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SOME BIOLOGICAL AND ECOLOGICAL STUDIES ON THE DATE-STONE PALM BEETLE, *Coccotrypes dactyliperda* F. (COL., SCOLYTIDAE)

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ABSTRACT

Laboratory and field studies on the date stone palm beetle, *Coccotrypes dactyliperda* (F.) were conducted at Kafr El-Sheikh governorate, during 2000 and 2001 seasons. The obtained results indicated that food type had highly significant effects on all the tested biological aspects of *C. dactyliperda*.

Date fruits are more sensitive to attack by *C. dactyliperda* beetles than date stones. It provides higher survival rate shorter developmental periods and large growth index values. Specific stage survival among the different developmental stages (egg, larvae, pupa and adults) indicated that larval and pupal stages approved to be the main sensitive stage for food types

As for field studies, results showed that fruits thinning had a significant effect on infestation rates. The infestation percentages were, 16.8, 16.2, 18.3 and 17.6% of fallen fruits under trees with fruits thinning rates 20 and 30% were less than those under trees without fruits thinning (26.8 and 31.2%), during 2000 and 2001 seasons, respectively. Data revealed also that fruits thinning had a significant effect on date fruits properties, fruit weight and fruit length, were 11.4 (g), & 3.47 (cm) and 15.97 (g) & 4.26 (cm) for fruits taken from treated and untreated palm trees, respectively. So the fruits thinning system could be a very useful mean for date protection and production.

INTRODUCTION

The data stone palm beetle, *Coccotrypes dactyliperda* F. is a serious insect pest of palm trees at the middle north of the Nile delta in Egypt (Alfieri, 1976; Hussein, 1990; Boraei *et al.*, 1994 and Aly, 1995). Many authors in different countries of the world studied the bionomics of *C. dactyliperda* (Herfs, 1959; Bright, 1981; Blumberg and Kehat, 1982; El-Haidari and Hafidh, 1986; Siverio and Molesdeoca, 1990). Although the biology of the date stone palm beetle, *C. dactyliperda* has been investigated by several authors (Blumberg and Kehat, 1982; Boraei *et al.*, 1994 and El-Sufty & Helal, 1998), but a few information are available on the bio-ecologicals of this insect pest in Egypt. Therefore, the present study was conducted to investigate the following objectives:

1. Effect of food type on the reproductive performance of *C. dactyliperda*.
2. Effect of fruit thinning on infestation rates by this insect pest.
3. Effect of fruits thinning on some date fruits properties.

MATERIALS AND METHODS

Laboratory studies:

Two cultures of *C. dactyliperda* were kept under laboratory conditions at the Economic Entomology Department, Faculty of Agriculture, Kafr El-Sheikh, Tanta University. Insects of the first culture were reared for several generations on healthy date stones while those of the second culture were reared on healthy date fruits.

To study effect of food type (healthy date stone and healthy date fruits) on the reproductive performance of *C. dactyliperda,* newly emerged adults of both the two cultures were separately collected and kept in two litre jars. From each jar, ten couples of insects were taken, each composed of one newly emerged male and virgin female. Each couple was confined inside small vial (3 x 5 cm). Vials contained adult insects taken from the first jar (reared on healthy date fruits) were provided with healthy date-fruits as a source of feeding, while those taken from the second jar (reared on healthy date-stone) were fed on healthy date-stones, then vials were carefully covered with their perforated caps and incubated at 27 ± 1°C and 75 ± 5% R.H. Date-stones and date fruits were carefully dissected under steromicroscope to detect and count the total number of laids' eggs by each female, number of hatched ones, the percentage of the adult survival as well as the number of progeny reached to adult stage for each food type. Also, the growth index was estimated by dividing the natural logarithm of the percentage adult survival ($\log_e S$) by the means of developmental period (T) (Howe, 1970) to compare the susceptibility of the date-fruits and date stones to infestation by *C. dactyliperda*.

$$\text{Growth index} = \frac{\text{Log}_e S}{T} \times 100$$

Field studies:

Experiments were carried out in an orchard of date palm trees at Baltim, Kafr El-Sheikh Governorate. Palm trees considered in this study were kept from any insecticide applications throughout the whole period of investigation.

