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Role of Aromatic Plants in Reducing Insect Damage in Stored Dates

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Abstract: This study was conducted to find out the effect of some aromatic plants on date moth *Ephestia cautella* (Walk.) and *Oryzaephilus surinamensis* (L.). The percentage of damage with the two insects was not significant compared with control with the exception of dates treated with coriander plants, where the infection rate decreased to 8.29% compared to the control treatment (10.58%). The Brim variety was resistant to infection with an infection of 0% when treated with celery leaf extract after a three-month storage period compared with the control treatment of the same variety (4%). Shikkar variety was the highly susceptible with infection of 21, 20 and 20.67% in the treatment of mint, sweet seed and celery, respectively, after a period of six months of storage. The severity was high after a storage period of three months (8.34 larva/25 fruits). The treatment of stored dates with aromatic plants did not show a significant effect with regard to the percentage of infestation, but it had a significant effect on the severity of the infestation as it reduced the number of larvae.

Keywords: Aromatic plants, Date moth larvae, Date palm variety, Saw-chest beetle

The date palm *Phoenix dectylifera*, which belongs to the Arecaceae palm family, is one of the most important fruit trees in Iraq because of its great nutritional and economic value. Given the need for dates in the human diet throughout the year, large quantities of them are stored because of their economic importance for farmers. Dates are not immune to many insect pests damage such as the saw-chest beetle *Oryzaephilus surinamensis* L, the fig moth (*Ephestia cautella* (Walker), the carob moth *E. calidella* (Gn.) and the currant moth (*E. figulilella* (Greg.) (Ali and Hama 2016). The date moth *Ephestia cautella* (Walker) is one of the most important insect pests (Boeke et al 2004). The economic damage of the insect is evidenced by the extent of the damage caused by its larvae through feeding or by contaminating the stored dates with dead insects, their products, feces, wastes, and shedding skins (Boeke et al 2004). It affects dates during storage and during the packaging and export stages and causes damage to them (Ali and Hama 2016). The *Oryzaephilus surinamensis* (L.) fruit beetle is also considered to be a pest of date stores, causing more than 70% of the stored material damage. Globally, the percentage of loss due to this insect is estimated at seventy billion dollars annually (Kuhn and Winston 2000). Damage from this pest results from feeding of adult insects and larvae on stored grains and fruits. Ali and Hama (2016), observed that these insects are controlled in several ways, including pressing dates, using heat or heat with air vacuum, or using some inert gases such as carbon dioxide CO2, nitrogen N2, helium and others or using aromatic plants or volatile oils. The aromatic plant contains essential oils which have great importance in various fields (Parekh et al 2006). As a result of the emergence of insect resistance against synthetic chemical pesticides, and to reduce the use of chemical pesticides in the control due to their harmful effects, pollution to the environment, and harm to humans in the short and long termemphsisi is on alternative (Peterson et al 2000, Oleiwi et al 2020). Therefore, modern trends is focused on use of natural plant compounds for insect control due to the effective secondary compounds. This research aimed to study the effect of some aromatic plants on insects associated with common stored dates in Iraq.

MATERIAL AND METHODS

Four varieties of dates (Barhi, Khadrawi, Braim and Shikkar) were selected washed and dried under the sun for a period of 5-7 days. Four aromatic plants were collected from herb shops in Al-Qurna district as follows Mint (*Mentha*), black caraway (*Nigella sativa*), coriander (*Coriandrum sativum*), in addition to celery (*Apium graveolens*), which was dried naturally in the open air for a period of 7-10 days. The aforementioned plants were prepared and milled separately by electric grinder, in addition to the fifth treatment (Control), by taking an equal amount from each sample (mint black caraway coriander and celery) and mixing well.

The selected date samples were collected from the local varieties of dates at a rate of 50 fruits per bag, with three replicates for each treatment for each variety, in addition to one replicate remaining untreated as a control treatment. The bags were treated with 2 gm of each aromatic substance and mixed homogeneously with dates in bags. Samples were stored in bags that are used to store flour or sugar and prepared according to measurements required to store dates, (25 cm in length and 20 cm in width). The bags were sealed from the top, taking into account that one side remained open and stored for six months at room temperature. Samples were examined after a period of 3 and 6 months of storage, by calculating the percentage of infected and healthy dates.

RESULTS AND DISCUSSION

The treatment of stored dates with aromatic plants did not show significant differences in the percentage of infestation with the two target insects, except for the dates treated with coriander plants, lower rate of infection of 8.29% compared to the control treatment (10.58%) (Table 1). The highest incidence was in the Shikkar variety (14.89%), while the lowest in Braim variety (3.47%). In addition, the effect of time period on the infection rate showed variations. The incidence after three-month storage period was 8.56%, while after six months increased to 11.6 %. From the interaction among the treatments, indicated that the most resistant to infection was the Braim variety with an infection rate of 0% when treated with celery plants after a three-month storage period compared with the control treatment for the same variety was 4%, followed by the black caraway treatment (6.67%). The highest susceptible varieties was the Shikkar variety with the highest rate of infection of 21, 20 and 20.67% when treated with mint, black caraway and celery, respectively after a period of six months of storage.

