American Journal of Experimental Agriculture
3(3): 651-663, 2013

SCIENCEDOMAIN *international*
www.sciencedomain.org

Susceptibility of Some Dry Date Cultivars to Infestation by *Oryzaephilus surinamensis* (L.) (Coleoptera: Silvanidae)

Sawsan S. Moawad[1*] and F. F. Al-Ghamdi[2]

[1]Pests and Plant Protection Department, National Research Center, Cairo 12311 Egypt.
[2]Faculty of Science, Noura Princess University, Al-Ryad, Kingdom of Saudia Arabia.

Authors' contributions

This work was carried out in collaboration between all authors. Author SSM designed the study, wrote the protocol, wrote the first draft of the manuscript managed the analyses of the study, read and approved the final manuscript. Author FFA carried out the experiments; performed statistical analysis and managed the literature searches.

Research Article

Received 6th February 2013
Accepted 23rd April 2013
Published 16th May 2013

ABSTRACT

Susceptibility of eight date cultivars (namely Barhi, Barni Al Madina, Deglet Noor, Rushodia, Sukari, Ajwa, Mabroom and Nabtat Ali) to an attack by saw-toothed grain beetle *Oryzaephilus surinamensis* (L.), was estimated under laboratory conditions. Physical characteristics (texture, shapes and colour) and chemical constituents (total amount soluble solid, sugar, moisture, nitrogen, lipids, and fatty acid and percentage of ash) of the tested date cultivars were recorded. The laboratory evaluation indicated that the most preferable cultivar to eggs deposition and attack adults of the saw- toothed grain beetle was Sukari while the most resistance cultivars were Deglet Noor and Ajwa. The growth index of immature stages increased in the most susceptible cultivars (Sukari) but decreased in the resistance one (Deglet Noor and Ajwa). On the other hand the susceptible index indicated that three cultivars as Sukari, Barhi, and Rushodia were the most susceptible cultivars compared to others. There was a positive and significant correlation between moisture contents and the susceptible index while ash content elicited negative and highly significant correlation with susceptible index. During six months of storage, the highest rate of weight loss of tested date cultivars, that caused by infestation of saw-toothed grain beetle, was for Barhi followed by Barni Al Madina, Rushodia, and Sukari.

**Corresponding author: Email: abzs9999@yahoo.com;*

Keywords: Saw-toothed beetle; date cultivars; susceptibility; epihylaxis factors; endophylaxis factors; chemical constituents; physical characters.

1. INTRODUCTION

Few plant species have developed into an agricultural crop so closely connected with human life as has the date palm. The date palm (*Phoenix dactylifera* L.) yields a variety of products for use in agricultural production and for domestic utensils of human. The world date palm cultivation is concentrated mostly in the Near East and Africa, favored by the most suitable dry sub-tropical and high temperature climate prevailing in these regions.

The dates are the important product of palm which used directly as fresh or dry in different countries, especially in the Arab region. During storage, the dry dates are attacked by numerous pests which caused to loss its' quality and quantity, as *Oryzaephilus surinamensis*, *Tribolium castaneum* (Herbest)*, Ephestia* (*Cadra*) *cautella* (Walker)*, Tribolium confusum* (Jacquelin du val), *Plodia interpunctella* (Hubner), *Carpophilus hemipterus* (L.) and *Lasioderma serricorne* (F.) [1]. Recently, many researches were carried out to improve some of physical and chemical properties of palm tree, by trying to overcome infestation of different pests that might caused to decrease its quality and quantity. The presence or absence of various external or internal factors in different date cultivars makes them to be more resistance or sensitive to insect infestation. The fact that insects may be prevented from feeding by certain chemicals is the potential value in crop protection [2].

The aim of the present study was to measure the susceptibility of date cultivars to *O. surinamensis* infestation, and determination of the rate of loss during storage.

2. MATERIALS AND METHODS

2.1 Rearing *O. surinamensis*

Infested dates were collected from storehouse at plastic containers and carefully investigated to isolate adult stage (female and male) of saw-toothed grain beetle by using stereomicroscope according to description of Al-Bidawy, A.E and El-Derham, Y.N. [1]. After that five pairs of males and females beetles were put on plastic container (8x12 cm^2) which contains 150g of disinfested dates and then tight close it. The rearing containers were placed in incubators at 27±1ºC and 65 ±5% rh for three weeks. The infested dates were isolated in another plastic container and repeated that till obtain the pure 3^{th} generation of saw-toothed grain beetle to start laboratory experiment.

