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BIOECOLOGY OF THE BUPRESTID BORER, *Ptosima undecimmaculata* HERBST (COLEOPTEA: BUPRESTIDAE): A PEST OF GRAPEVINE

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ABSTRACT

The buprestid borer *Ptosima undecimmaculata* Herbstwas found to be the most destructive pest of grapevine (*Vetis venifera* L.) in El Sadat City, Menoufia was found causing 30.4 – 47.2% damages between 1998 - 2000. Emergence of adults lasted about 20 weeks from March to July with peaks occurring throughout May. An average of 4.50, 5.80 and 7.85 beetles emerged per tree during 1998 - 2000, respectively. The effect of day-maximum temperature, night-minimum temperature and daily mean relative humidity on *P. undecimmaculata* seemed to be fluctuated within the optimal range of beetles' activity during 1998 while they were out of the optimal range of beetles emergence throughout 1999 and 2000. The activity of beetles was mostly related to the combined action of the three weather factors simultaneously 56.6 – 81.7% in the rate of beetles emergence was attributed to the effect of these three weather factors.

Research into biological aspects of *P. undecimmaculata* demonstrated that the life cycle elapsed more than one year with adult emerged between March and July. Peak adult emergence occurred in May and male: female sex ratio was about 1.3: 1.0. Males outnumbered females in the early emergence period, whilst females were more numerous between May and July. The mean lengths of preoviposition, oviposition and postoviposition periods were 11.0 ± 1.4, 8.4 ± 2.2 and 9.4 ± 2.7 days, respectively. The mean longevity of females and males was 28.8 ± 3.8 and 20.4 ± 2.9 days, respectively. Data indicated that an average of 29.9 ± 9.4 eggs were laid per female and the mean number of deposited eggs per female per day was 3.54 ± 0.4 eggs. Egg hatch with an 80% success rate after 23.5 ± 4.1 days. There was no correlation between preoviposition period and female longevity, but oviposition period was significantly correlated with female longevity. Also, fecundity was correlated significantly with longevity. The mean total larval and pupal periods were 379.4 ± 29.4 and 21.3 ± 4.1 days, receptively.

INTRODUCTION

Borers are known as chronically damaging pests. Their inaccessibility in woody hosts has resulted in few effective control programs that prevent serious economic loss from developing. For the same reasons there have been few published reports of the population dynamics of borer species under field conditions (Nielsen 1981).

The buprestid borer, *Ptosima undecimmaculata* Herbst is a polyphagous species. It usually occurs on deciduous trees. In Egypt, Nour (1963), Alfieri (1976), Batt (1989) and Abd El-Latif (1995) mentioned that *P. undecimmaculata* infests healthy and weakened standing trees of apricot, plum, peach, pomegranate and grapevine trees. On the other hand, Ferrero (1987) in Roussillon, Tezcan (1995) in Turkey and Prez *et al (*1998) in Spain demonstrated that *Ptosima flavoguttata* Illiger usually attacks many woody Rosaceae trees that are weakened.

A successful larval development is dependent on a high average summer temperature together with limited moisture in the attacked wood. These conditions seemingly exist in Egypt. Eggs are usually laid under the bark of branches and stems through the breakage of bark such as cracks or wounds, etc. Both larvae and adults cause damage. Larvae bore into the inner layer of the bark, cambium, phloem and into the sap wood during their long development making an irregular feeding galleries, preventing nutrient uptake, causing the deterioration of tree that resulting in serious economic losses. Mature larva bores into the wood to make individual elongate-oval pupal chamber. Adult makes an oval exit hole, which is prepared just a thin layer of wood and filled with rather coarse wooden fibers. Adults feed on the bark of the trees which ultimately dry up.

In some areas where grapes (*Vetis venifera* L.) are grown, various endemic borers will attack the trees. In El-Sadat City, Menoufia Governorate, *P. undecimmaculata* has been known to attack vineyards. Characteristically, *P. undecimmaculata* populations repeatedly attacking grapevines can cause serious damage affecting yield and long-term vigor. The infestation with this borer has been known in Sadat City where the grape-growers recorded *P. undecimmaculata* outbreaks periodically since 1993, causing 20-30% mortality of grapevines trees within 5-7 years ago.