To study the effect of fruits thinning on infestation rates by the insect pest, two sets of date palm trees with fruits thinning by cutting 20% and 30%, respectively from strands on bunches during pollination as well as a set of trees without fruits thinning were chosen randomly. Each set consists of ten trees. Monthly samples (50 fruits/tree) were collected from newly fallen dates, throughout the fruiting seasons of 2000 and 2001. These samples were kept in paper bags and transferred to the laboratory and examined by a binocular microscope to determine the number of infested dates and stones as well as the number of holes. For estimating effect of fruits thinning on date fruits properties at harvesting sample consisted of 200 date fruits were taken from each set (20 fruits/tree), hand-picked at random. The picked fruits were directly put inside a paper bag closed tightly then transferred directly to the laboratory. Fruit, pulp and stone weight (g), stone % and fruit and stone length (cm) were determined. Date obtained were analysed statistically by the multiple range (Duncan, 1955) and related weather conditions were supplied from Sakha Exp. Station.

Fruit thinning by cutting 20% from strands on bunches during pollination

RESULTS AND DISCUSSION

1. Laboratory studies:

The obtained data (Table 1) indicated that fecundity of adult female reared on healthy date-fruits was (62.8/female) significantly higher than that reared on date stone (41.7 eggs/female). In addition to laid's egg by female reared on healthy date fruits recorded high percentage of hatchability (84.4%) in comparison with laid's eggs by the other female.

Immature stage duration of *C. dactyliperda* fed on date fruits was significantly shorter (22.2 days) than that reared on date stone (29.2 days). Average number of progeny/female reached to adult stage and adult survival percentage were significantly higher (39.5 adult/female and 87.4, respectively) under date-fruits food conditions than those reared on date stones (Table 1).

According to Howe (1970) formula date-fruits approved to be more susceptible to infestation by *C. dactyliperda* than date stone and thus growth index values of *C. dactyliperda* were 8.3 and 6.0 on date-fruit and date stone, respectively.

The present results partially agree with those obtained by Boraei *et al.* (1994). They reported that number of eggs/female was 40.0±8.0, immature stage duration was 26.1±6.1 days and longevity of both male and female were 22.0 ± 2.1 and 49.6 ± 3.8 days, respectively. Also, Hassanein *et al.* (2000) found that the effect of male feeding on different foods on the longevity was highly significant, the longest mean duration (16.62 days) was recorded with males fed on infested stones the shortest mean duration (8.10 days) was recorded with males fed on compressed dates without stones and the mean number of adults produced by each female fed on date stone was 42.8 individuals at 28°C and 80% R.H. Blumberg and Kehat (1982) recorded that at 28°C, the developmental period from egg to adult, averaged 22.1 to 24.8 days. El-Sufty and Helal (1998) reported that the mean number of progeny/female of *C. dactyliperda* was 37.4 at 27 ± 1°C and 75 ± 5% R.H. This incomplete agreement can be attributed to the variation of food type.

The variation was clear between the two food types at all parameters tested in the previous experiments, and it was confirmed by estimating the growth index of each food type. It was 8.3 for date fruits and 6.0 for date stone. This means that date-fruits are more sensitive to attack by *C. dactyliperda* beetles than those of date stones. It provides shorter developmental periods and thus gives large index values which in turn indicate greater suitability for insect development and this revealed the effect of either the fleshy part of the fruit or the stone on the infestation rate.

Table (1): Effect of food type (date fruits and date stone) on some biological aspects of *C. dactyliperda* female.

Parameters tested		Date fruits with stones	Date-stones	L.S.D.
Av. no. of eggs/female		62.8 a	41.7 b	8.3
Hatch ability %		72.0 b	84.4 a	6.4
Mean developmental period (days)		22.2 b	29.2 a	0.8
Av. no. of progeny reached to adult stage		39.5 a	20.4 b	3.0
% of adult survival		87.4 a	58.1 b	5.3
Growth index		8.3 a	6.0 b	0.5
Longevity of adult	(male)	17.2 a	15.7 a	1.7
	(female)	51.3 a	48.6 b	2.6

In the same row means followed by the same letter are not significantly different according to DMRT at level of 5%.

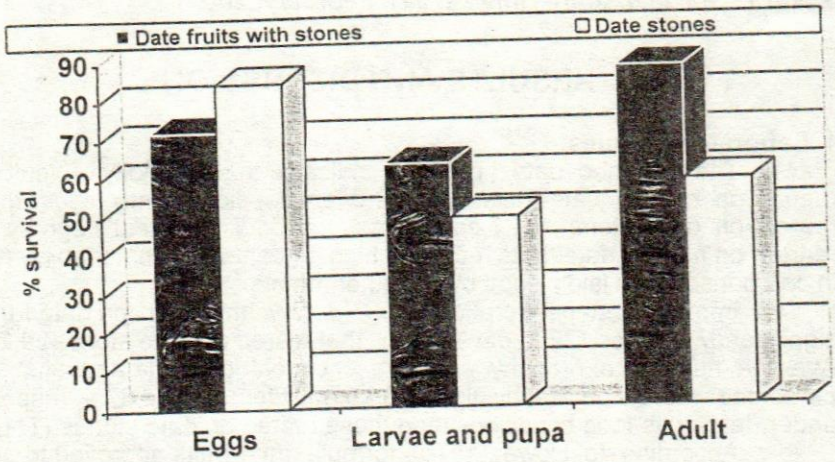

Fig. (1): Survival rates of different developmental stages (eggs, larvae, pupae and adult) reared on date fruits and date stones L.S.D. at 0.05 = 6.4, 3.0 and 5.3 for survival of eggs, larvae and adult stages, respectively.

