PACHYCREPOIDEUS VINDEMMIAE (RONDANI), A NEW RECORD PARASITOID (HYMENOPTERA, PTEROMALIDAE) ON PUPAE OF THE BEET LEAFMINER, *PEGOMYA MIXTA* VILLENEUVE (DIPTERA: ANTHOMYIIDAE), AND THE BEET MOTH, *SCROBIPALPA OCELLATELLA* (BOYD) (LEPIDOPTERA : GELECHIIDAE)

EL-SERWY, S. A.

Plant Protection Research Institute, A R C, Dokki, Giza

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Abstract

Pachycrepoideus vindemmiae (Rondani) (Diptera: Anthomyiidae), is a new parasitoid recorded on the pupae of the beet leafminer, *Pegomya mixta* in the Governorates of Giza, Kafr El-Sheikh (at Bila) and Dakqhliya (at El-Simbalwein and Belqas) and with the beet moth, *Scrobipalpa ocellatella* in Kafr El-Sheikh (at Sakha) and in Dakqhliya (at Shirbin). It is a solitary pupal parasitoid, rarely polyparasitism was found. Intraspecific variations in *P. vindemmiae* parasitism were 16.7% and 12.6% opposed to 4.3% and 2.6% on parasitized pupae of the beet fly and moth on sugar beet at Sakha and Shirbin, respectively. Interspecific activities by *P. videmmiae* and *Opius nitidulator* (Nees) (Chacidoidae: Braconidae) resulted in overall means 15.5% and 23.6% representing efficacies about 40% and 60% as biological control agents against the beet fly. On parasitized sugar beet pupae, parasitism by *P. vindemmiae* increased 1.7% and, 26.4% at (Sakha & El-Simbalwein) in 2004-2005, and 32.2% & 30.0% in (2004-2005 and 2005- 2006) at Giza but decreased 24.4%,15.3% and 5% at (Bila, Belqas and Shirbin) in 2005- 2006 than *O. nitidulator*. Efficacies of *P. vindemmiae* increasing about 5% & 71% and 45% & 43% versus about 96%, 75% and 17% by *O. nitidulator* as biological control agents against the beet fly. Intraspecific variations in *P. vindemmiae* parasitism resulted in descending means 50.4%, 25.2%, 16.7% and 3.5% on parasitized pupae reared from sugar beet, goosefoot, spinach and chard at Giza. Generally, parasitic activity by *O. nitidulator* started on mid November and continued until late April, However, *P. vindemmiae* appeared in two cyclic activity periods from the third week of November to late January and from mid March to late May. The interspecific competition resulted in overall means of 3.1% and 47.5% by the pteromalid species versus 27.8% and 11.4% by the braconid species in the two cyclic activity periods. The activity by uncompetitive *O. nitidulator* suffered overall means 18.6% and 45.6% during the same periods. Interspecific competition activities between the two parasitoid species and intraspecific by *O. nitidulator* resulted in an increase about 36% and 34% in parasitism than these recorded by the competitive braconid species. Increasing parasitism by *P. vindemmiae* probably replaced by *O. nitidulator* or acts as hyperparasitoid on its parasitized pupae. It is a generalist pupal parasitoid resulted in overall means 4.3% and 15.5% on the beet moth and fly pupae. It did not previously recorded on lepidopterous pupae, it obligate to parasitize on the beet moth pupae as alternative host when the beet fly pupae were scarce at the end of sugar beet growing season. Wasps emerged from the third week of December to mid September and from late April to early October and about 49%

and 51 % emerged during July and June from parasitized beet fly and beet moth pupae. To conserve these parasitoids insecticides must be entirely avoided.

