

Susceptibility of some date to infestation by *Oryzaephilus surinamensis* (L.) (Coleoptera: Silvanidae)

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Abstract

The susceptibility of some date cultivars namely: (Sewi, Bartamouda, Malakabi, Sakkouti and Gondeila) to infestation with *Oryzaephilus surinamensis* (L.) was studied at 25°C and 70±5% R.H. Some biological aspects of this pest and loss in date weight were recorded of each variety. Moreover, correlation between fruit weight as well as chemical components and the susceptibility index of the tested cultivars were investigated.

Results indicated that the two cultivars Gondeila and Sewi were the least susceptible to infestation with the pest as shown by the longest developmental period, the lowest number of adult emergence and loss in date weight. Also, the least values of susceptibility index of these cultivars were observed. The Sakkouti and Bartamouda cultivars were more susceptible to infestation by *O. surinamensis*. Average fruit weight (as physical character) is positively correlated with the susceptibility index. While, the chemical components (such as Ash %, Moisture content % and Total sugars) were negatively correlated with the susceptibility index of the tested date cultivars.

Key words: Date palm, *Phoenix dactylifera* L., *Oryzaephilus surinamensis* L.,

Introduction

Different date palm, (*Phoenix dactylifera* L.) cultivars show a variation in their susceptibility to storage insects, the dates are used directly as fresh or dry in the Arab region. Aldryhim and Adam (1998) noticed that during storage, the dry and semi-dry dates are attacked by numerous pests and subsequently loss its quality and quantity. Out of the dangerous storage insects the saw-toothed grain beetle, (*Oryzaephilus surinamensis* L.) which attacks different date cultivars in store-rooms. The relative susceptibility of different date cultivars to infestation with the saw-toothed grain beetle was studied by many researchers such as Mallah *et al.* (2016) who revealed that the semi-dry cultivars were more attractive to the pest as compared to dry cultivars. Also, Moawad and Al-Ghamdi (2013) and Shattir *et al.* (2002) cleared that, the infestation by *O. surinamensis* caused loss in quality and quantity of dry date cultivars during storage.

The present study planned to measure the relative susceptibility of different date cultivars to infestation by *O. surinamensis*. Also, the relationship between the average fruit weight (as physical character) and the chemical components of the tested date cultivars and the infestation by this pest was recorded.

Materials and methods

A stock culture of (*Oryzaephilus surinamensis* L.) was reared on fully matured dates at 25°C and 70±5 % R. H in the laboratory of plant protection Department, Faculty of Agriculture, Minia University, according to Alqurashi and Bakhawain (2010). Five cultivars of fully matured dates belonging to species (*Phoenix dactylifera* L.) were obtained from Mattana Agric. Res. Station in Aswan government, Egypt. Before use, the dates for all tested cultivars were kept one week in a deep freezer to sterilize them. They were conditioned at 25°C and 70±5 % R.H for two weeks to allow for moisture content equilibration Parkin (1956).

The relative Susceptibility of the previous date cultivars to infestation with *O. surinamensis* were compared in this investigation by releasing twenty newly hatched larvae less 24 hours on each lot of dates (100 gm. of each variety replicated four times). The vials were observed daily till adult emergence and the total numbers of emerged adults were recorded. In the same time, the developmental period in days (egg hatching to adult emergence) was investigated. For recording the incubation period, one hundred eggs were put on four separates 30 g m s lots of each date variety in 5x10 cm plastic vials at 25 °C and 70±5 % R.H.

The susceptibility index was also calculated according to Dobie (1974) by dividing the log number of adult emergence on the average developmental period.

To record the losses associated with infestation by the saw-toothed grain beetle, 100g from whole dates of each date variety were weighted and put into 6x10 cm plastic vials in four replicates and each vial was inoculated with ten larvae (1-2 days old). A further -vials on each variety containing 100g of dates without insects were used and served as controls. The vials were maintained at 25 °C and 70±5 % R.H and observed until adult emergence. The content of each vial at the end of experiment was then weighted and an adjustment being made for moisture content change using the weights of the control as the reference El Nazir (2004).