2. Field studies:

Data presented in Table (2) indicate that infestation rates of palm fruits fallen under the trees by *C. dactyliperda* in samples taken under the trees with fruit thinning were highly significant than those recorded for samples collected under the untreated trees. The mean of infestation rates fallen date fruits under the untreated trees were 26.8 and 31.2% during 2000 and 2001 seasons, respectively. In the other hand the mean of the least infestation rates (16.8 and 18.3%) and (16.2 and 17.5%) were recorded for fallen date fruits samples taken under the trees treated with fruit thinning (20%) and 30% in 2000 and 2001 seasons, respectively.

The effect of daily mean temperature and daily mean R.H.%. On the infestation rates of *C. dactyliperda* on thinned and non-thinned date palm trees was determined during the two successive years of study (2000-2001) (Fig. 2).

The correlation coefficient for the two weather variables were calculated for each set of trees (trees without thinning, trees with thinning by 20 and 30%, respectively). Statistical analysis indicated that there are positive correlations between the R.H.% and infestation rate on date palm trees, respectively, especially on trees without thinning (r=0.85, 0.30), while on thinned trees, there are relative correlations (r= 0.49 and 0.88, 0.52 and 0.88) in thinned trees with 20 and 30% thinning during seasons (2000 and 2001, respectively). Also, there are positive correlations between mean temperature and infestation rate on date palm trees, especially on trees without thinning (r=0.45 and 0.62) while on thinned trees there are correlations (r = 0.87, 0.83 and 0.90 and 0.83) with 20 and 30% thinning during the two successive years of study (2000-2001), respectively. So, fruit thinning system creates better ventilation conditions which lead to reduction of infestation and a good date fruits properties.

Table (2): Effect of fruits thinning on infestation rates of date fruit by *C. dactyliperda* in date plantations at Baltim (Kafr El-Sheikh Governorate) in season 2000 and 2001.

Months	% infestation		
	Trees without thinning	Trees with thinning	
		20%	30%
Fruiting season 2000			
July	22.34 a	17.2 b	17.0 b
August	31.8 a	22.3 b	21.8 b
September	36.2 a	17.5 b	17.3 b
October	21.5 a	15.3 b	14.6 b
November	25.2 a	16.7 b	15.2 c
December	23.8 a	11.8 b	11.3 b
Mean	26.8	16.8	16.2
Fruiting season 2001			
July	30.5 a	19.8 b	19.2 b
August	34.1 a	21.7 b	21.0 b
September	27.2 a	23.3 b	22.8 c
October	29.3 a	16.7 b	15.9 b
November	36.3 a	18.5 b	17.6 c
December	29.5 a	9.6 b	9.1 b
Mean	31.2	18.3	17.6

In the same raw, means followed by the same letter are not significantly different according to DMRT at level 0.05.