2.2 Determination of the Physical Characters and Chemical Constituent of Tested Cultivars

Eight cultivars of date were selected namely Barhi, Barni Al Madina, Deglet Noor, Rushodia, Sukari, Ajwa, Mabroom and Nabtat Ali. The physical characters such as texture, colour and shape were determined, in addition to analysis of its chemical constituents (total soluble solid, sugar, moisture, nitrogen, lipids, fatty acid and ash percentages) which carried out at Research laboratory of Plant Production Department, Agriculture and food Faculty, Saud University in Saudi Arabia Kingdom. The acidity, total sugar and moisture content percentages were calculated according to Makate [3]. The obtained data were analyses through Master programs [4].

2.3 Determination of the Susceptibility of Different Date's Cultivars to Infestation by *O. surinamensis*

The experiments were carried out to determine the susceptibility of different date cultivars according to epiphylaxis and endophylaxis factors as follows:

2.3.1 Epiphylaxis factors

It was evaluated through oviposition preference (non choice test) and the attractive cultivars to adult stage (choice test) of saw-toothed grain beetle, the following experiments were conducted:

2.3.1.1 Non-choice test (oviposition preference)

Five pairs of males and virgin females were released in Petri-dish (9 cm.) which contained one type of tested dates cultivars. It was investigated in daily basis to determine the number of deposited eggs for up to fifteen days. Each experiment was replicated five times.

2.3.1.2 Choice test

The experiment was carried out at arena apparatus which made of plastic plate (20 cm in diameter), divided to eight parts by plastic partitions and left its center open to facilitate locomotion of released beetle between tested cultivars (Fig. 1). Equal weight of tested cultivars data were introduced in each partition of arena, released 10 pairs of adult stages of saw-toothed grain beetles and tight closed it. After seven days, each one was investigated to count number of beetle attacked to calculate preferable date's cultivars to adult stage of tested beetle.

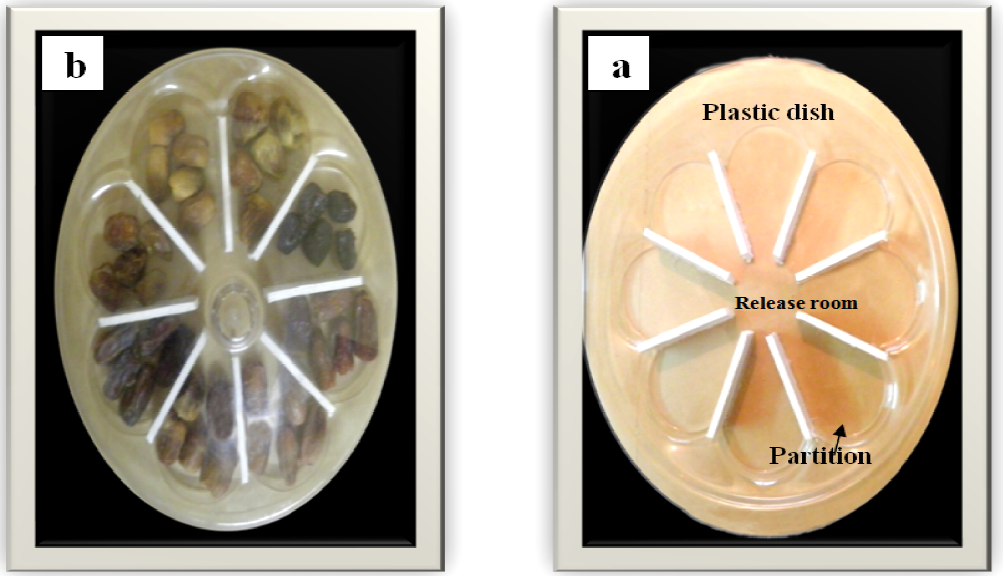

Fig. 1. Arena design which used in preference test
(a) = Structure of arena; (b) = Arena during experiment

2.3.2 Endophylaxis factors

In order to evaluate endophylaxis factors the following experiments were carried out:

2.3.2.1 Susceptibility index

Fifty grams of each tested dry date varieties was taken separately in a plastic container (500 ml) and 5 pairs of males and virgin females of saw-toothed beetles were released inside the container for ten days. After that the beetle were removed and the test was follow up till new generation is obtained [5]. Calculate the susceptible index according to Dobie [6] and Sarin et al. [7] as follows:

$$(SI) = (Log \log_{10} F1)/D \times 100$$

Where

SI = Susceptibility Index.
F1 = total number of released weevil.
D = duration needed to release 50% of new generation.

