A STUDY ON THE INCIDENCE OF DIAPAUSE AND PARASITISM OF, *PEGOMYA MIXTA* VILLENEUVE, (DIPTERA: ANTHOMYIIDAE) IN KAFR EL- SHEIKH AND DAQAHLIYA GOVERNORATES.

EL-SERWY, S. A.

Plant Protection Research Institute, ARC, Dokki, Giza

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Abstract

Infested leaf parts with the sugar beet leafminer, *Pegomya mixta* Vill., (Diptera: Anthomyiidae) were collected from untreated sugar beet, *Beta vulgaris* L., fields in Governorates of Kafr EL-Sheikh (at Sakha and Bila) and Daqahliya (at El-Simbalwein, Bilqas and Shirbin) during the period from December, 2004 and 2005 to April, 2005 and May, 2006. Rate and incidence of diapause and parasitism as well as emergencies of flies and parasitoids were determined. Incidence of diapaused pupae and parasitism by *Opius nitidulator* (Nees) (Braconidae) increased progressively and varied according to location and season. Diapause and parasitism were two times greater and somewhat higher at Kafr El-Sheikh than at Daqahliya with overall means of 41.8 and 21.5% as well as 20 and 19.1%, respectively. Such rates were 49 & 23% in (2004- 2005) and 17 & 21% in (2005- 2006). Rate of diapause ranged between 47- 69% at Sakha and El-Simbalwein in 2004- 2005, 15- 27% at Shirbin and Bilqas in 2005- 2006 and 30- 66% at Bila in the second and the first seasons. The corresponding rates of parasitism were 8- 18% at El-Simbalwein and Sakha, 18- 20% at Bilqas and Shirbin and 6- 25% at Bila in the first and the second seasons. In both seasons, flies emerged earlier than parasitoids from active and diapaused puparia, whereas asynchrony was found between the adults of host and parasitoids either at its timing of emergencies or activity peaks. In both diapause seasons, majority (> 79 & 58%) of flies and parasitoids emerged from late October to late November and in January and were continued until mid February, respectively. In both active seasons, it were emerged in lower rates 8 and 3% during the second half of December and continued until the second and the first weeks of May with peaks of 32 and 37% in March, respectively. Interference between the timing of flies emergencies from diapaused and active puparia resulting in overlapping generations, whereas the population growth rate of parasitoids was lower than those of flies, which retarded the biological control, at the beginning of the season. To conserve and promote parasitoids, pesticides must be entirely avoided. Also, the bio- effectiveness of the parasitoids is indicated by the decrease in emergence flies from diapausing puparia by applying deeply plowing and dropping kerosene at a rate of 30 liter / feddan = 4200 m^2 into irrigation water against diapaused pupae in the soil to reduce the population of the emerged flies of the first generation.

INTRODUCTION

The sugar beet leafminer, *Pegomya mixta* Vill., is a main pest attacking sugar beet, *Beta vulgaris* L., and widespread in Egypt. Females laid their eggs singly or in batches of between 2 and 13 on the underside of the sugar beet leaves, rarely on the other one (Fig. 1- a). After hatching, maggots dig a narrow mine which expand by feeding and mines of a number of larvae join to form larger blotches The full grown larvae drop and pupate in the soil and some times dig a narrow mine for pupation especially at the end of the growing season. It has two overlapping broods during the activity period of flies from mid November to the end of May (El-Saeady & Shaheen,1987). Iskander (1982) classify five overlapping generations on seasonal basis as a winter generation from November to February, an early spring generation in February and March, two spring generations from March to mid June and summer (or aestivation) generation from mid- May to October. Pupae went into hibernation (overwinter diapause) during November- January and the majority into aestivation (summer diapause) during February- April and (> 91%) of flies emerged in November (El-Serwy, 2007 b). Three pupal parasitoids, *Opius nitidulator* (Nees) (Braconidae) *Pachycrepoideus vindemmiae* (Rondani) (Pteromalidae) and *Phygadeuon* sp. (Ichneumonidae) were recorded (Hafez *et al*, 1970, El-Serwy, 2007a). *P. mixta* is one of eight *P. hyoscyami* species complex. *P. hyoscyami* and the beet leafminer *P. betae* (Curtis) belongs to this group and widespread throughout Europe, Asia, North Africa, Canada and USA. Both species overwintering as pupae in the soil, emerge as adults in late May to early June and had three generations per year. The second and the third generations are often more attacked by *O. nitidulator* (D'Aguilar & Missonnier, 1957, Hurej, 1986, McKinlay, 1992, Babushkina, 1996). Now, both species are considered as one species *P. hyoscyami* (Steyskal, 1977). It had two generations and the pupae went into aestivation in hot summer in Iraq (Mohamed & Al-Adil, 1987).

