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STUDIES ON THE SEASONAL ABUNDANCE OF LAND SNAILS ON DATE PALM SHOOTS IN SHARKIA GOVERNORATE

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Abstract

In Sharkia Governorate, date palm shoots are subjected to severe infestation with the three dominating land snail species, *Helicella vestalis* (Pfeiffer), *Cochlicella acuta* (Muller) and *Theba pisana* (Muller (Pulmonata : Helicidae). Monitoring land snail populations was carried out during the two successive years, 1991 and 1992. The commencement dates and peaks of snail activity were recorded and the seasonal broods were approximated. Snails were noticed on date palm shoots from January to December for *H. vestalis* and *C. acuta*, and from February to November for *T. pisana*. *H. vestalis* was the most abundant snail on date palm shoots allover the year round where the cumulative mean number being 564.0-597.0 individuals per shoot, followed by *C.acuta* (495.7-523.9 individuals) then *T. pisana* (303.0-346.9 individuals) for 1991 and 1992, respectively. For the three snail species, spring, summer and autmn seasons showed the maximum abundance (477.4-526.4, 400.6-405.3 and 396.6-442.8 individuals per shoot), while winter was the least (88.1 - 93.3) during the respective two years. The effect of temperature and relative humidity on land snails activity was statistically studied.

INTRODUCTION

Land snails are serious pests on fruit trees, field, vegetable and ornamental plants in lower Egypt (Delta region) with much concentration and excessive abundance in the northern coastal belt of the Mediterranean Sea (Kassab and Daoud, 1964; Bishara *et al.*, 1968; El-Okda, 1980 ; Hashem *et al.*, 1992 & 1993). Kassab and Daoud (1964) mentioned that *H.vestalis and T.pisana* were much abundat in Bilbeis, Sharkia on citrus, grape-vines, apricot, palm and mango tress. Recently, continuous observation indicated that date palm shoots are liable to severe infestation with the land snails at Bilbeis, Sharkia Governorate.

The aim of the present study is to survey the prevailing snail species on date plam shoots, and monitor their population during the two successive years 1991 and 1992 to determine the commencement, last dates and peaks of their activity together with the approximated broods.

The correlation between the number of snails on date plam shoots and temperature and relative humidity was also studied.

MATERIALS AND METHODS

During 1990, frequent visits were paid to Bilbeis, Sharkia governorate in order to survey the dominating land snails on date palm shoots.

Starting from January, 1991 until December, 1992, 30 date palm shoots divided into 3 replicates (10 shoots each) were subjected to periodically half-monthly interval inspection throughout the two successive years 1991 and 1992. Snail individuals were collected from each shoot, sorted out into their specific species according to their external features and counted, then released again under the shoots. Inspection was carried out in the early morning. To study the activity seasons and progress of each snail species infestation, data were accumulated monthly, seasonally then allover each single year and at the end of the two successive years.

The first peak and last dates of each snail species were recorded.

To smooth down the population frequency distribution curves to an almost normal form, 3 reading running means of data were calculated. Thus, broods of snail activity were approximated and the simple correlation between the mean number of snails and the coincided temperature and relative humidity was worked out.

RESULTS AND DISCUSSION

Survey studies in date palm orchards of Bilbeis, Sharkia Governorate during 1990, indicated the domination of the three snail species; *Helicella vestalis* (Pfeiffer), *Cochlicella acuta* (Muller) and Theba pisana (Muller) from family Pulmonata and Order Helicidae.

Seasonal Abundance

The seasonal fluctuation for the three snail populations on date palm shoots at Sharkia governorate during 1991and 1992 is recorded in Table 1 and illustrated in

Figure 1.

H.vestalis revealed to be the most abundant snail species on date palm shoots (564.0-597.0 individuals) each year, representing 41.39-40.67% of the total number of the three snail species in the orchard during 1991 and 1992, respectively.

The snail activity started from the 2*nd* half of January until the end of December, with two peaks on the 2*nd* half of June 1991 and 1992 the 1*st* half of September, 1991 or the 2*nd* half of September, 1992 (Table, 1).

