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SUSCEPTIBILITY OF CERTAIN DATE PALM VARIETIES TO INFESTATION BY THE *Parlatoria blanchardi* (TARG.) (HOMOPTERA: DIASPIDIDAE) ON THE LEAFLET QUALITY, ESSENTIAL NUTRIENTS AND THEIR INHIBITORS AT LUXOR GOVERNORATE, EGYPT.

Salman, A. M. A.[1] ; S. F. M. Moussa[2] and M. M. S. Bakry[2]

[1] Plant Protection Dept., Fac. of Agric. Sohag Univ., Sohag, Egypt.

[2] Scale Insects and Mealybugs Res. Dept., Plant Protection Res. Inst., A.R.C, Dokii, Giza, Egypt

ABSTRACT

The present investigation was carried out at Esna district, Luxor governorate during 15 September 2011, to determine the role of the two main essential nutrients and their inhibitors in susceptibility of five date palm varieties to infestation by *Parlatoria blanchardi* (Targ.). Date palm varieties varied significantly in their susceptibility to *P. blanchardi*. White variety was the highest infestation with the pest (23.9 insect/leaflet) and exhibited the highest concentrations of crude proteins, total carbohydrates and food quality index, but had exposed the lowest concentrations of both total tannins and phenols in the infested leaflets compared with other the tested varieties. In contrast, Gendeila variety was the least infested variety by this insect (8.2 insect/leaflet). While, Malakaby, Seedy Balady and Shamia varieties were moderately infested with mean number of 17.2, 15.7 and 12.9 insect per leaflet, respectively. The levels of total soluble carbohydrates and crude proteins of infested date palm leaflets for all tested varieties were lower than those of the uninfested ones, while, tannins and phenols were lower in the uninfested varieties than in the infested ones. In addition, the increase in concentrations of soluble condensed tannins and phenols in leaflet might be due to an decrease in population density of insect in Shamia variety. Also, may be play a role in the defense mechanism of *P. blanchardi* infested date palm leaflets, thereby delay their death. It is clear that the highest percentage of reduction in crude proteins, carbohydrates and food quality index was measured in infested leaflets of White date palm variety as compared with the uninfested ones. The results revealed highly significant positive correlations between the rate of infestation by *P. blanchardi* and the percentage of reduction in crude proteins, carbohydrates and food quality index**.** In contrast, there were insignificant negative correlations between insect infestation and the percentage of reduction in tannins, fats and phenols. The loss in the measured parameters was a summation of many factors including level of infestation, time of infestation, variety and essential nutrients and inhibitors of leaflets. The relative role of these factors may differ among different varieties.

Keywords: *Parlatoria blanchardi*, date palm varieties, susceptibility, essential nutrients and inhibitors, food quality index.

INTRODUCTION

Insects represent potential biotic stresses to their host plants. Plants challenged by insects respond through changes in the composition and physical properties of the cell wall as well as the biosynthesis of secondary metabolites (Hpkins and Huner, 2004). Pest populations could thereby be suppressed below the level of economic damage with no added pollution and

no additional cost to the producer. For determining of low susceptible cultivar, a better understanding of the factors that elicit or inhibit host plant selection by insects is critical.

Date palm tree (*Phoenix dactylifera* L.) is one of the oldest domesticated fruit crops and one of the most important fruits adapted to growing in desert areas in many countries all over the world because it could be established in a wide range of soil and environmental conditions (El-Shibli and Korelainen, 2009 and Ramawat, 2010).