The purpose of this work was to study the incidence of diapause and parasitism as well as emergencies of flies and parasitoids from active and diapause puparia reared from sugar beet at different localities in 2004- 2005 and 2005- 2006 sugar beet growing seasons.

MATERIALS AND METHODS

Six untreated sugar beet fields were selected in Governorates of Kafr El-Sheikh (at Sakha and Bila) and Daqahliya (at El-Simblawein, Shirbin and Belqas). Infested leaf parts were detached from infested sugar beet leaves and collected at 14 days interval from December13, 2004 to February 21, 2005 and shortened a week from March 7, to April 25, 2005 at Sakha. Three samples were taken on March 26, April 17 and May 3, 2005 at El-Simblawein, whereas one sample was collected on April 18, 2005 at Bila. Samples were taken every two weeks from December 4, 2005 to

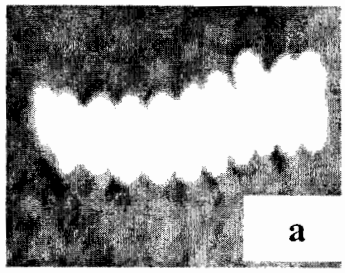
March 26, and April 9, 2006 at Shirbin and Bilqas, but were taken later on 8 December in 2005 and extended to April 26, 2006 at Bila.

On each collection date, the infested leaf parts were placed into circular plastic containers (50 x 15 cm) each provided with a sandy layer at the bottom to facilitate pupation process. Pupa were collected and placed into petri dishes (10 cm in diameter). Dried leaves were kept in plastic sacs fitted with a rubber band. Daily inspection was made and emerged adults of flies and parasitoids were collected, identified and counted. At the end of the active emergence season, puparia were examined and the failed emerged flies (Fig. 1 b) or wasps (Fig. 1 c) were recorded. The remained puparia were counted and placed into new petri dishes. Daily inspection was also made on early October in 2005 and 2006, whereas emerged flies and wasps were collected, identified and recorded. At the end of the diapause emergence season, puparia were dissected and the failed emerged adults of host and parasitoids were counted.

RESULTS AND DISCUSSION

1-Diapause:

Data in Table 1 show that the diapaused pupae varied according to season and location. The general mean was 49.1% (2004- 2005) and 23.4% (2005- 2006). It ranged between 47.2- 69.4% at Sakha and El- Simblawein in 2004- 2005, 15.3- 26.9% at Shirbin and Bilqas in 2005- 2006 and 29.7- 65.9% at Bila in the second and the first seasons. Pupae went into hibernation (overwinter diapause) during December- January and aestivation (summer diapause) from February to the end of the sugar beet growing season and highly varied. The total number of hibernated and aestivated pupae were (12 & 171) and (1083 & 806) with general rates of (less than 1% & 4%) and (48.6 & 19.3%) in 2004- 2005 and 2005- 2006 seasons, respectively (Tables 1, 2 and 3). Hibernated pupae represented about 1 and 18% of the total number of hibernated and aestivated pupae, respectively. The corresponding hibernation rates were less than 1% and about 6% represented less than 2% as well as 21 and 37% at (Sakha & Bila) and (Bilqas & Shirbin), respectively. At Sakha, the hibernated rate was 13.3% on late January in 2005, whereas the aestivated one started in a rate of 22.7% after two weeks, increased gradually to reach a maximum of 93.2% in early April, but decreased to 82.9% after two weeks (Table 2). In mid April of 2005, rates of 65.9% and 97.7% were recorded at Bila and El-Simblawein, but abruptly declined to 25% by early May at the later region. In 2005- 2006, less than 1%, 1.1% and 3.5% went into hibernation on early and mid December as well as mid January and increased to 2.7% on the third week of January at Bila also 16.1 and 20% 10 days later at Shirbin and Bilqas, respectively (Table 3). Aestivated pupae started in rate of 27.2% on early February at Bila, whereas 49.3 and 25.2% were attained after 10 days at Shirbin and Bilqas, respectively. It increased progressively reaching high rates of 83.7% on late March at Shirbin and about 95% on early April at Bila and Bilqas, respectively.



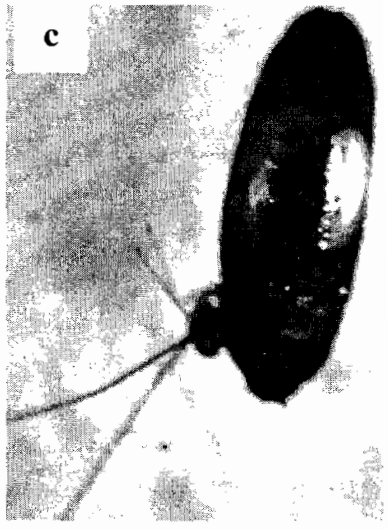


Fig 1. Batches of laid eggs (a), failed emerged adults of *Pegomya mixta* (b) and *Opius nitidulator* (Nees) (Braconidae) (c) from healthy and parasitized puparia.