Population frequency distribution curves indicated two broods from the 1st half of January to the 1st half of August and from the 1st half of July to the 1st half of December of each year (Fig. 1).

Relatively less abundance of C.acuta was noticed on date palm shoots where 495.7-523.9 individuals were recorded each year, representing 36.37-35.69% of the total number of the three snail species during 1991 and 1992, respectively.

Table 1 showed that *C.acuta* started to be active on shoots during the 2*nd* half of January and continued until the 1*st* half of December, with two peaks on the 2*nd* half of June and the 2*nd* half of October.

Population frequency distribution curves illustrated that there were two broods that could be approximated from the 2*nd* half of June to the 2*nd* half of December of each year (Fig.1).

T.pisana was the least abundant snail on date palm shoots. The reported number was 303.0-346.9 invdiduals, reprenting 22.24-23.64% of the total number of the three snail species during 1991 and 1992, respectively.

As shown in Table 1, the population started on date palm shoots late in the 2*nd* half of February until the 2*nd* half of November, with two peaks on the 2*nd* half of June and the 1*st* half of October.

Figure 1 further indicates two approximated broods from the 1*st* half of February to the 1*st* half of August and from the 1*st* half of July to the 1*st* half of December.

Effect of Temperature and Relative Humidity on Land Snails Activity

Land snails were affected with temperature and relative humidity (Table 2). Statistical analysis indicated significant positive correlation between mean number of H.vestalis and the maximum and minimum temperatures during the two periods of 1991. This however was insignificant in 1992 except for the maximum temperature during the 2nd period of 1992 which was significant. Correlation with mean relative

humidity was insignificant and negative during the two periods of the two years.

The mean number of *C. acuta* was significant and positive with the maximum and minimum temperatures during the 1st period of 1991, but insignificant during the same period of 1992 and the second period of 1991 and 1992. The correlation with the mean relative humidity was insignificantly positive during the 1st period of 1991, but was negative during the 2nd period of 1991 and the two periods of 1992.

T.pisana population was positively insignificant with the maximum and minimum temperatures and the mean relative humidity during the two periods of the two years except for the 2nd period of 1992 with the maximum temperature which was significant and the mean relative humidity which was negative.

These results indicate that snails activity are variably affected whith the maximum and minimum temperatures and mean relative humidity.

Kassab and Daoud (1964), El-Okda (1979) and Hashem *et al.* (1992 & 1993) studied the seasonal abundance of land snails in citrus orchards at the northern region of Delta and stated that snails are active from January, February or March to November or December of each year.

The seasonal cycle of the three land snails on date palm shoots at Sharkia Governorate during 1991 and 1992 is illustrated in Fig. 1. The snail activity season consisted of 11.5, 11.0 and 9.5 months from January or February to November or December followed by an inactivity that prevailed for 0.5, 1.0 and 2.5 months for *A.vestalis, C.acuta* and *T.pisana*, respectively.

During 1991, the total number of individuals by the and of December was 564.0, 495.7 and 303.0 individuals, increased to 1061.0 , 1019.6 and 649.9 individuals by the end of December, 1992 for the respective three snail species, showing almost double increase in snail attack to date palm shoots.

The maximum number of snail individuals per shoot was recorded during spring followed by summer then autumn and winter (Table , 3 and Fig. 2). H.vestalis recorded the highest abundance on each shoot during winter (40-51 %), spring (44-45%) and summer (38-45%), but ranked second during autumn (34-36%). C.acuta showed the maximum abundance per shoot during autumn (40-42%) but ranked second during winter (39-48%), spring (32-33) and summer (33-35%) . T.pisana ranked third in snail population per shoot during the four seasons : winter (11-12%), spring (23%), summer (22-27%) and autumn (24%).

With regard to the three snails H.vestalis, G. acuta and T.pisana, spring, summer and autumn were the fevourable seasons where 24.2-37.6 % of each snail were

Table 1. Mean and range of the number of snail species on date palm shoots at Sharkia Governorate during 1991 and 1992.