Date palm is the most important fruit crops. In Egypt, date palm ranked the third crop after orange and grape (Agric. Econ. Bull., 2005). Because of date palm can grow and produce under a wide range of soil and climatic conditions, growers have mistakenly believed that it does not require much attention. Date palm trees are subjected to infestation by different pests. Among these pests*, Parlatoria blanchardi* (Targ.). Both immature forms and adult females of this insect attack tender shoots, twigs, leaflets, leaves, offshoots and fruits causing less production (El-Said, 2000). The presence of this insect weakens the infested plant itself by sucking the sap with the mouth parts causing thereafter deformations by the action of the toxic saliva. Severe infestations cause the drying out of the branches and cortical lesions form, yellow, dropping and distortion of the foliage and chlorosis, leaf dropping, and reduction in general plant vigor. Also, the infestation results in serious damage on palms growth and increasing transpiration, depleting nutrients and destroying chlorophyll, so impairing photosynthesis and productivity and subsequently, cause considerable quality and quantity yield losses and also marketing value of the fruits. A characteristic symptom of infestation with *P. blanchardi* is the appearance and accumulation of its scales on attacked palm parts (El-Said, 2000, El-Sherif *et al*., 2001, Abivardi, 2001 and Blumberg, 2008).

After all, herbivores require nutritive compounds from their diet and insect population grows better on leaflets that have an appropriate nutritional balance (Chapman, 2003).

However, there is little information on the effect of *P. blanchardi* infestation on leaf quality and defense mechanism on date palm trees against pests. Accordingly, in this study parallel samples from infested and uninfested leaflets of five date palm varieties were analyzed for their content of the two main essential nutrients (proteins and Carbohydrates) and inhibitors (phenols and tannins) to determine their role in susceptibility differences among the tested date palm varieties.

MATERIALS AND METHODS

* **Study site:**

The present investigation was conducted at Esna district, Luxor Governorate on September 15 th, 2011 to study the effect of *P. blanchardi* infestation on main essential nutrients and their inhibitors of date palm leaflets of five date palm varieties. These varieties are named: White (local name), Seedy Balady, Gendeila, Malakaby and Shamia. Preliminary studies

revealed that the insect is activity during autumn (El-Said, 2000 and El-Sherif *et al*. 2001). An orchard about three feddans was used to conduct this study. The selected date palm trees received the normal agricultural practices without pruning the fronds and without any chemical control measures before and during the period of investigation.

Six trees from each variety (three uninfested and three infested trees) were assigned. For considered treatment, samples of ten leaflets were randomly taken half monthly from every tree. The uninfested and infested trees was selected as uniform as possible and nearly similar in age (about 5 years), size, shape, height, vigor and homogeneous in their infestation with this scale insect were selected as representative of the whole orchard. Samples of leaflets from medium age leaflets (two-year old) were kept in polyethylene bag until they were examined in the laboratory. It was considered that the visual symptoms of chlorosis appear on the infested leaflets. The infested date palm leaflets as well as the uninfested ones were collected for biochemical measurements. The percentage of crude proteins, carbohydrates, fats and tannins were determined (on dry weight basis) in the leaflets of date palm varieties.

1- Crude proteins: was calculated the percentage nitrogen in 6.25.

Protein (%) = (N x 6.25).

2- Carbohydrates:

Total soluble Carbohydrates were determined using anthrone reagent according to Fairbairn (1953).

3- Tannins:

Total condensed tannins (TCT) were estimated according to A.O.A.C. (2000).

4- Calculation of a food quality index:

A food quality index (FQI) was calculated as described by Habemann (2000) by dividing the sum of the concentration of soluble carbohydrates (A) and protein (B) by the contents of condensed tannins (C).

(FQI) = (A+B) / C

5- Fats Extraction:

The total fats extracted from the samples according were estimated according to (Folch *et al.* 1957) by Chloroform : methanol 2:1 and shaking for 2 hr. then filtered and repeat for 5 times.

6- Total soluble phenols:

The total soluble phenols were determined on fresh leaflets by extraction the samples according to colorimetric method of analysis and estimated according to Mailk and Singh (1980).

All samples of leaflets were transferred to the central laboratory for Chemical Analysis, Horticulture Research Institute, A.R.C, Ministry of Agriculture in Giza. These analyses may be an indication to the bio feeding components that may attract the scale insect and be responsible to heavy scale infestation.