These results indicate that, the overall mean of diapause was two times greater at Kafr El-Sheikh Governorate than at Daqahliya. Hibernated pupae represented about 21 and 37% of the total number of hibernated and aestivated pupae at Bilqas and Shirbin in 2005- 2006, respectively, but was less than 2% at Sakha and Bila in the first and the second seasons. *P. mixta* pupae reared from the different chenopodiaceous host plants followed the same behavior at Giza in Egypt, whereas the short day leafminer *Pegomya bicolor* Wied. pupae went into summer and winter diapause in China and the summer diapause occurred which gradually rose as the day length and temperature increased (Xue, *et al*, 2001, El-Serwy, 2007 b). On contary, pupae of the related species *P. hyoscyami* entered aestivation under the hot dry conditions in Iraq, but went into winter diapause with *P. betae* during September in Europe (D'Aguilar & Missonnier, 1957, Hurej, 1986, Mohamed & Al-Adil, 1987).

2- Parasitism:

Data in Table (1) indicate that parasitism was markedly fluctuated during the course of this study with general mean of 17% (2004- 2005) and 21.1% (2005- 2006). It ranged between 6.1- 8.1% at Bila and El-Simblawein in 2004- 2005 and 20.1- 25.1% at Shirbin and Bila in 2005- 2006, but a rate about 18% was recorded at Sakha and Bilqas in the first and the second seasons, respectively. In early December of 2005, parasitic activity by *O. nitidulator* started in low rates of 7.2, 15.4 and 15.3% at Bilqas, Shirbin and Bila, respectively, whereas in 2004 a high rate 38.5% was recorded nearly a week later at Sakha (Tables 2 and 3). It increased to 29.2 and 27.8% after two weeks, but lowered to 4.4 and 9.2% on early January and February in 2006 and 2005, respectively. Parasitism was generally fluctuated throughout the growing season and reach the high rates of about 65% and 69% at (Bila & Shirbin) and Bilqas in late March in 2006, whereas 73.2% was attained at Sakha on late April in 2005. In December, the general means of parasitism ranged between 9.9- 31.6% at Bila and Sakha in 2005 and 2004, and 14.5- 21.9% at Bilqas and Shirbin in 2005, but were decreased to about 11% in the next month at both regions (Tables 2 and 3). Parasitism had no an obvious trend, it increased progressively during the following months and reached the highest rates of 43.1, 63.6 and 51.6% at Shirbin, Bilqas and Bila in February, March and April in 2006, but lowered to 24.4 and 27.7% in the next months at the first two regions, respectively (Table 3). It ranged between 17.1%- 23.6% in March and April at Sakha in 2005. At El-Simblawein, parasitism increased from 6.7% to 9.3% during March and April, but no parasitic activity by the braconid species was observed in May, 2005 (Table 2).

Aforementioned results indicate that parasitism was somewhat higher at Kafr El-Sheikh than at Daqahliya with overall means of 20 and 19.1%, respectively. It

varied at the same location in the different seasons and locations in each season. It ranged between 6.1- 25.1% at Bila in the first and the second seasons, 8.1- 18.1% at El-Simblawein and Sakha in 2004- 2005 and 18.4- 20.1% at Bilqas and Shirbin in 2005- 2006. It had reported that rates of parasitism by *O. nitidulator* on puparia of *P. mixta* (reared from sugar beet) were about 24 11 and 8% in Kafr El-Sheikh & Daqahliya, Giza & Beni Sueif and Fayoum Governrates,, respectively (Ewais, 1990, Zawrah, 2000). Rate of parasitism ranged between 15- 20% on September and December sugar beet plantations at Kafr El-Sheikh and varied on the different chenopodiaceous host plants with a general mean of 43% at Giza (El-Agamy *et al*, 1994, El-Serwy, 2007 b). Parasitic activity by *O. nitidulator* followed a similar pattern of parasitism and began in low rates at the beginning of the sugar beet growing season, increased progressively and reached the highest rates during February, March and April at Shirbin , Bilqas and Bila, respectively, but declined in March and April at the first two regions. At Sakha, parasitism decreased 8% from December, 2004 to April, 2005. Competition between *O. nitidualtor* and *Pachycrepoideus vindemmiae* (Rondani) (Pteromalidae) resulted in increased parasitism by *P. vindemmiae* about 8, 55 and 88% in March and April (at Sakha), March (at Shirbin), and May at El-Simblawein than the braconid one (El-Serwy, 2007 a). Increasing parasitism in late April at Bila in 2006 may be attributed to the low level of host population. Babushkina (1996) reported that parasitism on *P. betae* by *O. nitidulator* increased in warm and dry summers which retarded more on the host.