		H. vestalis		*C. acuta*		*T.pisana*	
	1991	1992	1991	1992	1991	1992	
Jan.	1-15	-	-	-	-	-	-
	16-31	2.1± 0.36 (0-5)	5.6± 1.1 (0-9)	5.1± 1.3 (0-11)	4.2± 1.5 (0-12)	-	-
Feb	1-15	7.2 ± 1.3 (3-14)	8.5± 0.7 (5-11)	8.2± 0.9 (0-15)	7.3± 1.1 (0-13)	-	-
	16-28	9.3 ± 0.7 (6 ± 15)	13.2± 1.5 (4-19)	11.1± 1.2 (5-18)	9.5± 0.9 (6-19)	4.5± 1.2 (0-9)	2.9± 0.8 (0-5)
Mar.	1-15	15.5 ± 1.7 (6-28	18.9± 1.8 (9-30)	17.5± 1.5 (12-25)	15.0± 1.6 (10-23)	6.1± 0.8 (3-15)	7.1± 0.5 (4-9)
	16-31	20.1 ± 2.7 (6-31)	22.1± 1.9 (9-33)	15.7± 2.3 (11-30)	13.1± 2.0 (9-27)	7.0± 1.1 (4-16)	9.2± 1.6 (6-20)
Apr.	1-15	28.1±2.0 (18-35)	33.2± 1.9 (20-45)	17.9± 1.3 (10-27)	23.1± 1.6 (11-33)	11.2± 1.3 (9-20)	13.1± 1.3 (5-24)
	16-30	35.2±2.7 (19-50)	43.1± 2.8 (25-57)	23.3± 2.1 (17-39)	25.3± 1.4 (15-37)	15.3± 1.8 (6-25)	18.9± 1.9 (7-26)
May	1-15	40.0±3.5 (26-65)	40.7± 3.9 (18-55)	27.2± 3.0 (14-41)	32.4± 2.5 (19-47)	19.5± 1.2 (12-33)	23.2± 2.6 (15-36)
	16-31	43.1±4.3 (28-71)	48.0± 3.5 (15-66)	32.4± 2.3 (20-43)	36.7± 2.9 (22-65)	25.7± 2.8 (13-37)	27.1± 2.9 (16-40)
June	1-15	45.3±5.0 (29-67)	50.2± 4.8 (39-77)	41.5± 2.7 (19-76)	38.5± 2.4 (20-58)	28.9± 3.5 (16-55)	28.5± 2.6 (0-9)
	16-30	53.2±6.1 (22-79)	57± 8.6 (33-82)	42.6± 3.3 (18-81)	44.0± 5.1 (19-77)	30.0± 2.8 (21-15)	7.1± 1.3 (13-45)
July	1-15	11.9±1.4 (6-22)	10.5± 1.4 (6-21)	7.2± 1.6 (0-14)	5.2± 0.9 (4-12)	3.1± 0.2 (0-5)	32.2± 2.5 (23-55)
	16-31	8.7±2.2 (3-15)	5.3± 1.0 (2-11)	10.1± 1.3 (3-15)	9.1± 1.8 (4-18)	6.3± 1.5 (0-14)	5.0± 0.6 (0-9)
Aug.	1-15	23.1±2.4 (15-34)	13.1± 1.8 (8-21)	15.1± 2.0 (9-29)	16.3± 1.6 (12-23)	9.1± 1.1 (5-23)	7.1± 1.3 (0-15)
	16-31	35.2±1.9 (27-51)	28.2± 2.5 (14-40)	23.5± 2.3 (11-37)	30.2± 2.4 (18-45)	18.2± 1.7 (7-35)	12.3± 1.2 (3-22)
Sept.	1-15	48.0±3.1 (23-65)	40.8± 2.9 (27-64)	32.2± 3.4 (20-47)	37.0± 2.8 (18-55)	23.1± 2.8 (17-37)	25.4± 2.7 (11-38)
	16-30	40.1±4.2 (13-77)	45.7± 3.2 (25-67)	35.7± 2.9 (24-51)	38.6± 3.4 (23-59)	28.0± 2.1 (15-40)	26.5± 3.0 (18-41)
Oct.	1-15	38.3±2.5 (20-55)	40.0± 3.2 (18-55)	39.1± 2.9 (28-50)	40.7± 3.8 (21-65)	30.6± 2.3 (18-55)	30.1± 2.9 (19-41)
	16-31	30.5±2.9 (21-44)	37.6± 3.5 (18-63)	44.4± 2.4 (30-57)	46.1± 3.4 (25-64)	21.1± 2.5 (19-54)	32.3± 2.5 (20-53)
Nov.	1-15	20.2±2.8 (10-33)	23.5± 3.2 (10-35)	30.3± 4.1 (15-45)	34.2± 2.0 (13-41)	8.1± 1.3 (2-19)	20.9± 1.9 (11-39)
	16-30	5.3±1.4 (0-11)	7.4± 0.9 (0-13)	12.5± 1.8 (0-21)	12.3± 1.5 (3-19)	7.2± 2.1 (0-22)	20.0± 1.1 (12-28)
Dec.	1-15	2.1±1.0 (0-6)	3.2± 1.3 (0-10)	3.1± 0.9 (0-10)	5.1± 1.2 (0-10)	-	5.1±0.9 (1-13)
	16-31	1.5±0.87 (0-6)	1.1± 0.5 (0-5)	-	-	-	-
General %	Total	564.0 41.39 %	597.0 36.37 %	495.7 35.69 %	523.9 35.69 %	303.0 22.24 %	346.9 23.64 %