Fifty dates were taken randomized from each variety before artificial infestation and **the following physical and chemical constituents were measured:**

1. Average fruit weight in grams.
2. Moisture content in each date variety was determined according to Dowson and A ten (1962)
3. Ash % was also determined according to A.O.A.C. (1965)
4. Total sugars percentages in the pulp according to Lane and Eynon (1923).

Statistical analysis

The collected data were statistically analyzed according to Gomez and Gomez (1984) method. The treatment means were compared according to (Waller and Duncan, 1969).

Results and Discussion

Results for the development of *O. Surinamensis* on some date cultivars are presented in Table 1. It is apparent from data that the longest incubation period, larval and pupal duration were observed on Gondeila and Sewi cultivars, (13.00, 27.50, 16.00, and 7.25, 30.75, 12.75, respectively.), while the other date cultivars ranged from (4.00 to 11.00, 20.50 to 23.25 and 9.75 to 10.55 days, respectively.). The average developmental period (from egg hatching to adults) noticeable varied on all tested cultivars. However, considerable prolongation in the development from egg hatching to adults was observed with Gondeila and Sewi date cultivars, as compared with the other tested cultivars. On the other hand, the least number of adult emergence were also recorded on Sewi and Gondeila cultivars (11.25 and 13.00, respectively) while the highest numbers of adult emergence were observed on Sakkouti and Bartamouda (25.00 and 18.50, respectively). Similar findings were obtained by El Nazir (2004).

Table (1) Some biological studies of *O. Surinamensis* reared on some date cultivars

Date variety	Incubation period (days)	larval duration (days)	Pupal duration (days)	Development period (days)	Adult emergence
Sewi	7.25±2.29 c	30.75 ± 1.25a	12.75±1.93 b	50.75±0.85 b	11.25±0.25e
Bartamouda	4.00±1.08 d	22.50± 1.04 d	9.75±0.75 c	36.25±0.48 d	18.50±0.65 b
Malakabi	11.00± 0.41b	20.50± 0.65 e	10.50±0.50 c	42.00±1.00 c	16.75±0.49 c
Sakkouti	8.12±1.04 c	23.25±0.63 c	10.50±0.50 c	41.87±1.25 c	25.00±0.58 a
Gondeila	13.00±0.91 a	27.50±0.65 b	16.00±4.09 a	56.25±0.65 a	13.00±0.41 d

Values not followed by the same letters are significantly different at 5.0% level of probability (Duncan's multiple range test).

Furthermore, the quality of the diet can be judged on the basis of loss in date weight percentage due to the feeding activity of beetle larvae (Table 2). It is clear from the data that the loss in date weight percentage differed among all tested cultivars. However, the least loss in weight was shown with Gondeila and Sewi cultivars (3.00 and 4.59%, respectively). But the cultivars of Sakkouti and Bartamouda had the highest values of loss (11.99 and 10.24%, respectively).

The chemical components such as moisture% and total sugars were negatively correlated ($r = -0.07$ and -0.65 , respectively), while ash% was positively correlated ($r = 0.03$) with loss in date weight % of the tested cultivars (Table 2).

Table (2) Loss in date weight % in different date cultivars by saw-toothed grain beetle in relation to moisture, ash and total sugars.

Date variety	Loss in date weight %	Moisture %	Ash %	Total sugars %
Sewi	4.59 ±0.13d	3.22±0.08	4.09±0.14	58.63±0.48
Bartamouda	10.24 ±0.58b	2.64± 0.05	5.18±0.17	48.60± 0.67
Malakabi	5.48 ±0.15c	1.59± 0.07	3.94± 0.07	53.43± 0.30
Sakkouti	11.99 ±0.23a	1.88± 0.05	3.51±0.15	50.55± 0.29
Gondeila	3.00 ±0.04e	2.15± 0.13	6.18± 0.12	65.15± 2.76
(r)	-	-0.07	0.03	-0.65

r: correlation coefficient for each chemical character and loss in date weight % of the tested cultivars.