The amount of damage and losses of parameters due to the scale insect were calculated according to the following equation**:**

$$\% \text{ Loss} = \frac{A-B}{A} \times 100$$

Which:

A= uninfested **B=** infested

Statistical analysis (simple correlation and regression values, coefficient of determination and explained variance) in the present work was carried out with Computer using (MSTATC Program).

RESULTS AND DISCUSSION

Susceptibility of five date palm varieties to infestation by *Parlatoria blanchardi* (Targ.):

Data in Table (1) the highest mean number of *P. blanchardi* infestation per leaflet was found on White date palm variety (23.9 insect/leaflet). In contrast, Gendeila variety received the least infestation average (8.2 insect/leaflet). While, Malakaby, Seedy Balady and Shamia varieties had moderate infestation with mean number of 17.2, 15.7 and 12.9 insects per leaflet, respectively (Table, 1 and Fig., 1). In addition, the susceptibility of date palm trees to *P. blanchardi* infestation differs among different varieties (Sabry, unpublished observations). The susceptibility of these date palm varieties could be arranged in descending order as following: White **>** Malakaby **>** Seedy Balady **>** Shamia **>** Gendeila. On the other hand, there were highly significant differences among the five tested varieties regarding the level of infestation.

Effect of infestation with *P. blanchardi* on chemical components of date palm leaflets:

Crude protein:

Data in Table (1) revealed that the White and Malakaby leaflets were found to contain significantly the highest in the percentage crude of protein (7.729 and 7.604%) followed by Seedy Balady (7.5%). The least percentage was measured in Shamia and Gendeila (7.208 and 7.167%). The statistical analysis revealed significant differences in crude protein content between all tested varieties in infested leaflets of date palm. Results depicted in Table (2) showed that the uninfested date palm leaflets had significantly higher percentage crude protein than the infested ones (8.058 compared to 7.442 % as a general average for the all tested varieties). Also, the infested leaflets lost about 7.65 % from crude protein as compared with the uninfested leaflets. Significant differences among in the uninfested leaflets were calculated for all tested varieties. Results revealed that the infestation with this pest caused a reduction in the percentage of crude protein in infested leaflets in all tested varieties in the following descending order: White (10.6%), Malakaby (9.88%), Seedy Balady (7.7%). Shamia (5.46%) and Gendeila (3.91%) (Table, 3 and Fig., 1).

Total soluble carbohydrates:

Carbohydrate contents of the date palm varieties leaflets infestation are shown in Table (1). Shamia leaflets contained the lowest percentage of carbohydrates (6.733%). The differences in total soluble carbohydrates among infestation leaflets for all tested varieties were insignificant (expect Shamia variety). In all infested date palm varieties, leaflets had less quantity of the total soluble carbohydrates (7.107 %) than the uninfested leaflets (8.227 % as a general average for the all tested varieties). Also, the infested leaflets lost about 13.6% from total soluble carbohydrates. The uninfested leaflets for tested varieties varied significantly in total soluble carbohydrates.
In addition, the infestation with *P. blanchardi* caused a reduction in percentage of total soluble carbohydrates in the infested leaflets in the following descending order: White (18.52%), Malakaby (15.06%), Seedy Balady (13.36%), Shamia (12.17%) and Gendeila (7.89%) (Table, 3 and Fig., 1).

The mechanisms underlying the reduction of growth components of date palm by *P. blanchardi* might include the removal of assimilates and adjusting the sink source ratio of the benefit of *P. blanchardi*. The absolute decline of carbohydrates and proteins of plants, because of sucking large amount of sap plant or a combination of these factors may be also accountable for the reduction in plant biomass.

Table (1): Effect of infestation by *P. blanchardi* on the leaflet quality, essential nutrients and inhibitors in the infested leaflets of five date palm varieties at Esna district, Luxor Governorate.