3- Adult emergence:

Data in Table (1) show that emerged flies was higher than parasitoids in both active and diapause seasons. It represented about (92 & 87%) and (74 & 52%) of the total number of emerged flies and parasitoids from active and daipaused puparia in 2004- 2005 and 2005- 2006, respectively. The corresponding values being in respective were 90 & 87% opposed to 66 & 60% in Kafr El-Sheikh and Daqahlyia Governorates, respectively. The emerged adults were:

3-1 *P. mixta* emerged flies represented about 83 and 79% of the total number of emerged flies and parasitoids in 2004- 2005 and 2005- 2006 seasons, respectively (Table 1). Ratios between emerged flies from active and diapaused puparia were about 56: 45 (2004- 2005) and 85: 15 (2005- 2006). In 2005- 2006 active season, flies emergencies started in the third week of December at Shirbin and Bilqas and the next week at Bila and continued until the third week of April at Shirbin and a week later at the two other localities (Table 4). Two peaks were occurred in the third week of January and February at Bila, whereas the population of the first and the second peaks occurring in mid February and early March at Shirbin and Bilqas. In 2004- 2005

active season, flies first appeared in early January and continued until early May with two peaks in early March and mid April at Sakha (Table 4). Flies emerged in a few numbers in the third week of April and early May at El-Simblawein and Bila and continued until mid May at both regions. During the first diapause season (2005-2006), flies first appeared in late October, early and mid November at Sakha, Bila and El-Simblawein, respectively, whereas emergencies continued until late January, but extended two weeks at the Sakha (Table 4). Two peaks were occurred in mid November and January at the three localities, but the population of the first peak occurring in late November at El-Simblawein. In 2006- 2007 diapause season, flies followed a similar pattern of emergence and emerged in individual numbers by mid November, reached its peak in the next week and continued until the first, the third and the fourth weeks of January at Bila, Shirbin and Bilqas, respectively (Table 4).

3-2 *O. nitidulator* emerged wasps represented about 17 and 21% of the total number of emerged parasitoids and flies in 2004- 2005 and 2005- 2006 seasons, respectively (Table 1). Ratios between emerged parasitoids from active and diapaused puparia were about 25 : 75 (2004- 2005) and 47 : 53 (2005- 2006). In 2005- 2006 active season, wasps emerged a week later than flies and continued until the second, the third and the fourth weeks of April at Bila, Shirbin and, Bilqas, respectively (Table 5). Two peaks were attained in mid January and early March at Bila, whereas the first peak occurred in early and mid February at Bilqas and Shirbin and the second one in early April at both regions. In 2004- 2005 , emergence started two weeks later than flies and continued until late April with two peaks in late February and the third week of March at Sakha, but wasps emerged from mid April and early May at El-Simblawein and Bila to mid May at both regions. In 2006- 2007 diapause season, wasps followed a similar pattern of emergence and the first emergence started a week later than flies and continued until mid February with a distinct peak in its population occurring in mid January and early February at Shirbin and Bila, respectively, but emergence began 3 weeks later than flies and continued until late January with a distinct peak in mid January at Bila (Table 5). In the first diapause season (2005- 2006), wasps first appeared 2 weeks later than flies at Sakha and El-Simblawein, but extended to 4 weeks at Bila (Table 5). The first emergence of wasps occurred in mid November and continued until mid February with two peaks in early December and the third week of January at Sakha, whereas wasps emerged in a few numbers during late November-late December and from early December to early February at El-Simblawein and Bila, respectively.

Percentage of progress of emergence of hosts or parasitoids shows the progress of emergence during the active or diapause seasons. It is calculated by

dividing the number of emerged flies or parasitoids adults from alive pupae collected in a certain period by the total number of emerged adults during the season of emergence, multiplied by 100.

Percentages of progress of host and parasitoid emergencies showed a similar trend in active and diapause seasons. Emergencies of parasitoids and flies started in low percentages, increased gradually to reach the highest levels of 45.1 & 52.2% in March and April and 34.8 & 32.6% in February and March in 2004- 2005 and 2005-2006 active seasons, respectively (Tables 4 and 5). The highest percentages of emerged flies were about 82 and 72% at the beginning of the emergence season to late November, whereas about 38 and 72% of parasitoids were emerged in January in 2005- 2006 and 2006- 2007 diapause seasons, respectively (Tables 4 and 5). In the same months, the corresponding values of parasitoids and flies emerged from active puparia were (44.8 & 31.7%) and (39.7 & 36.3%) whereas (82.6 & 67.2%) and (60 & 54.9%) of flies and parasitoids were emerged from diapaused puparia in Kafr El-Sheikh and Daqahlyia Governorates, respectively,.