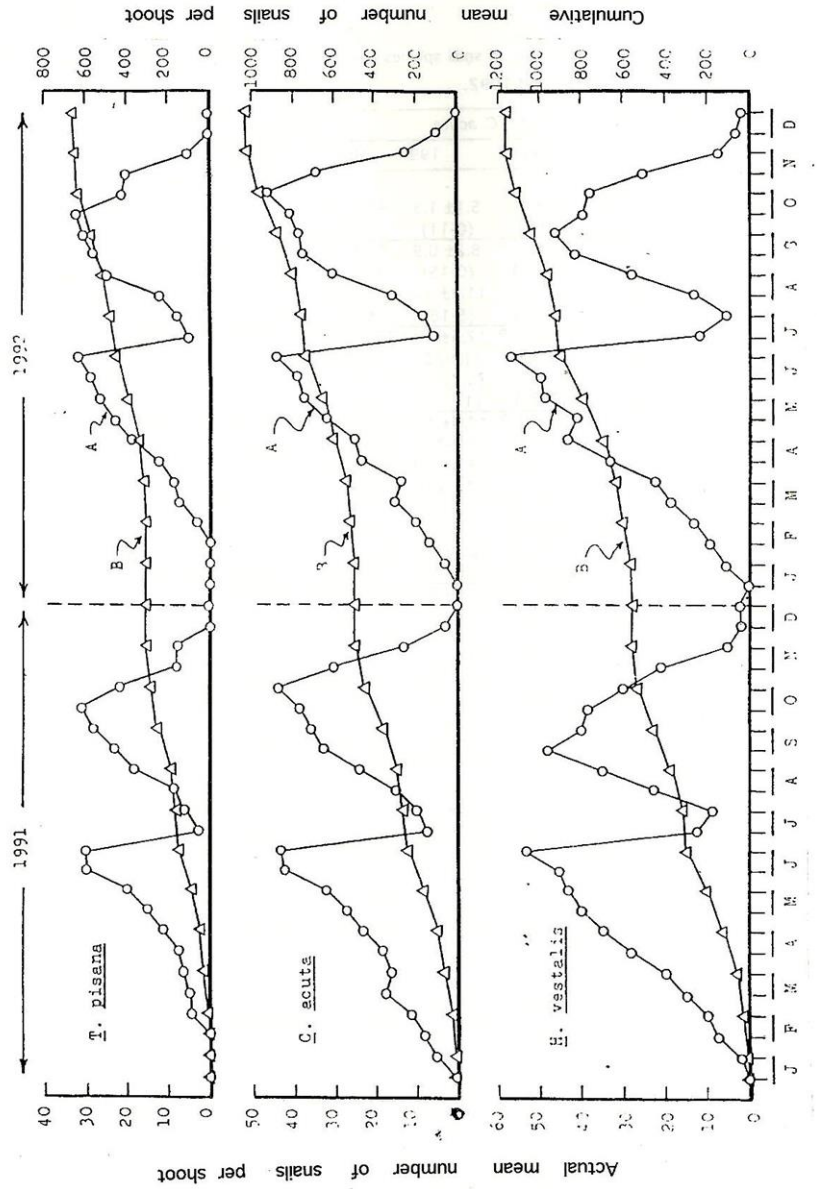

Fig. 1. Actual (A) and cumulative (B) number of the snails, *H. vestalis, C.. acuta* and *T. pisana* on date palm shoots half-monthly intervals during 1991 and 1992 at Sharkia Governorate.

Table 2. Simple correlation "r" between the number of snail species and mean-maximum (Max.T.), minimum (Min.T.) temperature and mean relative humidity(M.RH) during the major two periods of activity in 1991 and 1992.

Species	year	period	From	To	n-l	Correlation coefficien "r"		
						Max.T.	Min.T.	M.RH
H. vestalis	1991	1st	1st Jan.	2 nd July.	13	0.515*	0.515*	-0.075
	1992				13	0.386	0.415	-0.171
	1991	2nd	2 nd July.	2 nd Dec.	10	0.752**	0.666**	-0.013
	1992				10	0.585*	0.585*	-0.189
C. acuta	1991	1st	1st Jan.	2 nd July.	13	0.521*	0.529*	0.042
	1992				13	0.478	0.498	-0.070
	1991	2nd	2 nd July.	2 nd Dec.	10	0.521	0.387	-0.444
	1992				10	0.525	0.406	-0.419
T. pisana	1991	1st	2 st Feb.	2 nd July.	11	0.473	0.463	0.094
	1992				11	0.459	0.468	0.29
	1991	2nd	2 nd July.	2 nd Dec.	9	0.535	0.432	0.016
	1992				9	0.576*	0.477	-0.060

found on each shoot in the two years of study. Winter season was not favourable for snail activity.