The current infestation of *P. undecimmaculata* in grapevines at Menoufia Governorate was the subject of this research. Information on ecological and biological aspects of the pest is lacking. A part from study made by Abd El-Latif (1995) in apricot trees at Fayoum Governorate, no papers has been published. A more detailed study describing its life history and the effects of environmental factors is needed. Therefore, this study was conducted on the bioecology to discus most aspects of the insect's ecology and biology on grapevine trees

MATERIALS AND METHODS

The field studies were carried out in a grapevine orchard at El-Sadat City, Menoufia Governorate throughout 1998 to 2000. “Infestation percentage” was the criterion used to determine the annual infestation of grapevines with the pest. The level of infestation was determined by visual inspection of 125 random selection grapevine trees. Each selected tree was examined for the external sign of infestation, which is the presence of adult oval exit holes. This criterion was firstly determined in January 1988 and again by the end of August 1998,1999 and 2000, respectively.

“Rate of adult emergence” was the parameter considered for following up the seasonal emergence of *p. undecimmaculata* adults*, i.e.,* weekly mean numbers of oval exit holes per tree. For this purpose, 20 randomly distributed trees were selected. On each tree, all old oval exit –holes were individually recorded at early January 1998, about 2 months before the emergence of adults. Beginning from early March, each new exit hole was marked on the tree and not recorded in the subsequent counts. This routine work was repeated each year.

Weather parameters under field conditions like day-maximum and night-minimum temperatures as well as daily-mean relative humidity were

recorded during the period under study. The emergence of adults was statistically analyzed for the partial regressions.

Biological studies were initiated using 10 grapevine trees that were badly damaged with the borer in another orchard. The damage was extensive enough that the vineyard-man required that those trees be destroyed. The ten trees were removed individually then cut into logs of about 1 m length and put in outdoor wire cages (120 cm long X 120 cm wide X 60 cm high) from January to August 1998 (until the emergence of adults was ended).

After the adults' emergence in daytime, they were sexually dimorphic and the sex ratio of the emerging adults was recorded. The sexes can be separated externally by measuring body length of adults upon emergence where the female beetles are relatively larger in size (13.25-15.65 mm. with an average of 14.69 mm. In body length) than males (11.03-12.74 mm. with an average of 12.09 mm. in body length) (n = 20 females and 20 males). Also, Adults were sexed by the last abdominal segment which is obconical, obtuse, denticulate on edges in female while it is widely rounded, subtruncate at apex in male.

Ten pairs of adults emerged from these grapevine logs were used for the biological experiments. Within a day after emergence, the adults were paired and each pair was transferred to a separate grapevine seedling (about one year old) caged with suitable cylinder wire net and reared in outdoor (natural daylight, 27 - 35 5 °C and 60 -70% RH). The seedlings were examined 3 times a week till oviposition, then they were changed daily and the daily number of eggs deposited for each individual female was recorded by checking up the removed seedling under a binocular microscope. This routine work was continued till the female died. Thus, the reproductive properties of each pair were estimated.

Fifty deposited eggs were randomly taken from seedlings and each of them was placed in a Petri dish (5 cm in diameter, 1 cm in depth) with moistened filter paper and incubated at 25 ± 2 °C to determine the incubation period. Hatchability percent was also estimated.

Fecundity was assessed by dissecting the 10 ovipositing females shortly after they died and the number of eggs remaining in their ovaries - plus those they laid - were considered to be the fecundity.

After hatching, neonate larvae were individually reared in laboratory on grapevine cuttings (their ends were waxed with hot praffin to slow desiccation). One neonate larva was introduced into small hole artificially made with a cutter. Larvae tended to bore into the cutting immediately after being introduced to it. Two weeks intervals, cuttings were dissected and the surviving larvae were individually transferred to gradually bigger cutting appropriate with their growth and put in glass jars of suitable size covered with muslin. Records were kept for larval and pupal development.