INTRODUCTION

Pachycrepoideus vindemmiae (Rondani), is a new parasitoid on pupae of the beet leafminer *P. mixta* Villeneuve (Diptera: Anthomyiidae) and the beet moth, *Scrobipalpa ocellatella* (Boyd) (Lepidoptera: Gelechiidae). It is widely distributed species on the beet fly pupae in the Governorates of Giza (at Giza), Kafr El-Sheikh (at Bila) and Dakqhliya (at El-Simbalwein and Belqas) and with the beet moth pupae in Kafr El-Sheikh (at Sakha) and Dakqhliya (at Shirbin). *P. vindemmiae* is considered a solitary pupal ectoparasitoid containing a great number of cyclorrhaphous Diptera, including species of genus: *Anastrepha, Calliphora, Ceratitis, Chrysomya, Bactrocera, Drosophila, Fannia, Haematobia, Hylemya, Lucilia, Musca, Myiopardalis, Oxysarcodexia, Paratheresia, Phaenicia, Phoridae, Phormia, Poecilosomella, Peckia, Rhagoletis, Sarcophagula, Sarcodexia and Terellia* (Rueda and Axtell, 1985; Hanson and Gauld, 1995 and Marchiori *et al.*, 2002 & 2005). This species presents a diversified (cosmopolitan) distribution and it has been found in North America, Canada, Africa and Europe (Rueda and Axtell, 1985). Several authors contributed to biology and parasitism of *P. vindemmiae* on *Ceratitis capitata* Weidemann in Egypt, *Dresophila melanogaster* Meigen and *Delia radicum* L. in France and *Sarcodexia lambens* Walker and *Megaselia scalaris* (Loew) in Brazil (Sarhan, 1981, Goubault, *et al*, 2004a and Marchiori *et al*, 2003 & 2005).

The purpose of this work was to study occurrence, efficacy, parasitism and emerged wasps of *P. vindemmiae* on the beet fly, *Pegomya mixta* and the beet moth, *Scrobipalpa ocellatella* pupae at different localities.

MATERIALS AND METHODS

Untreated free pesticides sugar beet, *Beta vulgaris* L., fields were selected at six sites in the Governorates of Kafr El-Sheikh (at Sakha and Bila) and Dakqhliya (at El-Simbalwein, Shirbin and Belqas) and with goosefoot, *Chenopodium murale* L.; spinach, *Spinacia oleracea* L; Chard, *Beta vulgaris* var. *cicla* L.; wild beet, *Beta vulgaris* L. ssp. *perennis* and beet, *Beta vulgaris* ssp. *vulgars* at Giza Agric. Exp. Sta., Giza Governorate.

Infested sugar beet leaves by the beet fly, *P. mixta* were collected biweekly intervals from December 13, 2004 to February 21, 2005 and shortened to 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-Simbalwein) in addition to a sample on April 18, 2005 at Bila. Samples were collected every two weeks from December 4, 2005 to March, 26 and April 9, 2006 at Shirbin and Belqas, as well as from December 8, 2005 to April 26, 2006 at Bila. Seven and nine samples were taken from December 26, 2004 and January 2, 2006 to March 27, 2005 and April 10, 2006 at Giza.

To determine the number and size of the collected samples from the infested chenopodious plants by the beet fly at Giza, weekly inspection was made. The taken samples 10, 7 and 4 were obtained from infested goosefoot, spinach and wild beet plants from November 21, 2004 and February 13 or 20, 2005 to April 24 and 17, 2005, respectively. Twelve and eleven samples were collected from infested goosefoot and spinach from November 14 and 21, 2005 to April 10, 2006. However, 5 and 3 samples were taken from infested chard and beet from November 21, 2005 to January 30, 2006. A sample was taken from infested wild beet on February 20, 2006.

Infested sugar beet leaves by the beet moth, *S. ocellatella* were detached and placed into plastic sacs at 7 and 10 days intervals from April 6, 2006 to May 25 and from May 15 to June 14, 2006 at Sakha and Shirbin, respectively.

On each collection date, infested leaves were visually examined and the cuttings of the mined areas was made. The infested leaf pieces by the beet fly or the infested leaves by the beet moth were placed into separated plastic containers (50 x15 cm) each provided with a sandy layer at its bottom. The beet fly or moth pupae were collected and placed into petri dishes, 10 cm diameter each. The dried leaves were kept in plastic sacs fitted with a rubber band. Daily inspection was made and the emerged adults of flies, moths and parasitoids were collected, identified and recorded. At the end of emergence season, puparia were dissected and healthy (emerged or failed emerged flies or moths) or parasitized pupae (emerged parasitoids from pores or failed emerged parasitoids) were counted.