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دراسة النشاط الموسمي للقواقع الأرضية علي فسائل نخيل البلح في محافظة الشرقية

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تتعرض فسائل نخيل البلح في مركز بلبيس بمحافظة الشرقية للاصابة الشديدة بالقواقع الأرضية، ومن خلال البحث الحالي أمكن تسجيل ثلاثة أنواع من القواقع الأرضية السائدة علي فسائل نخيل البلح، وهي قوقع الرمال الصغير (هيلبسيلا فيستاليس)، القوقع الحلزوني الصغير (كوشليسيلا اكيوتا) وقوقع الحدائق الصغير (ثيابيسانا) ، من عائلة "هيليسيدي" ورتبة "بالموناتا" تم تتبع تعداد القواقع الثلاثة علي فسائل نخيل البلح خلال عامين متتاليين هما ١٩٩١، ١٩٩٢. لوحظ تواجد القواقع علي فسائل نخيل البلح في الفترة من يناير الي ديسمبر للنوع (تيبا بيسانا). وقد وجد أن قوقع الرمال الصغير (هيليسيلا فيستاليس) أكثر الانواع في تعدادها علي مدار العام حيث كان متوسط التعداد التراكي ٥٦٤,٠ – ٥٩٧,٠ فردا علي الفسيلة الواحدة ويليه القوقع الحلزوني الصغير (كوشيليسيلا اكيوتا) وكان تعداد أفراده ٤٩٥,٦ – ٥٢٣,٩ فردا علي كل فسيلة واخيرا قوقع الحدائق الصغير (تيبا بيسانا) وتعداد أفراده ٣٠٣,٠ – ٣٦٤,٩ فردا علي لكل من العامين . وعموما فلقد بلغ تعداد الأفراد من القواقع علي فسائل نخيل البلح أقصاه في فصلي الربيع والخريف وأدناه خلال الشتاء ، كما درس تأثير درجات الحرارج والرطوبة النسبية علي نشاط القواقع .