RESULTS AND DISCUSSION

Ecological studies
Annual infestation:

At the beginning of the study, among 125 trees observed in the experimental field during January 1998, there were 38 damaged trees with borer forming 30.4% infestation rate. An average increase of about 6.3% damage occurred yearly where the annual infestation rate escalated from 30.4% to 47.2% in 2000 (representing an increase of 16.8% within 32 months). By the end of August 2000, twenty trees were killed (3 – 5 tree killed annually) and 39 trees were found debarked that resulted in a yellowing leaf shedding and reduced yields (Table I).

Table (1):Progress of infestation rate with *P. undecimmaculata* throughout 1998–2000 at Sadat City, Menoufia Governorate.

Date of inspection	No. of observed trees	No. of			% infestation
		Infested trees	Killed trees	Total	
January, 1998	125	30	8	38	30.4
August, 1998	125	33	11	44	35.2
August, 1999	125	37	15	52	41.6
August, 2000	125	39	20	59	47.2

Seasonal emergence of adults:

Weekly emergence pattern throughout 1998 – 2000 is shown in Fig. (1). The emergence of adults was observed during March and lasted about 20 weeks till July. Adult emerged by making an oval exit-hole measuring about 7 mm Long and 4 mm wide. Maximum number of emerged beetles (more than 50%) took place during April and May. A total average of 4.50, 5.80 and 7.85 beetles/ tree were emerged throughout 1998 – 2000, respectively (n = 20 weeks). Abd El-Latif (1995) in apricot trees at Fayoum Governorate reported that the emergence occurred from last week of February to April whereas the present study revealed that the beetles' emergence continued up from March to July. Peak emergence occurred during May; in the last week during 1998 but it was observed in the third one in 1999. Due to the early increases of temperature in 2000, peak emergence was observed during the first week of May.

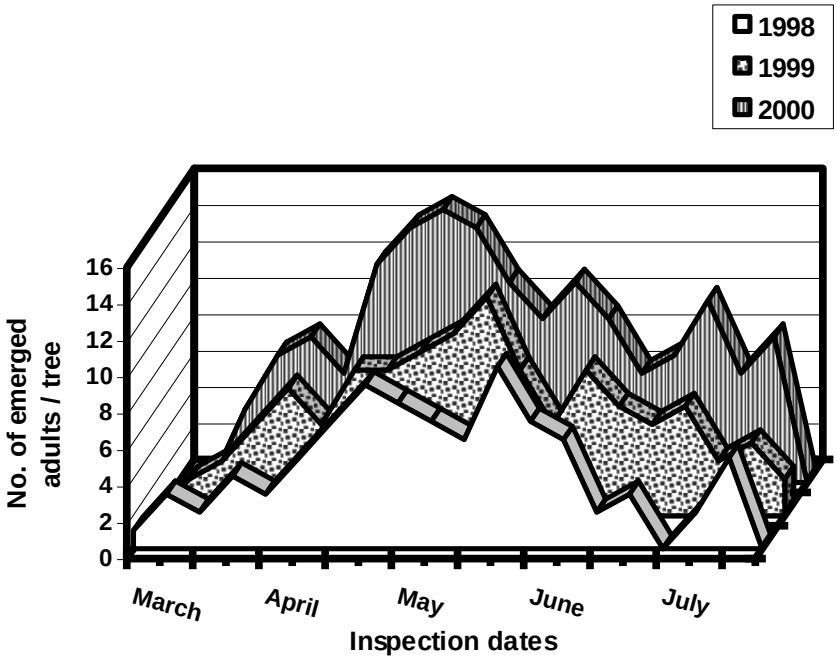

Fig. (1): Mean number of *P. undecimmaculata* emerged beetles throughout 1998 - 2000 at Menoufia Governorate.

As mentioned above, the population level of emerged adults was higher in 2000 than 1999 and 1998 where the whole averages/ tree/ week were 7.85, 5.80 and 4.50, respectively. That is due to the effect of high temperature and low relative humidity. During the emergency period, the general daily mean temperature average was relatively higher in 2000 (25.3 °C) than 1999 (22.2 °C) and 1998 (21.9 °C). Also, daily mean relative humidity average decreased in 2000 (41.3%) than 1999 and 1998 (53.2% and 54.2%, respectively) with about 11.9 – 12.9%.