Experiment was carried out at incubator (27±1ºC and 65±5%) and each one replicated five times.

2.3.2.2 Growth index of immature stages (larvae and pupae)

Ten pairs of virgin males and females were released in Petri dish (9 cm.) which contained 2g flour and acted as eggs deposition substrate. Daily, the flour was investigated to obtained 1st instars larvae. The obtained larvae were released on 10g of the tested date cultivar which put at plastic container (500ml). The tested container were tight closed and kept at incubator. Growth index of immature stages was calculated according to equation of Al-Dosari et al. [8] as follows:

$$Growth\ index = N/D$$

Where,
D = the total development time.
N = Larvae that become adult (%).

2.4 Effect of Saw-Toothed Grain Beetle Infestation on the Weight Loss of Stored Date Cultivar

The test was carried out by using separately 100 g of tested date cultivars at sack clothes , placed inside plastic container (500 ml.) and then released 10 pairs of virgin saw-toothed beetles. After six month, the dates were weighted to calculate the weight loss according to Metwaly, et al. [9] equations as follows:

$$W = We - Wc$$

$$Weight\ loss\ (\%) = \frac{WI - W}{WI} \times 100$$

Where;

W = real weight loss due to infestation.
We = weight of date lost after six month of infestation.
Wc = weight loss at the control (without infestation
WI = weight of dater before infestation.).

3. RESULTS AND DISCUSSIONS

3.1 Estimation of the Physical and Chemical Properties of Tested Date Cultivars

The results indicated to the variation in physical and chemical properties of tested date cultivar which might lead to variation in its susceptibility. It was recorded as following:-

3.1.1 The physical characters

The Fig. 2 described that there were variations between tested dates in texture, colour, and shape. The texture of Barhi, Barni Al Madina, Rushodia, Sukari, and Nabtat Ali were smooth, but Ajwa, Mabroom and Deglet Noor were curly, little and much wrinkle.

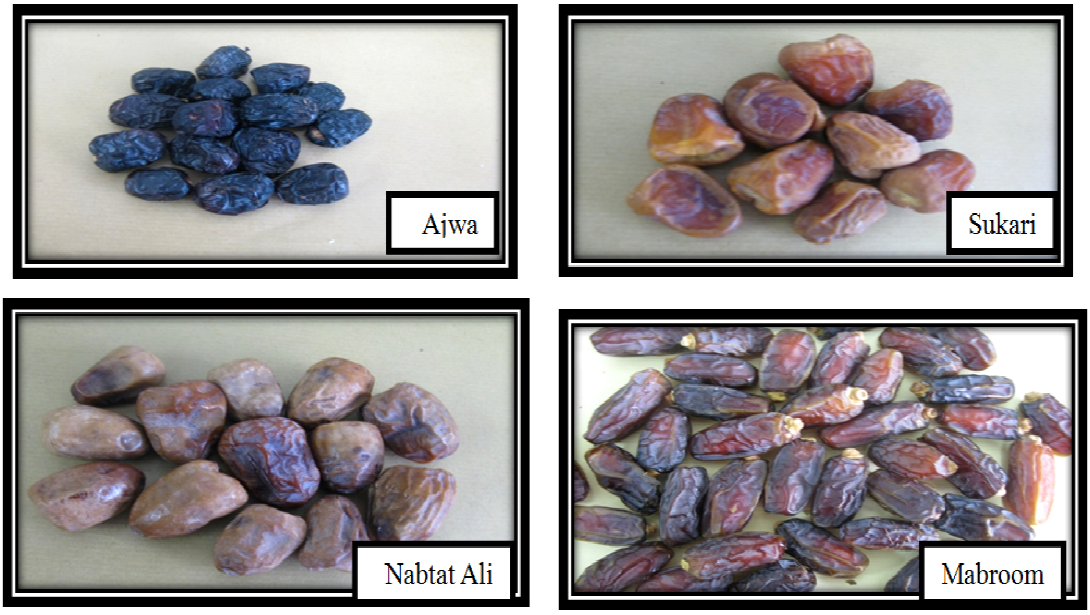

Fig. 2. Photo shows the physical properties (texture, colour, shape and size) of the different varieties of date