These results refers to that flies emerged earlier than parasitoids. Asynchrony was found between the adults of host and parasitoids and the timing of its emergencies at the beginning of the emergence or the highest percentages in both active and diapause seasons. On contrary, synchronization existed between the highest percentages of adults of the same host and parasitoid species and the timing of its emergencies from puparia reared from different chenopodiaceous host plants in both diapause seasons and the first active one, but was lost in the second active season at Giza (El-Serwy, 2007 b). Majority (> 73 & 60%) of flies and parasitoids emerged from active and diapaused puparia, whereas (> 65 & 84%) of flies and (>72 & < 45%) and parasitoids were recorded at Kafr El-Sheikh and Daqahliya Governorates, respectively. It is clearly that, majority (>82 & 71%) of flies and parasitoids (> 37 & 72%) were emerged from diapaused puparia during late October-late November and January in 2006 and 2007, respectively. The corresponding values being in respective were ((>67 & 82) and (54 & 60%) at Daqahliya and Kafr El-Sheikh Governorates. The highest flies emerged at the beginning of the emergence season coincides with the peaks of *P. mixta* (*=P. hyoscyami*) catches at Bahteem or those emerged from diapaused puparia reared from different chenopodiaceous host plants at Giza in Egypt (Hafez *et al*, 1970, El-Serwy, 2007 b).

In conclusion, the puparia of *P. mixta* entered diapause during the sugar beet growing seasons and the same behavior was observed with *O. nitidulator*. It had been reported that the summer (or aestivation) generation of *P. mixta* prolonged from mid May to October and its parasitoid *O. nitidulator* spends the summer as a full grown

larvae within the puparium on its host (Iskander, 1982, Ewais, 1990). Rate and incidence of diapause and parasitism were highly varied at the different localities. The highest rates of diapause in order of prevalence were about: of 47% at Sakha (2004-2005), 29, 27 and 15% at Bila, Bilqas and Shirbin (2005- 2006). However, such rates of parasitism were about 25 and 20% at Bila and Shirbin in the second season, but was 18% at Sakha and Bilqas in the first and the second seasons. Pupae went into diapause in December in a low rate less than 1%, at Shirbin and Bila and high rates 11 and 12% in the next month at Sakha and Bilqas, respectively. Parasitism increased progressively and reached the highest rates of 39% (at Shirbin) in March and 70, 93 and 95% (at Sakha, Bila and Bilqas) in April. In December, parasitism started in variable rates of 10, 15, 22 and 32% at Bila, Bilqas, Shirbin and Sakha, respectively. It increased progressively to reach the highest level 57.4% in April at Bila, but declined to 11% in January at Shirbin and Bilqas and 12% in February at Sakha. The highest rates about 43, 63 and 24% were recorded in February, March and April, respectively. The overall means of diapause and parasitism were about two times greater and somewhat higher at Kafr El-Sheikh Governorate than at Daqahliya, being in respective 41.8 and 21.5% as well as 20 and 19.1%. Flies emerged earlier than parasitoids in active and diapause seasons. In both seasons, majority of flies 79% and parasitoids 58% were emerged from diapaused puparia at the beginning of the emergence season to late November and in January which continued until mid February. However, about 8 and 3% were emerged from active puparia during the second half of December and reaches the highest values about 32 and 37% in March. Interference between the times of flies emergencies from diapause and active puparia resulting in overlapping generations and the population growth rate of parasitoids was lower than those of flies, which retarded the biological control, at the beginning of the season.

It can be recommended that pesticides must be entirely avoided to conserve and promote parasitoids, also, the bio-effectiveness of the parasitoids is indicated by the decrease in emergence flies from diapausing pupae. Thus could be achieved by applying some suggested agricultural practices i. e. deeply plowing and dropping kerosene at a rate of 30 liter / feddan = 4200 m^2 into irrigation water can be used as safe and tactic control methods against pupae to reduce the population of the emerged flies of the first generation. Hand pick and destroy infested mined leaves before the full grown larvae drop to the soil can decrease the population size of emerged flies of the second generation.

Table 1. Total no. of collected alive pupae and emergencies of *Pegomy mixta* and *Opius nitidulator* from active and diapaused puparia at Sakha, Bila, El-Simbalwein, Shirbin and Bilqas in 2004- 2005 and 2005- 2006.

Season	Locality	Total no of collected alive pupae	No. of adults emerged from						No. of parasitized pupae	Parasitism %
			Active puparia			Diapaused puparia				
			Flies	Parasi-toids	%	Flies	Parasi-toids	%		
2004- 2005	Sakha	2210	1066	100	52.8	744	300	47.2	400	18.1
	Bila	164	55	1	34.1	99	9	65.9	10	6.1
	El-Simbalwein	62	18	1	30.6	39	4	69.4	5	8.1
	Total	2436	1139	102		882	313		415	
	General mean %				50.9			49.1		17.0
2005- 2006	Bila	1304	808	109	70.3	169	218	29.7	327	25.1
	Shirbin	1595	1143	208	84.6	131	113	15.3	321	20.1
	Bilqas	1284	840	98	73.1	208	138	26.9	236	18.4
	Total	4183	2791	415		508	469		884	
	General mean %				76.6			23.4		21.1
Overall mean %					67.2			32.8		19.6

Table 2. Total no. of collected alive pupae and emergencies of *Pegomy mixta* and *Opius nitidulator* from active and diapaused puparia at Sakha, Bila and El-Simblawein during December- May in 2004- 2005 season.