Effect of weather factors on the emergence of beetles

Results given in Table (2) gave an evidence of insignificant precise effects of day-maximum temperature (D. Mx. T.), night-minimum temperature (N. Mn. T.) as well as daily-mean relative humidity (D. M. R. H.) on the emergence of adults during 1998.

The actual influences of the three weather factors throughout 1999 and 2000 were entirely in contrast with their effects during 1998 where the obtained partial regression values emphasized that the exact effects of the tested weather factors on the rate of beetles emergence were always highly

significant. The effects were positive In cases of D. Mx. T. (+2.46 and +3.57) and D. M. R. H. (+ 0.12 and +0.45) while they were negative in case of N. Mn. T. (-2.62 and –3.26). The weekly mean number of emerged beetles would be doubled by changes of about +0.45 °C, - 0.38 °C and + 8.33% in D. Mx. T., N. Mn. T. and D. M. R. H. during 1999, and +0.28 °C, - 0.31 °C and 2.22%, respectively during 2000.

With regarded to the calculated "t" values, it could be concluded that the 3 weather factors were within the optimal range of beetles emergence during 1998. On the other hands, these factors were out of the optimal range of beetles' emergence throughout 1999 and 2000, thus, yielded highly significant values.

The combined effects of the three weather factors on the population of *P. undecimmaculata* were highly significant, and the percentages of explained variances indicated that the three examined factors were responsible for about 56.6%, 81.4% and 81.7% of the variability of weekly population throughout 1998-2000, respectively.

Table (2): Partial regressions (P. reg.), analysis of variances (F.) and the corresponding percentages of explained variance (E.V.%) of the weekly means of *P. undecimmaculata* adults on three tested weather factors together with the average changes in weather factors required to alter the weekly mean number of emerged beetles throughout 1998–2000 at Menoufia Governorate.

Year	Weather factors								Average increase or decrease in		
	D. Mx. T.		N. Mn. T.		D. M. R. H.		F	E.V. %	D. Mx. T. (°C)	N. Mn. T. (°C)	D. M. R. H. (%)
	P. reg.	t	P. reg.	t	P. reg.	t					
1998	-0.28	0.43	+0.45	0.61	-0.37	0.72	11.09**	56.6	-	-	-
1999	+2.46	3.52**	-2.62	3.00**	+0.12	4.44**	37.27**	81.4	+0.45	-0.38	8.33
2000	+3.57	3.10**	-3.26	2.80**	+0.45	5.34**	38.06**	81.7	+0.28	-0.31	2.22

**** Highly significant at probability level 1%.**
D. Mx. T.: Day-maximum temperature.
N. Mn. T.: Night-minimum temperature.
D.M.R.H.: Daily-mean relative humidity.

Biological studies

Pattern of emergence:

The period of emerged adults from grapevine logs kept in outdoors wire-net cages occurred continuously from March to July. As shown in Fig. (2), the males were more numerous than females early in the emergence period (March and April), although this trend was later reversed (May, June and July). The emergence peak of males and females (24 and 31 individuals, respectively) took place in May (Table 3). These results confirming the seasonal emergence of adults in the field.