Parameters / Varieties	Average number of insect per leaflet	Mean of Percentage					Phenolics (mg/g f.w)
		Crude protein	Carbohydrates	Tannins	Food quality index	Fats	
White	23.90 a	7.729 a	7.333 a	1.310 c	11.51a	3.05 a	1.230 b
Seedy Balady	15.70 c	7.500 b	7.133 a	1.373 c	10.67 a	3.00 a	1.553 a
Gendeila	8.20 e	7.167 c	7.000 a	1.630 a	8.71 b	3.05 a	1.613 a
Malakaby	17.20 b	7.604 a	7.333 a	1.320 c	11.35 a	2.92 a	1.267 b
Shamia	12.90 d	7.208 c	6.733 b	1.470 b	9.47 b	3.07 a	1.587a
Mean	15.58	7.442	7.107	1.420	10.34	3.02	1.451
L.S.D.between varieties	0.57	0.255	0.597	0.094	0.903	0.202	0.079

Carbohydrates and proteins are generally assumed as the primary arrestant (chemical serving as effective phagostimulant and thereby maintaining prolonged feeding by the pest) for insects belonging to various taxa (Chapman, 2003). Carbohydrates are the main source of energy and proteins are the major source of amino acids and nitrogen for insects (Jain *et al.,* 2000). Thus, low concentrations of such essential nutrients in date palm leaflets may reduce the trees suitability for *P. blanchardi*.

Table (2): Mean percentages of leaflet quality, nutrients and inhibitors in the uninfested leaflets of five date palm varieties at Esna district, Luxor Governorate.

Parameters / Varieties	Mean of					
	Percentage					Phenolics (mg/g f.w)
	Crude proteins	Carbohydrates	Tannins	Food quality index	Fats	
White	8.646 a	9.000 a	1.210 d	15.10 a	3.067 a	1.133 b
Seedy Balady	8.125 c	8.230 c	1.267 c	12.92 c	3.019 a	1.4267 a
Gendeila	7.458 e	7.600 d	1.547 a	9.738 e	3.072 a	1.513 a
Malakaby	8.438 b	8.633 b	1.207 d	14.15 b	2.928 a	1.160 b
Shamia	7.625 d	7.670 d	1.360 b	11.245 d	3.096 a	1.467 a
Mean	8.058	8.227	1.318	12.632	3.036	1.337
L.S.D. between varieties	0.199	0.314	0.051	0.904	0.188	0.089

Soluble condensed tannins:

Data represented in Table (1), showed the effect of infestation by *P. blanchardi* on the concentrations of soluble condensed tannins in leaflets of different of date palm varieties. Gendeila leaflets contained the highest concentration of soluble condensed tannins (1.630%) followed by Shamia (1.470%). While, there were no significant differences between Seedy Balady, Malakaby and White date palm varieties. The least concentrations of soluble condensed tannins were measured in White date palm variety. This variety was considered the greatest infested with *P. blanchardi* (23.90 insect/leaflet). Statistical analysis showed that there was highly significant negative correlation was found between the rate of infestation by *P. blanchardi* and the quantity of concentrations of soluble condensed tannins of five date palm varieties (r = -0.898).

Data obtained in Table (2) proved that in the all varieties, the mean percentage of tannins in the uninfested leaflets was lower (1.318 %) than that the infested ones (1.420%). The quantity of tannins was significantly higher in attacked leaflets by insect. The increasing was about 7.74 % in infested leaflets compared with the uninfested ones. The uninfested leaflets for tested varieties varied significantly in total soluble condensed tannins. Insect infestation caused reduction in the concentration of soluble condensed tannins in infested leaflets compared with the uninfested ones for all tested varieties in the following descending order: Malakaby (-9.12%), Seedy Balady (-8.42%), Shamia (-8.33%), White (-8.26%) and Gendeila (-5.17%) (Table, 3 and Fig., 1).

In addition, the increase in concentrations of soluble condensed tannins might be due to the decrease in population density of insect. Also, it may play a role in the defense mechanism of *P. blanchardi* infesting date palm leaflets, thereby delay their death.

