noticed that the percentage of carbohydrates in the pollen increased in the treatments that recorded the lowest percentage of infection with the disease, and on the contrary for the treatments that recorded the highest percentage of infection and that recorded the lowest percentage of carbohydrates (Table 1). Therefore, differences appeared in the percentage of carbohydrates (Abdul Qadir et al., 1982). and Matar, 1991.

Table (2) Effect of plant extracts on the percentage of carbohydrates in male date palm pollen ghanami green

mint extract	Castor extract			mint extract effect average
	%0	%50	%70	
%0	7.28	8.79	10.77	8.95
%50	10.25	14.44	16.55	13.75
%70	12.29	17.42	21.37	17.03
Castor extract effect average	9.94	13.55	16.23	
L.S.D.	2.12= Castor		2.12= mint	3.36= interaction

3- The percentage of phenols in the pollen

It is clear from the results in Table (3) that the plant extracts have a significant effect in decreasing or increasing the percentage of phenols in palm pollen, where the control treatment recorded the highest percentage of 1.47%. While the treatment of mint extract at 70% concentration recorded the lowest value of 0.56%, while the treatment of castor extract

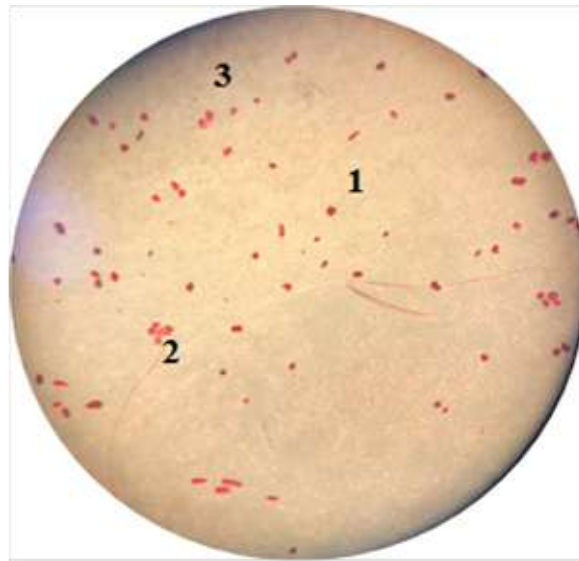
at 70% concentration recorded the lowest value of the percentage of phenols that reached 0.56%. As for the interaction between mint extract and castor extract, the treatment recorded 70% for each of them, the lowest percentage was 0.56%, while the control treatment recorded the highest percentage of phenols, which amounted to 2.36%. It is noted that the percentage of phenols in the pollen increased in the treatments that recorded the highest percentage of infection with the disease 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 infected pollen may be due to the effect of the pathogenic fungus on the plant, which leads to an increase in phenolic substances, which are among the natural chemical defenses present in the plant. Agrios (1997) stated that some phenolic compounds have an effective role in plant control against plant pathogens and that the increase of phenols in the plant reduces the effect of the pathogenic fungus (Nizam al-Din et al., 1983).

Table (3) Effect of plant extracts on the percentage of phenols in male date palm pollen ghanami green

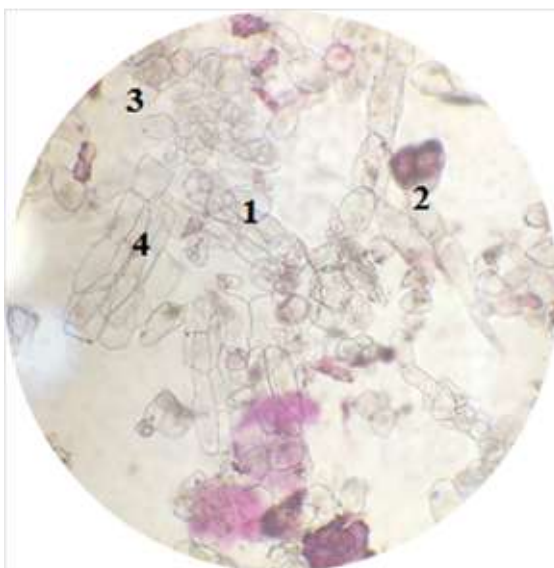
mint extract	Castor extract			mint extract effect average
	%0	%50	%70	
%0	2.36	1.23	0.81	1.47
%50	0.95	0.74	0.48	0.72
%70	0.87	0.43	0.39	0.56
Castor extract effect average	1.39	0.80	0.56	
L.S.D.	0.18= Castor		0.18= mint	0.21= interaction

4- Anatomical study of flowers

The results of microscopic examination of pollen sections of date palm cultivar Al-ghanami green healthy and infected with pollen Inflorescence Rot disease showed that the healthy pollen tissue (pictuer 1-a) has healthy walls in parenchymal cells and wood and is not decomposed, As for the parenchyma cells in the affected pollen tissue (panel 1-b), it was observed that they ruptured and merged with each other because the parenchyma consisted of thin cells composed of pectin and cellulose. It is known that plant pathogenic fungi, including *M. scaettae*, secrete pectin-degrading enzymes Cellulase (Abbas, 2005) by the action of the pectinase enzyme secreted by *M. scaettae* causes the cell walls to fold and thus disintegrate, thus detaching the phloem cells from the xylem (Agrios, 1997). It is noted that the wood cells are healthy because they are thick and contain lignin (Al-Aroussi and Wasfi, 1979).The separation of phloem cells from wood in vascular bundles was also observed. The reason for this decomposition in phloem brinkema is the decomposition of the middle lamella, which is made up of pectin.



(a)



(b)

picture (1) A cross-section of a flower of the pollen of the green Ghanamy cultivar. (A) A healthy flower showing 1- healthy-walled parenchymal cells 2- Tannin cells 3- Cortex (b) A flower infected with dysbacterium pollen disease showing 1- smashed-walled parenchymal cells 2 - Tannin cells 3- Cortex 4- Spores of pathogenic fungi

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