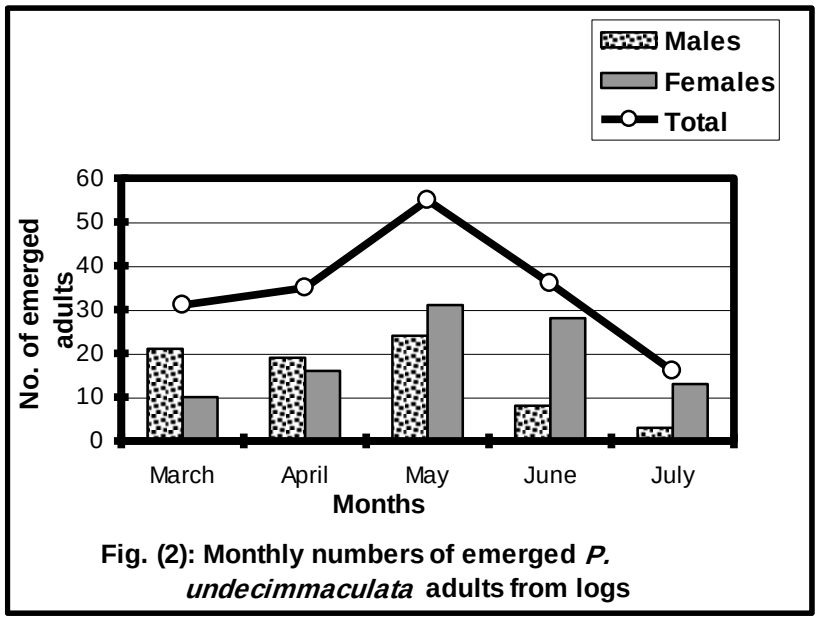

Fig. (2): Monthly numbers of emerged *P. undecimmaculata* adults from logs

Sex ratio:

The number of adults that emerged from logs varied from 16 to 55 between March and July (Table 3). However, out of 173 emerged beetles, 98 were females and 75 were males forming a sex ratio for all individuals of 1.3 females: 1.0 males, suggesting that adults sex ratio is nearly not equal

Table (3): Emergence pattern of *P. undecimmaculata* male and female adults from logs.

Sex	Number of emerged adults					
	March	April	May	June	July	Total
Females	10	16	31	28	13	98
Males	21	19	24	8	3	75
Total	21	35	55	36	16	173

Reproductive properties:

After emergence, adults were observed feeding on leaves and on twigs by scraping the bark. As shown in Table (4), females oviposited within 11.0 ± 1.4 days (the preoviposition period ranged 9 – 13 days) after the adult pair was put into the same grapevine seedling.

Oviposition often occurs on bright sunny days. The female beetles search ovipositional site on the bark and make “T” shaped incisions into which eggs were laid singly or in small groups. The egg was yellow in color and oval, with 1.16 ± 0.6 mm in length and 0.81 ± 0.61 in width (n= 20). Females continued to deposit their eggs for a period ranged 5 – 12 days with an average of 8.4 ± 2.2 days. Then females ceased oviposition for 5 - 15 days with 9.4 ± 2.7 as an average.

Table (4): Reproductive properties of *P. undecimmaculata* adults.

Pair number	Female reproductive properties			Longevity (days)		Total no. of deposited eggs per female	Man no. of eggs /day / female
	Preoviposition period (days)	Ovipoition period (days)	Postoviposition period (days)	Females	Males		
1	13	8	5	26	18	30	3.75 ± 2.1
2	10	7	6	23	16	28	4.00 ± 2.8
3	11	8	10	29	21	27	3.38 ± 2.3
4	9	11	11	31	20	40	3.64 ± 2.6
5	12	9	9	30	21	33	3.67± 1.9
6	10	12	8	30	18	51	4.25 ± 2.8
7	12	11	15	38	27	29	2.63 ± 2.2
8	11	7	9	27	20	25	3.57 ± 0.9
9	9	6	11	26	20	20	3.33 ± 2.1
10	13	5	10	28	23	16	3.20 ±2.3
Range	9 - 13	5 - 12	5 - 15	23 - 38	16 - 27	16 - 51	2.63 – 4.25
Mean ± S. E.	11.0 ± 1.4	8.4 ± 2.2	9.4 ± 2.7	28.8 ± 3.8	20.4 ± 2.9	29.9 ± 9.4	3.54 ± 0.4

The average number of eggs laid during the life of females was found to be 29. 9 ± 9.4 eggs (ranged between 16 and 51 eggs, n = 10). The average number of eggs deposited per female per day was 3.54 ± 0.4 eggs (ranged 0.5 – 5.5 eggs). Most of females (7 females) laid their eggs singly and only 3 out of the 10 females laid eggs singly and in small groups of 3 – 7 eggs.

Fig. (3) illustrated the average deposited egg frequency curve of females, which determined from the mean frequency eggs laid by females daily during oviposition period. The average frequency of laid eggs was a positive skew with a right side tail. This indicated that that *P. undecimmaculata* females deposited more eggs in the first half of their oviposition period than in the second half.