Tannins are the main group of phenolic compounds that decreases leaf digestibility and quality as described by Habemann (2000). Condensed tannins represent a major group of plant phenols, and their concentrations have been shown to have adverse affects on various herbivores, the effects

are considered to be caused by inhibiting the herbivores digestive enzymes and by forming strong molecular complexes with ingested proteins in the gut of insects (Riipi *et al*., 2002).

Food quality index:

Results depicted in Table (1) show the food quality index (FQI) for infested leaflets of date palm varieties. White variety had the highest FQI (11.5%). In contrast, Gendeila had the least FQI (8.7%). The statistical analysis revealed that there were significant differences in (FQI) among the infested leaflets for all tested varieties (L.S.D. was 0.903). Results in Table (2) showed that the uninfested date palm leaflets had significantly higher percentage (FQI) than the infested ones (12.632 compared to 10.340 % as a general average for the all tested varieties). In addition, the infested leaflets lost about 18.1 % from FQI as compared with the uninfested leaflets. There were significant differences among the uninfested leaflets for all tested varieties. It was also, noticed that the insect infestation exhausted about 23.76, 19.78, 17.46, 15.77 and 10.55 % in the food quality index for the infested leaflets of White, Malakaby, Seedy Balady, Shamia and Gendeila varieties, respectively, (Table, 3 and Fig., 1).

The measured traits in this study are potentially important determinants of leaf quality as a food for the generalist insect herbivores. Leaf quality in relation to generalist insect herbivores depends largely on food quality index, i.e., the relative concentrations of compounds with different physiological effects (arrestant and inhibitors) rather than on the absolute concentrations of individual leaf compounds (Lunderstadt, 1980). No phytophagous insect is known to taste all its essential nutrients and the ability to discriminate between nutrients is limited. The insects acquire a nutritional balance largely "adventitiously" because leaflets have an appropriate chemical composition and proportions (i.e. FQI) (Chapman, 2003). Thus, population of insects feeding on leaflets with higher FQI grows better than that feed on low FQI leaflets.

Fats:

As shown in Table (1), data confirmed that Shamia leaflets contained the highest percentage of fats (3.07 %). In contrast, Malakaby was the least percentage of fats (2.92 %). The differences in percentage of fat between infested leaflets for all tested varieties were insignificant (Table, 1). As well as, the uninfested leaflets for tested varieties varied in significantly in fat (Table, 2). The mean percentage of fats in the uninfested leaflets was higher (3.036 %) than that for the infested ones (3.019 %). Also, the infested leaflets reduced by 0.57% from the percentage of fats as compared with the uninfested ones. Moreover, the feeding by this insect on date palm leaflets caused a significant reduction on the percentage of fat. The reduction was 0.78, 0.64, 0.62, 0.47 and 0.33 % in the infested leaflets of Shamia, Seedy Balady, Gendeila, White and Malakaby, respectively (Table, 3 and Fig., 1).

Total soluble phenols:

Phenols compounds are considered one of the most wide spread and divers' complex organic compounds. They are responsible for many roles in higher plants (Radwan, 2003). Changes in the amounts and types of phenolics occur in both resistant and susceptible date palm varieties.

Analysis of infested leaflets for total soluble phenols in Table (1) indicated that leaflets of Gendeila variety contained the highest concentration (1.613 mg/g f.w). While, the White variety contained the lowest concentration (1.230 mg/g f.w). However, white variety was considered the greatest infested with *P. blanchardi* (23.90 insect/leaflet).

Gendeila date palm leaflets showed less infestation by insect, it is likely that nymphs did not develop, may be due to phenols. Plants accumulating higher rates of phenols tend to inhibit herbivore development. However, in this study, more stress symptoms were found in the Gendeila accumulating higher amounts of phenols compounds. Significant differences among infested leaflets were calculated for all tested varieties. Statistical analysis showed that there was strongly highly significant negative correlation was found between the rate of infestation by *P. blanchardi* and the quantity of the total soluble phenols of five date palm varieties (r = -0.86) and The unit effect regression coefficient (b), indicates that an increase one insect per leaflet decreased the total soluble phenols content by 0.027%.