The lowest severity of saw-chest beetle larvae was on date varieties treated with black caraway and coriander 1.92 and 1.42 larvae / 25 fruits, respectively (Table 2) and with celery and mint plants, the average infestation was 4.58 and 4.71 larvae / 25 fruits respectively, compared with the control (3.85 larvae / 25 fruits). Braim and Shikkar showed the least larval population of 0 and 0.94 larva / 25 fruits each, respectively and highest was in Barhi variety (6.52 larvae / 25 fruits).There were no significant differences with storage period (three and six months). There was no larval population in Braim variety. Barhi variety that was treated with celery leaves after a period of six months of storagerecorded maximum larval population of 16.67 larvae / 25 fruits followed by the Khadrawi variety that was treated with mint after a 3-month storage period. .

The stored dates treated with aromatic plants showed low population of date moth larvae (Table 3). The lowest severity was recorded on stored dates when treated with celery plant (4.21 larval/25 fruits) and the highest was of 5.71 larvae / 25 fruits, was significantly different from the control (8.75 larvae / 25 fruits). The most resistant cultivar was the Braim cultivar, (2.17 larvae / 25 fruits) compared with the highest infestation in Shikkar cultivar (9.94 larva / 25 fruits). The population was

Table 1. Percentage of infestation by the saw-chest beetle in different varieties

Treatment	Mean (%)	Month	Infestation in varieties (Per cent)				Mean
			Shikkar	Barhi	Khadrawi	Barim	
Celery	9.67	3	13	7.33	5.67	0.33	3 month/8.56
		6	20.67	15	14	1	
Black caraway	9.22	3	12	11.67	3.67	6.67	
		6	20	5.33	16.33	3.67	
Coriander	8.29	3	13.33	9	7.33	6.33	
		6	13.67	4.33	9.33	3	
Mint	12	3	13	8.67	10	5.33	6 month/11.6
		6	21	18.33	15.67	4	
Mixture	10	3	12.3	13	8	1	
		6	16.33	9	16.33	2.33	
Control	10.58	3	7.33	9.67	15	4	
		6	14.33	16.33	14	4	
Mean			14.89	10.64	11.31	3.47	
LSD (p=0.05)		Interaction 5.14		Variety 1.75			Treatment 2.15

high after a three-month storage period (8.34 larvae / 25 fruits,) which decreased after the six-month storage period (2.69 larvae / 25 fruits). From the interaction between the treatments indicted no larval population in Braim variety 0 larvae / 25 fruit after three months when treated with celery plant leaves and maximum was when treating the stored dates with black caraway, coriander and mint plants after three months. The highest infestation severity on the Khadrawi cultivar in control treatment after a three-month storage period of 23.33 larvae / 25 fruits.

The lowest percentage of infection in dates treated with coriander plants was 8.29% compared with control treatment 10.58. Thus, indicate that the black caraway is a repellant and causes a decrease in the number of infections more than the treatments of mixture and coriander seeds. The least severity of infection in saw-chest larvae of date varieties

Table 2. Density of saw-chest beetle larvae on some of the stored date varieties

Treatment	Mean (%)	Month	Infestation in varieties (Per cent)				Mean
			Shikkar	Barhi	Khadrawi	Barim	
Celery	4.58	3	0.33	3	13.33	0	3 month/2.99
		6	1	16.67	2.33	0	
Black caraway	1.92	3	1.33	3	2.33	0	
		6	1.67	3	4	0	
Coriander	1.42	3	1	6	0	0	
		6	1	0	3.33	0	
Mint	4.71	3	1.33	1	16	0	6 month/3.22
		6	1.67	15	2.67	0	
Mixture	2.17	3	0	4.67	3.67	0	
		6	0	4.33	4.67	0	
Control	3.83	3	1	4.33	9.33	0	
		6	1	14	1	0	
Mean			0.94	6.25	5.22	0	
LSD (p=0.05)		Interaction 4.99		Variety 1.44			Treatment 1.76

Table 3. Density of date moth larvae on some of the stored date varieties

Treatment	Mean (%)	Month	Infestation in varieties (Per cent)				Mean
			Shikkar	Barhi	Khadrawi	Barim	
Celery	4.21	3	13	6	7.7	0	3 month/8.39
		6	5.33	0	2	0.33	
Black caraway	5.71	3	16	8	5	5	
		6	6.33	1	3.33	1	
Coriander	4.54	3	13.67	5	4.33	6	
		6	3.33	1.33	2	0.67	
Mint	5.58	3	11.33	7	4.67	6	6 month/2.64
		6	11.67	0	3	1	
Mixture	4.29	3	13	9	3.33	1	
		6	4	0.33	2.67	1	
Control	8.75	3	17.33	13	23.33	3.33	
		6	4.33	6.33	1.67	0.67	
Mean			9.94	4.75	5.14	2.17	
LSD (p=0.05)		Interaction 3.41		Variety 1.13			Treatment 1.38

appeared when treated with black caraway and coriander (1.92 and 1.42 larvae / 25 fruits respectively). Hadi et al (2016) in a warehouse experiment observed the alcoholic extracts of the black caraway and coriander plant reduced the infection rates. The absence of saw-chest beetle larvae and the absence or low number of fig moth larvae in the stored dates treated with celery plant also may attributed to the nature of the celery plant and its nutritional composition (the content of volatile and stable oils) and the materials that act as a repellant to insects. The repellency rate of stable and volatile oils for some aromatic spices, such as mint, eucalyptus, and Elias, varied between 17-73% for the southern cowpea beetle (Farhana et al 2006).

CONCLUSION

The treatment of stored dates with aromatic plants did not show a significant effect with regard to the percentage of infestation, but it had a significant effect on the severity of the infestation as it reduced the number of larvae. The study also showed that the Braim cultivar was the most resistant to infection, while Shikkar variety was the highest susceptible.

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