On the other hand, the colours were ranged between light brown to dark brown for Barhi, Deglet Noor, Rushodia, Barni Al Madina, Sukari and Mabroom, but Ajwa and Nabtat Ali were Maroon and dark colour, respectively. Generally, the shapes were ranged between oval to elongate.

These observations agree with Hussein et al. [10] who studied physical characters of six date cultivars and recorded the variations in size, colour, shape and weight among its.

3.1.2 The chemical composition

The results indicated that there was significant ($p \leq 0.05$) variation in chemicals constituents of different date cultivars as recorded in Table (1). Barhi cultivar was recorded the highest percentages significantly ($p \leq 0.05$ or 0.01) in total soluble solids (76.8%), and sugar content (68.98%) compare to Mabroom, Rushodia, Nabtat Ali and Sukari which were recorded the lowest one, ranged between 70 to 50 % respectively. While the acidity percentage of the most tested date cultivars were closely nearly to each other, except that Deglet Noor and Sukari were recorded significant ($p \geq 0.05$) low percentage (0.156%). In addition to the highest percentage of moisture content in date cultivar was recorded to Rushodia (15.67%) while the lowest one was Barni Al Madina (11.38%).

Table 1. Analysis of chemical constituents of tested date cultivars

Date cultivars	Total soluble solids (%)	Acidity (%)	Total sugars (%)	Moisture content (%)	Nitrogen (%)	Lipids (%)	Fiber (%)	Ash (%)
Barhi	76.80_{a}	0.192_{a}	68.98_{a}	14.54_{b}	1.42_{f}	0.130_{f}	4.23_{f}	2.14_{b}
Barni Al Madina	74.00_{b}	0.205_{a}	67.02_{a}	11.38_{e}	3.91_{d}	0.141_{f}	7.06_{d}	2.30_{b}
Deglet Noor	74.00_{b}	0.156_{b}	65.40_{a}	13.10_{d}	5.12_{b}	0.321_{b}	9.33_{b}	2.31_{b}
Rushodia	68.40_{d}	0.217_{a}	58.78_{c}	15.67_{a}	2.74_{e}	0.143_{f}	5.79_{e}	1.72_{d}
Sukari	71.60_{c}	0.156_{b}	57.98_{d}	14.70_{b}	4.67_{c}	0.285_{c}	8.74_{b}	1.73_{d}
Ajwa	74.40_{b}	0.217_{a}	61.98_{b}	14.02_{b}	5.45_{a}	0.380_{a}	11.25_{a}	3.30_{a}
Mabroom	69.60_{c}	0.205_{a}	57.84_{d}	13.87_{c}	4.11_{d}	0.187_{e}	8.19_{c}	2.06_{c}
Nabtat Ali	71.20_{c}	0.192_{a}	59.68_{c}	14.61_{b}	4.99_{b}	0.215_{d}	8.52_{b}	2.23_{b}
$LSD_{0.05}$	2.09	0.027	3.95	0.70	0.299	0.015	0.89	0.24

Means with the same letters have no significant difference

Nitrogen, Lipids, Fiber and ash percentages in tested date cultivars were recorded the high significantly variation ($p \leq 0.01$or 0.05) in Ajwa, being 5.45, 0.38, 11.25 and 3.3% while Barhi was recorded the lowest percentage of nitrogen, lipids and fibers, being 1.42, 0.13 and 4.23% and Mabroom was recorded the lowest percentages of ash content, reaching to 2.06%.

The obtained results agree with [11] who mentioned that there are significant variations in chemical composition of eight date cultivars. Also, many researches confirmed that there are variations in physical characters and chemical constituents among various date cultivars. [11,12,13]

3.2 Laboratory Evaluation the Susceptibility of Different Dates Cultivars to Infestation by *O. surinamensis*

From previous results, it is clear that each date cultivar has physical and chemical characters which might effect on its' susceptibility toward the saw-toothed grain beetles. The present work was carried out in order to evaluate such characters under laboratory conditions.