Results in Table (2) cleared that uninfested leaflets had less quantity of the total soluble phenols (1.34 mg/g f.w) than the infested leaflets (1.45 mg/g f.w). The increasing was about 8.26 % in infested leaflets compared with the uninfested ones. In addition, the uninfested leaflets for tested varieties varied significantly in total soluble phenols. As regarded to the effect of insect infestation on the total soluble phenols value, data published that insect invasion promote phenols value decreases in the infested leaflets compared with the uninfested ones for all tested varieties in the following descending order: Malakaby (-9.20%), Seedy Balady (-8.88%), White (-8.82%), Shamia (-8.18%) and Gendeila (-6.61%) (Table, 3 and Fig., 1).

In addition, total phenols content were generally less in uninfested leaf samples compared to infested ones. Concentrations, of soluble condensed phenols may play a role in the defense mechanism of *P. blanchardi* infesting date palm leaflets, thereby delay their death.

The current results are in agreement with those obtained by many authors; phenolic compounds are produced in higher plants for several functions, one of which is defence against herbivores (Riipi *et al*., 2002). Phenols have been considered to play an important role in plant herbivore interactions. The ability of phenols to inhibit food digestion and uptake depends on the nature of its compounds (Salem *et al*., 2006). The phenols compounds are important factors of plant resistance to insect, as they reduce the pest population on the resistant plants. Bioactivity of plants depends on the presence of various chemical compounds in their tissues, which would inhibit insect feeding, cited in Golawska *et al*. (2008).

Relationship between *P. blanchardi* infestation and reduction of leaflet quality, nutrients and insect inhibitors:

Statistical analysis of data in Table (3) revealed highly significant positive correlations between the rate of infestation by *P. blanchardi* and the percentage of reduction in crude proteins, carbohydrates and food quality index of five date palm varieties (r = +0.94, +0.989 and +0.988). The slope of the regression lines, revealed that a unit change of insect (1 insect/leaflet) increased the percentage of reduction in each parameter by 0.46, 0.67 and

0.84%, respectively. The highest percentage of reduction in crude proteins, carbohydrates and food quality index was measured in White date palm variety. In contrast, simple correlations between *P. blanchardi* infestation and the percentage of reduction in tannins, fats and phenols were insignificant negative (r = -0.67, -0.55 and -0.97) respectively, Table (3) and Fig. (1). The slope of the regression lines revealed that a unit change of *P. blanchardi* (1 insect/leaflet) reduced the percentage of reduction in the tannins, fats and phenols by 0.18, 0.02 and 0.14 %, respectively.

Table (3): The relationship between the rate of infestation by *P. blanchardi* and the percentage of reduction in each of the leaflet quality, nutrients and inhibitors in the infested leaflets of five date palm varieties at Esna district, Luxor Governorate.

Varieties	Average number of insect per leaflet	Percentage of reduction in Percentage					
		Crude proteins	Carbohydrates	Tannins	Food quality index	Fats	Phenolics (mg/g f.w)
White	**23.9**	10.60	18.52	-8.26	23.76	0.47	-8.82
Balady	**15.7**	7.69	13.36	-8.42	17.46	0.64	-8.88
Gendeila	**8.2**	3.91	7.89	-5.17	10.53	0.62	-6.61
Malakaby	**17.2**	9.88	15.06	-9.12	19.78	0.33	-9.20
Shamia	**12.9**	5.46	12.17	-8.33	15.77	0.78	-8.18
r =		0.94**	0.989**	-0.67	0.988**	-0.55	-0.78
b =		0.46	0.67	-0.18	0.84	-0.02	-0.14
Standard Error		0.10	0.06	0.11	0.08	0.01	0.07
T value		4.67	11.84	1.58	11.08	1.15	2.16
Probability		0.009	0.00	0.19	0.00	0.31	0.10
y = a + bx		0.32 + 0.46 x	3.03 + 0.67 x	-5.06 - 0.18 x	4.37 +0.84 x	0.83 - 0.02 x	-6.17 – 0.14 x
R^2		0.88	0.98	0.454	0.98	0.30	0.609
E.V.%		87.98	98.04	45.40	97.66	30.03	60.90