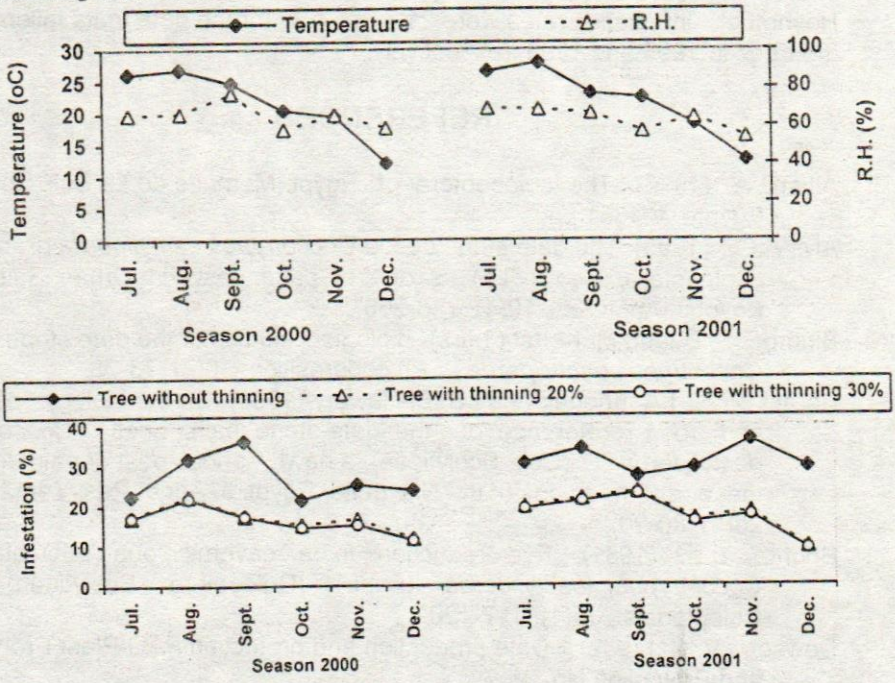

Fig. (2): Infestation rates of date fruit by *C. dactyliperda* on date palm trees with and without thinning in date plantations at Baltim (Kafr El-Sheikh Governorate), the average temperature and relative humidity in season 2000 and 2001.

Table (3): Effect of fruits thinning on date fruits properties and the *C. dactyliperda* infestations during season 2001.

Treatment	Weight (g)			Stone %	Length (cm)		Infestation rate
	Fruit	Pulp	Stone		Fruit	Stone	
Without fruits thinning	11.40 b	9.28 b	2.12 a	18.59 a	3.47 c	2.6 b	31.2 a
With fruits thinning (20%)	15.97 a	12.10 a	2.90 a	18.15 a	4.26 a	3.3 a	18.3 c

Duncan's Multiple range test, means followed by the same letter are not significantly different at LSD (P = 0.05).

The main characters of date fruits of every treatment were evaluated at harvesting. The obtained results in Table (3) showed that fruits thinning had a significant effect on fruit weight (11.40 and 15.97 g), pulp weight (9.28 and 12.10 g), fruit length (3.47 and 4.26 cm) and stone length (2.6 and 3.3 cm) in trees without fruit thinning and trees with fruit thinning, respectively. On the other hand, the obtained data in Table (3), showed that a highly significant effect in infestation rate (31.2 and 18.3%) in treatments without fruit thinning and treatments with fruit thinning (20%), respectively. Dowson (1982) found that fruit thinning had a significant effect on date fruits properties, date production and protection. El-Sufty and Helal (1998) reported that infestation of *C. dactyliperda* occurs throughout the date season from early July to late November, infestation rates were 21.7, 32.70% for the date fruits fallen under the trees in 1995 and 1996, respectively.

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بعض الدراسات البيولوجية والأيكولوجية على خنفساء نواة البلح *Coccotrypes dactyliperda* F.

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أجريت دراسات بيولوجية وايكولوجية على حشرة خنفساء نواة البلح فى محافظة كفرالشيخ وذلك لمدة موسمين متتاليين ٢٠٠٠ ، ٢٠٠١ وقد أشارت الدراسات المعملية الى أن نوع التغذية له تأثير عالى المعنوية على الصفات البيولوجية للحشرة وقد وجد أن ثمار البلح كانت أكثر حساسية للإصابة عن نواة البلح وقد كانت فترات النمو للحشرة هى ٢٢,٢ ، ٢٩,٢ يوم النسبة المئوية لبقاء طور اليرقة والعذراء (٦٢,٩ ، ٤٨,٩%) كانت أقل معنويا مقارنة بطور البيض والحشرة الكاملة عند التغذية على ثمار البلح ونواة البلح على التوالى.

وقد أظهرت نتائج الدراسات الحقلية أن خف ثمار البلح أثناء عملية التلقيح بازالة ٢٠ ، ٣٠% من الشماريخ الزهرية له تأثير معنوى على معدلات الإصابة بالحشرة. فقد وجد متوسط نسب الإصابة (١٨,٣ ، ١٧,٦) فى الثمار المتساقطة تحت الأشجار التى تم خف ثمارها كانت أقل من الثمار المتساقطة تحت الأشجار التى لم يتم خف ثمارها (٢٦,٨ ، ٣١,٢%) فى موسمى ٢٠٠٠ ، ٢٠٠١ على التوالى.

وقد أظهرت النتائج أيضا أن خف الثمار له تأثير معنوى على متوسط وزن الثمار وطول الثمرة حيث وجد أنها (١١,٤ جم ، ٣,٤٦ سم) ، (١٥,٩٧ جم ، ٤,٢٦ سم) فى حالة الأشجار التى لم يتم خف ثمارها والأشجار التى تم خف ثمارها على التوالى.

ولذلك فأن خف الثمار بازالة ٢٠ ، ٣٠% من الشماريخ الزهرية أثناء التلقيح يعمل على خلق ظروف تهوية أفضل مما يقلل نسبة الاصابة ويحسن صفات الثمار.