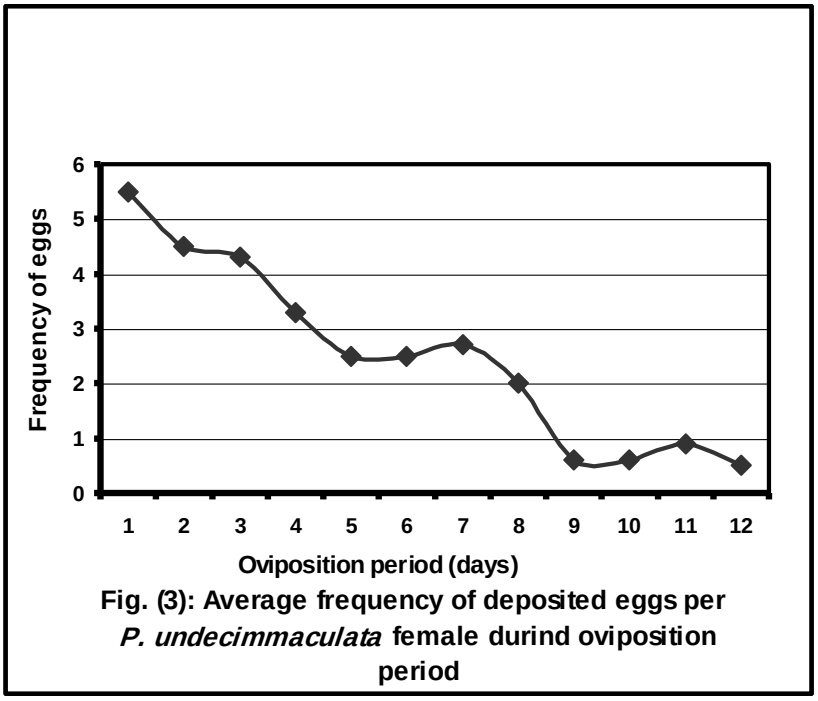

Fig. (3): Average frequency of deposited eggs per *P. undecimmaculata* female durind oviposition period

After oviposition, the female abdomen remained hollow throughout the postoviposition period, suggesting that there was no additional eggs formation or development. By dissecting the 10 females after they died, it was found 3.3 ± 1.5 eggs as an average in their ovaries. There were no immature oocytes or degenerated eggs, further indicating that additional eggs did not form and mature eggs were not resorbed. Given this, and that the average number of eggs laid by these 10 females was 29.9, their total fecundity could be 3.3 + 29.9 = 33.2 eggs, of which an average of about 90% were actually laid.

In the present study, The preoviposition period had no significant effect on female longevity ($F= 0.23$; $df = 1,8$; $P>0.05$). On the other hand, the female longevity tended to increase as oviposition period increased ($F= 6.33$; $df = 1,8$; $P<0.05$). Also, fecundity showed a tendency to increase as longevity increase ($F= 14.03$; $df = 1,8$; $P<0.05$).

Longevity:

The adults were long-lived, and females lived longer than males (Fig. 4). Average post-emergence longevity's of males and females were 28.8 ± 3.8 days (ranging from 23 to 38 days) and 20.4 ± 2.9 days (ranging 16 – 27 days), respectively.

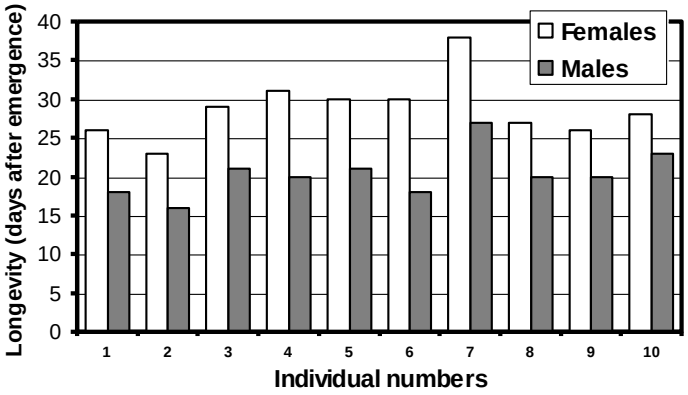

Fig. (4): Longevity of *P. undecimmaculata* female and male adults

Hatching:

Among a total of 50 eggs that were tested in this study, 40 eggs were hatched indicating that the hatchability was 80%. The most important mortality factor was the unfertilized eggs deposited (Itami and Craig, 1989). The mean number of hatching days was 23.5 ± 2.3 days and the range was 19 – 28 days, shorter to that reported by Abd El-Latif (1995).