Data in Table (3) cleared that Sakkouti cultivars had the smallest average fruit weight (6.66), while Bartamouda and Sewi had the highest values (10.81 and 8.91, respectively). Moreover, positive correlation between average fruit weight (g) and the susceptibility index of the tasted cultivars was observed ($r = 0.16$). While, the chemical components i.e., ash%, moisture% and total sugars% were negatively correlated ($r = -0.18$, -0.32 and -0.86 , respectively). Similar results were obtained by Saleh *et al.* (2002) and Ali and Aldosari (2007).

Table (3) Correlation between average fruit weight as well as chemical components of some date cultivars and the susceptibility index.

Characters	Date cultivars					R
	Sewi	Bartamouda	Malakabi	Sakkouti	Gondeila	
Average fruit weight (gm)	8.91	10.81	7.60	6.66	7.56	0.16
Ash %	4.09	5.18	3.94	3.51	6.18	-0.18
Moisture %	3.22	2.64	1.59	1.88	2.15	-0.32
Total sugars %	58.63	48.60	53.43	50.55	65.15	-0.86
Susceptibility index	5.71	7.04	6.60	7.80	5.01	

R: correlation coefficient for each chemical character and the susceptibility index of the tested cultivars

In conclusion, the tested date cultivars could be classified into the following three groups:

1. The Highly susceptible date cultivars to infestation with *O. surinamensis* were Sakkouti and Bartamouda
2. The moderately susceptibility date variety was Malakabi.
3. The Least susceptible date cultivars were Gondeila and Sewi

Also, the variation in the susceptibility of these date cultivars to *O. surinamensis* showed that all the studied chemical components were negatively correlated with the susceptibility index of the tested cultivars. But the average fruit weight (as physical character) was positively correlated with the susceptibility index value.

Based on these finding, the present study suggested that selection of tolerant date cultivars can play important role in order to minimize the infestation with *O. surinamensis*.

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حساسية بعض أصناف البلح للإصابة بحشرة خنفساء الحبوب المنشارية (السورينام)

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الملخص العربي

تم دراسة حساسية بعض أصناف البلح (سيوي - برتمودة - ملاكابي - سكوتي - قنديل) لحشرة خنفساء الحبوب المنشارية (السورينام) عند درجة حرارة 25م° ورطوبة نسبية 70±5% وتم تسجيل بعض النواحي البيولوجية للحشرة (فترة الحضانة، الطور اليرقي، طور العذراء، فترة النمو وعدد النسل الناتج من الحشرات الكاملة) وكذلك نسبة الفقد في وزن الثمار وقد تم تقدير علاقة الارتباط بين وزن الثمرة ومكوناتها الكيميائية ودليل الحساسية لإصناف البلح تحت الدراسة

وجد أن الاصناف جنديلة و سيوي أقل الاصناف المختبرة حساسية للإصابة حيث اتضح أنه أكثرها إطالة لفترات الأطوار المختلفة وفترة نمو الحشرة وكذلك سجلت هذه الاصناف أقل عدد لكل من الحشرات الخارجة وكذلك نسبة الفقد الناتج في وزن الثمار نتيجة الإصابة بهذه الحشرة. كما سجلت هذه الاصناف أقل قيمة لدليل الحساسية. وقد وجد أن الصنفين سكوتي و برتمودا أكثر حساسية للإصابة بهذه الحشرة.

كان معامل الارتباط موجباً بين كل من متوسط وزن الثمرة (كصفة طبيعية) ودليل الحساسية بينما كان معامل الارتباط سالباً بين كل من المكونات الكيميائية (الرماد، المحتوي الرطوبي، السكريات الكلية) ودليل الحساسية للإصناف المختبرة من البلح .

الكلمات الدالة: نخيل البلح، حشرة خنفساء الحبوب