Region	Date of collection		Total no. of collected alive pupae	No. of adults emerged from						Total no. of parasitized pupae	Parasitism %	Monthly mean
				Active pupae		Diapaused pupae						
	Month	Day		Flies	Parasitoids	Flies	Parasitoids	Diapause %	Monthly mean			
Sakha	December	13	13	8	5	0	0	0.0	0.0	5	38.5	31.6
		27	6	5	1	0	0	0.0		1	16.7	
	January	10	23	19	4	0	0	0.0	10.6	4	17.4	22.1
		24	90	60	18	9	3	13.3		21	23.3	
	February	7	273	197	14	51	11	22.7	32.2	25	9.2	12.3
		21	183	79	19	73	12	46.6		31	16.9	
	March	7	141	78	13	39	11	35.5	46.8	24	17.0	17.1
		14	426	258	9	152	7	37.3		16	3.7	
		21	173	69	10	65	29	54.3		39	22.5	
		28	335	128	7	102	98	59.7		105	31.3	
	April	4	333	141	0	133	59	57.7	69.8	59	17.7	23.6
		11	146	10	0	104	32	93.2		32	21.9	
		18	27	7	0	12	8	74.1		8	29.6	
		25	41	7	0	4	30	82.9		30	73.2	
Bila	April	18	164	55	1	99	9	65.9	65.9	10	6.1	5.1
El-Simblawein	March	26	15	14	1	0	0	0.0	0.0	1	6.7	6.7
	April	17	43	1	0	38	4	97.7	97.7	4	9.3	9.3
	May	3	4	3	0	1	0	25.0	25.0	0	0.0	0.0

Table 3. Total no. of collected alive pupae and emergencies of *Pegomy mixta* and *Opius nitidulator* from active and diapaused puparia at Bila , Shirbin and Bilqas during December- April in 2005- 2006 season.

Region	Date of collection		Total no. of collected alive pupae	No. of adults emerged from						Total no. of parasitized pupae	Parasitism %	Monthly mean
				Active pupae		Diapaused pupae						
	Month	Day		Flies	Parasitoids	Flies	Parasitoids	Diapause %	Monthly mean			
Bila	December	8	144	121	22	1	0	0.7	0.3	22	15.3	9.9
		22	170	161	9	0	0	0.0		9	5.3	
	January	5	159	152	7	0	0	0.0	1.5	7	4.4	10.2
		19	184	151	28	5	0	2.7		28	15.2	
	February	2	162	115	3	22	22	27.2	35.3	25	15.4	25.3
		16	130	51	20	30	29	45.2		49	37.7	
	March	1	75	19	15	18	23	54.7	74.9	38	50.7	51.6
		15	105	26	1	38	40	74.3		41	39.0	
		29	107	9	2	29	67	89.7		69	64.5	
	April	12	64	2	1	25	36	95.3	92.6	37	57.8	57.4
		26	4	1	1	1	1	50.0		2	50.0	
Shirbin	December	4	162	137	25	0	0	0.0	0.6	25	15.4	21.9
		18	176	127	47	0	2	1.1		49	27.8	
	January	1	136	105	30	1	0	0.7	10.6	30	22.1	10.6
		15	248	226	7	15	0	6.0		7	2.8	
		29	453	361	19	40	33	16.1		52	11.5	
	February	12	73	28	9	5	31	49.3	29.5	40	54.8	43.1
		26	224	80	63	56	25	36.2		88	39.3	
	March	12	80	78	2	0	0	0.0	39.4	2	2.5	24.4
		26	43	1	6	14	22	83.7		28	65.1	
Bilqas	December	4	97	90	7	0	0	0.0	0.0	7	7.2	14.5
		18	48	34	14	0	0	0.0		14	29.2	
	January	1	97	88	9	0	0	0.0	11.7	9	9.3	10.8
		15	199	175	17	3	4	3.5		21	10.6	
		29	335	251	17	46	21	20.0		38	11.3	
	February	12	202	147	4	41	10	25.2	30.9	14	6.9	22.8
		26	109	38	26	14	31	41.3		57	52.3	
	March	12	18	1	0	8	9	94.4	76.7	9	50.0	63.3
		26	42	10	3	3	26	69.0		29	69.0	
	April	9	137	6	1	93	37	94.9	94.9	38	27.7	27.7

Table 4. Weekly no. of *Pegomy mixta* emerged from active and diapaused puparia at Sakha (SK), El-Simblawein (SN), Bila (BI), Shirbin (SH)) and Bilqas (BL), during two successive seasons.