Duration of larvae and pupae:

The development profile was supported by data of 10 larvae succeeded to develop from neonate to adults' emergence, *i.e.,* 5 males and 5 females. However, the larval duration varied considerably. Total larval development from hatching to pupation took place 331 – 418 days with average of 379.4 ± 29.4 days. Total pupation period ranged 15 – 28 days with 21.3 ± 4.1 days as an average. Table (5) indicated that both larvae and pupae of females has longer development period than males. The mean female larval and pupal periods were 385.8 ± 26.5 and 21.4 ± 2.3 days, respectively whereas the respective means of male were 373.0 ± 30.7 and 21.2 ± 5.8 days.

Given this, and that the incubation periods averaged 23.5 days, it is concluded that the developmental time from neonate larvae to the emergence of adults could be lasted 23.5 + 385.8 + 21.4 = 430.7 days in average in case of female, and 23.5 + 373.0 + 21.2 = 417.7 days in average in case of male.

Table (5): Developmental periods of *P. undecimmaculata* larvae and pupae (The development profile was supported by data of 10 larvae succeeded to develop from neonate to adults' emergence, *i.e.,* 5 males and 5 females).

Individual number	Duration in days of					
	Females			Males		
	Larva	Pupa	Total	Larva	Pupa	Total
1	339	23	362	331	27	358
2	381	19	400	342	19	361
3	402	20	422	401	15	416
4	418	20	438	405	28	433
5	389	25	414	386	17	403
Range	339 – 418	19 – 25	362 – 438	331 - 405	15 - 28	358 - 433
Average ± S. E.	385.8 ± 26.5	21.4 ± 2.3	407.2 ± 25.7	373.0 ± 36.7	21.2 ± 5.3	394.2 ± 29.9

As mentioned above, work on the bioecology of *P. undecimmaculata* have been rather few. This study has provided an understanding of the annual infestation, seasonal abundance, life tables and reproductive properties of *P. undecimmaculata* currently attacking grapevines in Sadat City, Menoufia Governorate. Although there are several buprestids attacking both woody and non-woody plants, only a few are serious pests of important trees, and even fewer create economic problems in horticultural crops. There are two other economically important species infesting grapevine in Egypt: *Paropta paradoxa* H.-Schaeff (Lepidoptera: Cossidae) and *Chlorophorus varius* Mull. (Coleoptera: Cerambycidae) which does not appear to be an economic problem in Sadat City.

There are some explanation for the appearance of the current out break of *P. undecimmaculata* in Sadat City, such as vines that stressed under drought conditions are more susceptible to attack by the borer. In addition, *P. undecimmaculata* infestation was found attacking some plum trees in surrounding orchards, suggesting that the source of this pest is correlated with its occurrence in plum trees.

The ecological study showed that *P. undecimmaculata* was able to attack vineyards for relatively longer period (March – July) than that recorded by Abd El-Latif (1995) in apricot trees (late February – April). In addition, throughout 1998 – 2000, the annual infestation increased up to 47.2%, indicating of important economic problem of this pest for the growers. Literatures on the effect of main weather factors on the emergence of *P. undecimmaculata* are meager. Abd El-Latif (1995) mentioned that the effect of weather factors was generally insignificant. In the present study, the emergence of adults was negatively related to night-minimum temperature, and positively related to both day-maximum temperature and daily mean relative humidity throughout 1999 and 2000. On the other hand, adults emergence was not influenced by changes in these weather factors during 1998.

The seasonal emergence pattern of adults from logs was similar to that in the field that adults emerged from March to July.