Epiphylaxis factors (external protection agencies) were determined through ovipositional preferences and attractive of adult stages (choice test); while endophylaxis factors (internal protection agencies) were determined through measurement the susceptible index and growth index. The effect of these factors was determined as follows:

3.2.1 Ovipositional preferences

Results presented in Table (2) show that the role of physical characters (external protection agencies) of different date cultivars in selection of the saw-toothed grain beetles to the site oviposition. The data indicated that there was highly significant difference ($P \leq 0.01$) among the tested date cultivar. Sukari recorded the highest numbers of deposited eggs, being 61.67±1.7 eggs/five females/two weeks compared to Ajwa that recorded the lowest numbers of deposited eggs, reaching 2.67±0.9 eggs/five females/two weeks. The moderate susceptible one was Barhi, being 49.3 ± 3.2 eggs/five females/ two weeks while moderate resistance one was Mabroom cultivar, being 14±0.01 eggs/five females/two weeks.

Table 2. Effect of tested date cultivars on female fecundity of *O.surinamensis*

Date cultivars	Number of deposited eggs/5 females/2 weeks (Mean ± S.E)
Barhi	49.33±3.2b
Barni Al Madina	16.67±0.9e
Deglet Noor	6.67±1.2f
Rushodia	25.00±1.1d
Sukari	61.67±1. 7a
Ajwa	2.67±0.9f
Mabroom	14.00±0.01e
Nabtat Ali	32.33±0.9c
L.S.D at 0.05	4.68
L.S.D at 0.01	5.69

Means with the same letters have no significant difference

3.2.2 Attractive of adult stage (choice test)

Results shown in Table (3) indicated that there was an odd among tested date cultivars in the percentage of adult attack. The most preferable date cultivars were Rushodia and Sukari, reaching the attraction percentage to 28.75 and 22.5% while Al Ajwa and Deglet Noor were the least desirable cultivars, reaching to 3.1%.

Table 3. Attraction percentage of *O. surinamensis* adults toward eight dry date cultivars (Choice test)

Date varieties	Percentages of adults attract
Barhi	13.8
Barni Al Madina	11.3
Deglet Noor	3.1
Rushodia	28.8
Sukari	22.5
Ajwa	3.1
Mabroom	4.4
Nabtat Ali	13

From the obtained results it is clear that the physical characters like as colour, texture, size, etc. may play a role in orientation of adult stage to attack certain cultivars more than others as mentioned by Sihacek and Murphy [14].

3.2.3 Measurement of growth index of immature stages

Results in Table (4) indicated that there was highly significant ($P \leq 0.01$) variation in growth index of immature stages of Saw-toothed grain beetle among the most of tested date cultivars. The growth index of immature stage was increase with increase the percentage of larval development within short time, vise verse. The most preferable date cultivar was recorded to Sukari followed by Barhi and Rushodia, reaching 4.16±0.03, 3.22±3.7 and 3.22±0.08 larva to adult /day respectively. While Deglet Noor and Ajwa obstructed the growth of larvae, so it was recorded the lowest growth index, being 0.48±0.02 and 0.94±0.01 larvae to adult/day, respectively.

Table 4. Measurement of growth index of immature stages of *O. surinamensis* rearing on different dates varieties

Date varieties	Growth index (Mean ± S.E)
Barhi	3.7±0.08
Barni Al Madina	2.7±0.33
Deglet Noor	0.48±0.02
Rushodia	3.22±0.06
Sukari	4.16±0.03
Ajwa	0.94±0.01
Mabroom	2.29±0.32
Nabtat Ali	2.15±0.1
L.S.D at 0.05	0.504
L.S.D at 0.01	0.898

3.2.4 Measurement of susceptibility index

Table (5) cleared that there were three cultivars as Sukari, Barhi and Rushodia considered the most significantly (P≤0.01) susceptible cultivars comparable with others. It were recorded the SI ranged between 13.5 to 14.5%.