Emergence weeks		Active seasons									
		2004- 2005				%	2005-2006				%
Month	Week	SK	SN	BI	Total	progress	BI	SH	BL	Total	progress
December	3 rd	0	0	0	0	0.0	0	68	42	110	11.8
	4 th	0	0	0	0		104	69	48	221	
January	1 st	4	0	0	4	1.1	17	0	0	17	19.6
	2 nd	4	0	0	4		15	9	0	24	
	3 rd	1	0	0	1		155	121	35	311	
	4 th	3	0	0	3		23	91	80	194	
February	1 st	50	0	0	50	10.0	130	70	30	230	31.8
	2 nd	3	0	0	3		2	167	145	314	
	3 rd	50	0	0	50		143	0	5	148	
	4 th	11	0	0	11		5	82	108	195	
March	1 st	183	0	0	183	31.1	114	283	153	550	32.6
	2 nd	67	0	0	67		46	24	139	209	
	3 rd	60	0	0	60		22	68	36	126	
	4 th	44	0	0	44		1	22	2	25	
April	1 st	149	0	0	149	52.2	25	68	1	94	4.2
	2 nd	178	0	0	178		4	0	0	4	
	3 rd	130	14	0	144		0	1	11	12	
	4 th	123	1	0	124		2	0	5	7	
May	1 st	6	1	20	27	5.6	0	0	0	0	0.0
	2 nd	0	2	35	37		0	0	0	0	
Total		1066	18	55	1139	100	808	1143	840	2791	100

Emergence weeks		Diapause seasons									
		2005- 2006				%	2006- 2007				%
Month	Week	SK	SN	BI	Total	progress	BI	SH	BL	Total	progress
October	4 th	6	0	0	6	82.2	0	0	0	0	71.8
November	1 st	57	0	6	63		0	0	0	0	
	2 nd	250	1	36	287		1	2	4	7	
	3 rd	155	5	27	187		102	68	92	262	
	4 th	151	16	15	182		30	21	45	96	
December	1 st	9	0	1	10	3.4	15	19	34	68	26.8
	2 nd	6	0	0	6		16	10	13	39	
	3 rd	9	0	1	10		2	7	13	22	
	4 th	3	1	0	4		2	3	2	7	
January	1 st	28	1	0	29	13.7	1	0	1	2	1.4
	2 nd	42	11	11	64		0	0	2	2	
	3 rd	9	1	0	10		0	1	0	1	
	4 th	13	3	2	18		0	0	2	2	
February	1 st	4	0	0	4	0.7	0	0	0	0	0.0
	2 nd	2	0	0	2		0	0	0	0	
Total		744	39	99	882	100	169	131	208	508	100

Table 5. Weekly no. of *Opius nitidulator* emerged from active and diapaused puparia at Sakha (SK), El-Simblawein (SN), Bila (BI), Shirbin (SH)) and Bilqas (BL) during two successive seasons.

Emergence weeks		Active seasons									
		2004- 2005				%	2005-2006				%
Month	Week	SK	SN	BI	Total	progress	BI	SH	BL	Total	progress
December	4 th	0	0	0	0	0.0	0	15	1	16	3.8
January	1 st	0	0	0	0	4.9	5	7	1	13	10.1
	2 nd	0	0	0	0		12	1	0	13	
	3 rd	3	0	0	3		5	1	0	6	
	4 th	2	0	0	2		4	4	2	10	
February	1 st	1	0	0	1	18.6	7	32	14	53	34.8
	2 nd	0	0	0	0		9	35	12	56	
	3 rd	4	0	0	4		1	11	7	19	
	4 th	14	0	0	14		5	1	10	16	
March	1 st	11	0	0	11	45.1	20	14	10	44	34.7
	2 nd	7	0	0	7		9	5	9	23	
	3 rd	18	0	0	18		7	23	7	37	
	4 th	10	0	0	10		12	19	9	40	
April	1 st	4	0	0	4	30.4	10	31	12	53	16.4
	2 nd	12	0	0	12		2	2	0	4	
	3 rd	12	1	0	13		0	7	3	10	
	4 th	2	0	0	2		0	0	1	1	
May	1 st	0	0	1	1	1.0	1	0	0	1	0.2
Total		100	1	1	102	100	109	208	98	415	100