The reproductive biology of *P. undecimmaculata* was differ to that reported by the previous study (El-Latif, 1995). This includes the female: male

sex ratio (1.31: 1.00), the lengths of female reproductive properties and the adult longevity. The adult was long lived with feeding on leaves and branches. Females undertook maturation feeding for 9 – 13 days before started oviposition, and continuously had mature eggs for 5 – 15 days, laid only a few eggs every day. The mean life span of male and female adults obtained in the present study were shorter with 2 and 7 days, respectively to that reported in the previous study. Also, the findings of the mean number of eggs during the life of a female was about 2.4 times greater than previous study in which beetles were reared on apricot cuttings. The differences in food are considered to be a factor, which causes the differences in reproductive biology (Lee and Lo (1996).

Since the females were oviposited after emergence with 9 – 13 days and they oviposit several times throughout 5 – 12 days of their oviposition period, they have a chance to distribute their offspring over the vineyards. In addition, mainly because of long larval duration, the insect took about 13.9 – 14.3 months (417.7 – 430.7 days) from oviposition to male and female adults' emergence, respectively.

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دراسات إيكولوجية وبيولوجية على حفار الساق *Ptosima undecimmaculata* Herbst (Coleoptera: Buprestidae)

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قسم الحشرات الإقتصادية والمبيدات – كلية الزراعة – جامعة القاهرة0

يعتبر الحفار *Ptosima undecimmaculata* Herbst (Coleoptera: Buprestidae) من الآفات ذات الخطورة الشديدة على أشجار العنب0 ولقد تم دراسة بعض النواحي الإيكولوجية والبيولوجية لهذا الحفار في بساتين العنب لمدة ثلاثة مواسم متتالية (1998 – 2000) بمدينة السادات – محافظة المنوفية0 ويمكن تلخيص النتائج ما يلي:

أظهرت الدراسات الإيكولوجية أن خروج الخنافس قد إستغرق حوالي 20 أسبوعاً من مارس إلى يوليو، خلالها أمكن تسجيل ذروة النشاط في مايو0 وتدرجت معدلات الإصابة من 30.4% إلى 47.2% خلال سنوات الدراسة0 وبلغ المتوسط الكلي لعدد الخنافس التي خرجت من الشجرة الواحدة 4.50، 5.80، و 7.85 خلال مواسم 1998، 1999، و 2000 على التوالي0 ولم يكن لكل من درجة الحرارة القصوى أثناء النهار، درجة الحرارة الصغرى أثناء الليل، والمتوسط اليومي للرطوبة النسبية تأثير على معدل خروج الخنافس خلال موسم 1998، بينما كان هذا التأثير عالي المعنوية خلال موسمي 1999 ، و2000 0 كما ظهر أن التأثير المشترك للعوامل الجوية الثلاثة على نشاط خروج الخنافس كان أكثر وضوحاً من التأثير المنفرد لكل عامل جوي على حدة، وأن حوالي 56.6 % - 81.7 % من التباين في معدل خروج الخنافس يرجع للعوامل الثلاثة مجتمعة0

وأوضحت نتائج الدراسات البيولوجية أن دورة الحياة تستغرق أكثر من عام0 وكانت النسبة الجنسية 1.3 إناث : 1.0 ذكور على وجه التقريب0 بلغت فترات ما قبل وضع البيض، وضع البيض، ما بعد وضع البيض في المتوسط 11.00 ± 1.4 ، 8.4 ± 2.2 و 9.4 ± 2.7 أيام على التوالي0 كما بلغت مدة حياة الإناث والذكور في المتوسط 28.8 ± 3.1 و 20.4 ± 2.9 أيام على التوالي0 كان متوسط عدد البيض الذي وضعته الأنثى الواحدة خلال مدة حياتها 29.9 ± 9.4 بيضة بينما كان متوسط عدد البيض الذي وضعته الأنثى في اليوم الواحد 3.45 ± 0.4 بيضة0 وبلغت مدة حضانة البيض في المتوسط 23.5 ± 4.1 يوماً، وكان متوسط نسبة فقس البيض حوالي 80%0 لم تكن هناك علاقة بين فترة ما قبل وضع البيض ومدة حياة الأنثى، بينما كانت هناك علاقة بين كل من فترة وضع البيض والخصوبة على عمر الأنثى0 ,لقد إستغرق الطور اليرقي في المتوسط 379.4 ± 29.4 يوماً بينما إستغرق طور العذراء 21.3 ± 4.1 يوماً في المتوسط0