Generally, it can be concluded from the current investigation that White date palm variety was the most susceptible to infestation by *P. blanchardi*, which contained the highest concentrations of crude proteins, total carbohydrates and food quality index and the lowest concentrations of both total tannins and phenols in the infested leaflets in comparison with the other four varieties. This is supported in the current work where the levels of total soluble carbohydrates and total soluble proteins of infested date palm leaflets for all tested varieties were lower than those of the uninfested ones. The levels of susceptibility of date palm varieties for the infestation by *P. blanchardi* depend on the combined action of essential nutrients and their inhibitors of leaflets of date palm, which determine the quality of their leaflets. The loss in the measured parameters was a summation of many factors including level of infestation, time of infestation and essential nutrients and inhibitors of leaflets. The relative role of these factors may differ among different varieties.

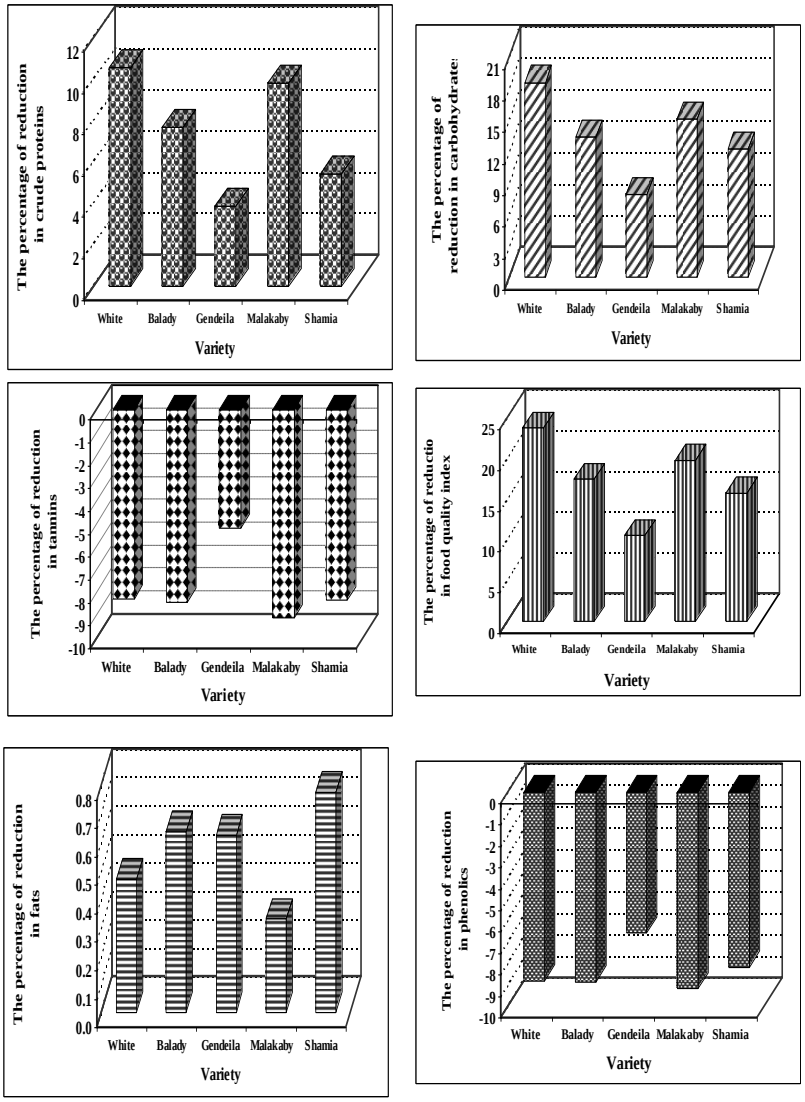

Fig. (1): Percentages of reduction in each of the leaflet quality, nutrients and inhibitors in the infested leaflets of five date palm varieties at Esna district, Luxor Governorate.