Emergence weeks		Diapause seasons									
		2005- 2006				%	2006- 2007				%
Month	Week	SK	SN	BI	Total	progress	BI	SH	BL	Total	progress
November	2 nd	4	0	0	4	23.7	0	0	0	0	1.3
	3 rd	12	0	0	12		0	1	1	2	
	4 th	57	1	0	58		0	2	2	4	
December	1 st	61	0	1	62	33.2	2	6	12	20	14.7
	2 nd	24	0	1	25		9	1	12	22	
	3 rd	10	0	1	11		1	1	5	7	
	4 th	3	3	0	6		8	3	9	20	
January	1 st	10	0	0	10	37.7	36	7	8	51	72.1
	2 nd	16	0	0	16		95	26	21	142	
	3 rd	45	0	5	50		54	24	15	93	
	4 th	42	0	0	42		13	16	23	52	
February	1 st	11	0	1	12	5.4	0	17	27	44	11.9
	2 nd	5	0	0	5		0	9	3	12	
Total		300	4	9	313	100	218	113	138	469	100

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دراسة عن سير السكون والتطفل لصانعة أنفاق أوراق البنجر *Pegomya mixta* فى محافظتى كفر الشيخ والدقهلية

سمير عوض السروى

معهد بحوث وقاية النباتات – مركز البحوث الزراعية- الدقى- جيزة

جمعت أجزاء أوراق مصابة بصانعة أنفاق أوراق البنجر *Pegomya mixta* من رتبة ذات الجناحين وعائلة Anthomyiidae من حقول بنجر سكر غير معاملة بالمبيدات في ناحيتي سخا وبيلا في محافظة كفر الشيخ وكذلك نواحي السنبلاوين ، بلقاس وشربين في محافظة الدقهلية خلال الفترة من ديسمبر ٢٠٠٤ و ٢٠٠٥ وحتى أبريل ٢٠٠٥ ومايو ٢٠٠٦ وذلك لدراسة معدل وسير السكون والتطفل وكذلك خروج كلا من الذباب والطفيليات . تشير النتائج المتحصل عليها أن نسب العذارى الداخلة في السكون وكذلك المتطفل عليها بالطفيلي (Nees) *Opius nitidulator* من عائلة Braconidaeتزدادا باضطراد خلال موسم النمو وتختلف تبعا للمكان والموسم. ازدادت العذارى الساكنة حوالي مرتين كما ارتفع التطفل إلى حد ما في محافظة كفر الشيخ مقارنة بالدقهلية وبمتوسطات كلية ٤١،٨ و ٢١،٥% وكذلك ٢٠ و ١٩،١%، على التوالي. كما بلغت تلك المعدلات ٤٩ و٢٣% فى موسم ٢٠٠٤- ٢٠٠٥ ١٧ % و ٢١% في موسم ٢٠٠٥- ٢٠٠٦.أما نسب السكون فتراوحت مابين ٤٧- ٦٩% في سخا والسنبلاوين في موسم ٢٠٠٤- ٢٠٠٥ و ١٥- ٢٧% في شربين و بلقاس في موسم ٢٠٠٥- ٢٠٠٦ وكذلك ٣٠- ٦٦% في بيلا في الموسمين الثانى والأول.أما معدلات التطفل ا لمقابلة فكانت ٨- ١٨% في السنبلاوين وسخا، ١٨- ٢٠% في بلقاس وشربين و ٦- ٢٥% في بيلا في الموسمين ألأول والثاني. فى كلا الموسمين، خرج الذباب مبكرا عن الطفيليات من العذارى النشطة والساكنة، كما وجد عدم تزامن بين كاملات العائل والطفيليات سواء في توقيت خروجها أو ذر وات نشاطها. وفى كلا من موسمي السكون، خرجت غالبية (> ٧٩ و ٥٨%) الذباب والطفيليات في أواخر أكتوبر وحتى أواخر نوفمبر وفى يناير وأستمر خر وجهما حتى منتصف فبراير، على التوالي. أما في موسمي النشاط، فقد خرجا بمعدلات منخفضة ٨ و ٣% خلال النصف الثانى من ديسمبر واستمر خروجهما حتى ألأسبوعين الثانى والأول من مايو وبلغا أعلا مستوياتها ٣٢ و ٣٧% في مارس، على التوالي. ويؤدى التداخل بين توقيت خروج الذباب من كلا من العذارى الساكنة والنشطة إلى تراكب ألأجيال وانخفاض معدل نمو أعداد الطفيليات مقارنة بأعداد الذباب مما يعرقل المكافحة الحيوية خاصة في بداية الموسم. لحفظ وإدامة تلك الطفيليات يجب تفادى الاستخدام الكلى للمبيدات ولزيادة فعاليتها ينبغى خفض أعداد الذباب الخارج من العذارى الساكنة وذلك بإجراء بعض العمليات الزراعية كالحراثة العميقة وإضافة السولار بمعدل ٣٠ لتر / فدان إلى ماء الري حيث يؤديا إلى قتل العذارى الساكنة بالتربة وبالتالى خفض أعداد ذباب الجيل الأول الخارج من العذارى الساكنة بالتربة.