Table 5. Susceptible index measurement of tested date cultivars towards Saw- teethed beetle

Date varieties	Total No. of First progeny	period for emergences of 50% First progeny	S.I (%)
Barhi	47±2.08b	28	14.3±0.4a
Barni Al Madina	34±4.5d	35	10±0.4c
Deglet Noor	27.7±3.7d	35	9.4±0.4d
Rushodia	43±2.5b	28	13.4±0.2a
Sukkari	57±1.5a	28	14.5±0.1a
Ajwa	13.67±3.9d	35	7.1±0.03d
Mabroom	2.6d 24.33±	28	11.4±0.4c
Nabtat Ali	39±6.6c	30	12.4±0.3c
L.S.D at 0.05	10.12		1.42
L.S.D at 0.01	13.45		1.95

Means with the same letters have no significant difference

3.2.5 Relation between susceptibility index and chemical constituent of date cultivars

The susceptibility of tested cultivars toward Saw-toothed beetle affected by chemical constituents, as depicted in Table (6). The susceptible index of tested cultivar was insignificantly (P>0.05) increased with decreased total sugar, acidity, lipids, fibers and nitrogen content (correlation value ranged between – 0.25 and – 0.62) while ash content was highly significantly affected on SI (r= - 0.833). On the other side, there was a positive correlation between SI and water content of tested cultivars (r= +0.71), which indicate that the susceptibility of date cultivars is increased with increasing water content.

Table 6. Correlation between chemical compositions of tested date cultivars and susceptibility index

Components (%)	Correlation (r)	Significant
Total soluble solids	-0.252	No sig.
Acidity	-0.364	No sig.
Total sugars	-0.238	No sig.
Moisture content	0.714	0.05
Nitrogen	-0.619	No sig.
Lipids	-0.476	No sig.
Fiber	-0.548	No sig.
Ash	-0.833	0.01

From the obtained results could be concluded that chemical composition of tested cultivars affected on its susceptibility toward Saw-toothed beetle. These observations agree with [8] who recorded that the rate of eggs deposition, longevity of larvae and pupae of *O. surinamensis* affected by date cultivars. [14] recorded the variations in growth rate of *P.*

interpunctella at different cereal cultivars and related that to the variation in the value of nutrition contents.

On the other hand there are many authors studied effects of others plant cultivars on growth index of larvae and deposited eggs of *O. surinamensis* as [15] on five wheat cultivars and [16] on corn cultivars.

3.3 Study the Weight Loss of Stored Date Cultivar Due to *O. surinamensis* Infestation

The dates in Table (7) cleared that there were gradual loss of date weight due to attack the saw- toothed beetles. The highest percentages of weight loss were recorded to Barhi follow by Barni Al Madina, Rushodia and Sukari, ranged between 62.7 to 43.7% after six months. While the least weight loss was recorded to Deglet Noor and Ajwa, reaching to 11.6 and 21.5% after six months.

Table 7. The percentages of the real weight of the different varieties of dates during storage for six months

Months of store / Tested Date cultivars	(% of weight loss) 1	2	3	4	5	6	Mean of monthly loss (%)
Barhi	2.7	5.5	18	40.4	55.4	62.7	30.8
Barni Al Madina	2.9	4.6	13.7	34.7	48.3	55.2	26.6
Deglet Noor	5.2	7	7.5	10.5	11.3	11.6	8.9
Rushodia	4.9	7	16.9	38.3	49.19	53.5	23.3
Sukkari	5.9	8.8	18.9	36	41.6	43.7	25.8
Ajwa	3.4	3.7	7.1	10.5	16.7	21.5	10.5
Mabroom	1.7	2.2	4.9	18.1	31.3	40	16.4
Nabtat Ali	5.6	8.2	18.7	33	36.7	38.6	23.5

It is clear that infestation by *O. surinamensis* caused loss in quality and quantity of Barhi, Barni Al Madina, Rushodia and Sukari during storage. The results confirmed by Wheatley [5] while working with other date cultivars who found that the Al Mahlawi cultivar had lost weight when exposed to *O. surinamensis* after 90 days of storage. Generally, the heavy infestation by insects in storage leads to increase the temperature degree which leads to increase loss of water content of stored materials and that lead to increase moisture and agglomeration of stored materials [17].