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حساسية بعض أصناف نخيل البلح للإصابة بحشرة نخيل البلح القشرية البيضاء على جودة الوريقة والمواد الغذائية الضرورية ومثبطاتها فى محافظة الأقصر- مصر.

أحمد محمود على سالمان[1]، صابر فهيم محمود موسى[2] و مصطفى محمد صبرى بكرى[2]
1- قسم وقاية النبات - كلية الزراعة - جامعة سوهاج ، مصر.
2- قسم بحوث الحشرات القشرية والبق الدقيقى- معهد بحوث وقاية النباتات - مركز البحوث الزراعية، الدقى، مصر.

هذه الدراسة أجريت فى مركز إسنا – محافظة الأقصر خلال ستمبر 2011. وقد تم دراسة حساسية خمسة أصناف من نخيل البلح للإصابة بحشرة نخيل البلح القشرية البيضاء والعلاقة بين التباين فى قابلية الأصناف للإصابة ومحتوى أوراقها من البروتين والكربوهيدرات والدهون والمواد المثبطة للتغذية الرئيسية (التانينات والفينولات) وتم حساب مدى جودة الوريقات كغذاء للآفة.

أوضحت النتائج أن جميع أصناف نخيل البلح المختبرة قد أصيبت بهذه الآفة. وأن هناك اختلافات معنوية بين الأصناف وكان الصنف الأبيض أعلى إصابة (23.9 حشرة على الوريقة) وذا محتوى عالى فى تركيز البروتين الخام والكربوهيدرات الكلية ودليل جودة الورقة وذا محتوى أقل فى تركيز التانينات والفينولات الكلية فى الوريقات المصابة مقارنة بباقى الأصناف. على العكس كان الصنف الجنديلة أقل إصابة (8.2 حشرة على الوريقة)، بينما كانت الأصناف الملكابى والبلدي البذرة والشامية متوسطة الإصابة (17.2, 15.7، 12.9 حشرة على الوريقة على الترتيب). لوحظ أن الكربوهيدرات الكلية والبروتين الخام فى وريقات نخيل البلح المصابة اقل منها فى الوريقات السليمة فى جميع الأصناف المختبرة. وكان متوسط كمية التانينات والفينولات الكلية فى وريقات النخيل البلح السليمة أقل فى الوريقة المصابة فى جميع الأصناف المختبرة. وتبين أن زيادة تركيزات التانينات والفينولات فى الوريقة أدى الى خفض الكثافة العددية للآفة فى صنف الشامية. كما تلعب التانينات والفينولات دورا فى آلية الدفاع فى وريقات نخيل البلح المصابة بالآفة. كما سجلت أعلى نسبة خفض فى البروتين الخام والكربوهيدرات ودليل جودة الوريقة فى الصنف الأبيض. أظهر التحليل الاحصائى أن هناك ارتباطا موجبا قويا عالى المعنوية بين معدل الإصابة بالآفة ونسبة الفقد فى البروتين الخام والكربوهيدرات ودليل جودة الوريقة للأصناف الخمسة. على العكس سجل ارتباط سالب غير معنوي بين الإصابة الحشرية ونسبة الفقد فى التانينات والدهون والفينولات.

وبناء عليه فأن تأثير حشرة نخيل البلح القشرية البيضاء على المقاييس تحت الدراسة هى محصلة لعدة عوامل (أولها مستوى الإصابة وتوقيت الإصابة والصنف ومحتوى المواد الغذائية الضرورية للوريقة ومثبطاتها) وأن الدور النسبى لكل عامل من هذه العوامل ربما يختلف من صنف الى أخر.

قام بتحكيم البحث

أ.د / سمير صالح عوض الله — كلية الزراعة – جامعة المنصورة
أ.د / محمود رمزى شريف — مركز البحوث الزراعية