4. CONCLUSION

Aims of the present study measure the susceptibility of different date cultivars to infestation by *O. surinamensis*. The obtained results can be summarized as following:

1- The most susceptible cultivars were Sukari, Rushodia and Barhi.
2- There were positive correlation between the susceptibility index of tested cultivars and water content.

3- There were negative correlation between the susceptibility index of tested cultivars and Ash.
4- Infestation by *O. surinamensis* caused loss in quality and quantity of Barhi, Barni Al Madina, Rushodia and Sukari during storage.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Al-Bidawy AE, El-Derham YN. Stored product pests and control methods. Saudi Kingdom Univ. 1991;1:46-47.
2. Munakata K. Insect antifeedants in plants. In D.L. Wood R.M. Silverstein and M. Nakajima (eds). Control of insect behavior by natural products. New York, Academic Press. 1970;179-187.
3. Makate N. The susceptibility of different maize varieties to post- harvest infestation by *Sitophilus zeamais* (Motsch) (*Coleoptera*: Cuculionidae). Scientific Research and Essay. 2010;5(1):30–34.
4. A.O.A.C. Association of official agricultural chemists: Official methods of analysis 15th ed. Published by A.O.A.C. Washington, D.C. (U.S.A.). (Snedecor and Cochran, 1980); 1995.
5. Wheatley PE. Relative susceptibility of maize varieties. Tropical Stored Prod. Information. 1973;(30):16–17.
6. Dobie P. The laboratory assessment of the inherent susceptibility of maize varieties to post-harvest infestation by *Sitophilus zeamis* (Motsch). J. Stored Products Research. 1974;(10):183–197.
7. Sarin K, Sharma K. Study of antibiosis in wheat varieties. Part 1. Correlation of diapauses and growth index. Bull. Grain Tech. 1983;21:24–30.
8. Al-Dosari SA; Suhaibani AM, Ali AG. Susceptibility of some dry date palm varieties to infestation by *Oryzaephilus surinamensis* (L.) (Coleoptera: Silvanidae) in relation to their chemical composition. Assiut Journal of Agricultural Science. 2002;33(2):187-193.
9. Metwaly HA, Abou-Rekab ZA, Abdel-Baky, El-Bana AA. Evaluation of some seeded date palm trees grown in Fayoum governorate a-physical characteristics. Conference on Recent Technologies in Agriculture. 2009;684-700.
10. Hussein AA, Attia NMI, Osman SM. Survey and evaluation of fruit cultivars for some species grown under Siwa Oasis. II Date palm. Annals-of-Agricultural-Science,-Moshtohor. 2001;39(2):1265-1278.
11. Parkin EA. Stored product entomology (the assessment and reduction of losses caused by insects to stored food stuffs). Annu. Rev. Entomol. 1956;1:233 –240.
12. El-Wakil HE, Harhash MM. Evaluation of some date palm cultivars grown in Siwa Oasis. The first international Conference on date palm. Al-Ain, United Arab Emirates, March. 1998;8–10:583-601.
13. Osman SM. Fruit quality and general evaluation of Zagloul and Samany date palms cultivars grown under conditions of Aswan. Proceedings of the Pakistan, Science-Conference, Lahore. Part3. Proceedings of the first Symposim on the date palm in Saudi Arabia. 2008;212-220.

14. Sihacek D, Murphy C. A simple wheat germ diet for studying the nutrient requirements of the Indian meal moth, *Plodia interpunctella* (H.). J. Stor. Prod. Res. 2006;42:427-437.
15. Beckel S, Lorini I, Lazzari SM. Rearing method of *Oryzaephilus surinamensis* (L.) (Coleoptera: Silvanidae) on various wheat grain granulometry. Revista Brasileira de Entomologia. 2007;51(4):501-505.
16. James ET, Douglas CD, Michael SM. Susceptibility of commercial oat cultivars to *Cryptoles pusillus* and *Oryzaephilus surinamensis*. Journal of Stored Product Research. 2003;39:213-223.
17. Al-Dosary NH, Al-Saadee TA, Muntha JK. Effect of different temperatures on some biological fields of saw-toothed grain beetle *Oryzaephilus surinamensis* (Silvanidae: Coleoptera). Journal of Al-Basrah Research (Science). 2007;33(4):7–13.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=229&id=2&aid=1402