Total rate of parasitism by *P. vindemmiae* (P) and *Opius nitidulator* (O) and rate of parasitism as well as efficacy of each species were calculated by using the following formulas:

$$\text{Total rate of parasitism} = \frac{\text{Total no. of emerged parasitoids(P+O)}}{\text{Total no. of emered flies and parasitoids}} \times 100$$

$$\text{Rate of each parasitoids (P)} = \frac{\text{Total parasitism no. of parasitoid (P)}}{\text{Total no of (P+O) parasitiods}} \times 100$$

$$\text{Efficacy of each parasitoid (P)} = \frac{\text{Rate of parasitism of parasitoid (P)}}{\text{Total rate of parasitism (P + O)}} \times 100$$

$$\text{Example: efficacy of } P.\ vindemmiae = \frac{15.5}{39.1} \times 100 = 40\% \text{(Table, 1).}$$

RESULTS AND DISCUSSION

P. vindemmiae is a new pupal parasitoid on *P. mixta* and first record on *S. ocellatella* in Egypt.

1. Efficacy of *P. vindemmiae* as biological control agent

Data in Table 1 show that, the overall means of parasitism by *P. vindemmiae* and *Opius nitidulator* (Nees) (Braconidae) were 15.5% and 23.6% (represented efficacy about 40% and 60%) as biological control agents against the beet fly. It was 4.3% by the pteromalid species on the beet moth pupae. Its efficacy was markedly fluctuated on parasitized pupae reared from sugar beet at different localities or these developed from chenopodious host plants at Giza. Parasitism by *P. vindemmiae* increased 1.7%, 26.4% and 30.4% than these resulted by *O. nitidulator* on parasitized sugar beet pupae in 2004- 2005 (at Sakha and El-Simbalwein) and in 2004-2006 at Giza (Table 1). On contrary, parasitism by the braconid species increased 24.4%, 15.3% and 5% than the pteromalid species at Bila, Belqas and Shirbin in 2005- 2006, respectively. At Giza, parasitic activity by *P. vindemmiae* increased 31.9% in (2004-2005), but decreased to 21.5% in (2005- 2006) than *O. nitidulator* on parasitized goosefoot pupae. It followed the same behavior and increased 6.2% versus 74.3% than the braconid species on parasitized pupae of spinach and chard in 2005- 2006. The general means of parasitism by the pteromalid and the braconid species were 14.5% and 17.9% represented efficacy about 45% and 55% as biological control agents against the beet fly on the sugar beet. Parasitism prevalence averaged 50.4%, 10.9% and 9% versus 20%, 17.8% and 17.4% at Governorates of Giza, Kafr El-Sheikh and Dakqhliya, respectively. *P. vindemmiae*, suffered high rates 16.8% and 12.6% opposed to 4.3% and 2.6% on pupae of the beet fly and moth at Sakha and Shirbin in 2004- 2005 (Tables 1 and 2).

Previous results indicate that, the parasitic activity by *P. vindemmiae* resulted in the highest rate of parasitism (50.4%) achieved efficacy about 72% as biological control agent against the beet fly reared from sugar beet at Giza. It ranged between

about 34%- 38% (at Dakqhliya and Kafr El-Sheikh) on the pupae reared the same host plant and about 39%, 37% and 4% were attained on pupae reared from spinach, goosefoot and chard at Giza, respectively. Parasitism by *P. vindemmiae*, *Spalangia gemina* Bouck (Pteromalidae) and *Euchalcidia caryobori* Hanna (Braconidae) resulted in about 9%, 6% and 5% on pupae of *C. capitata* under apricot, citrus and peach trees, respectively at Giza, Egypt (Sarhan, 1981).

2. Incidence of parasitism on pupae of

2.1. The beet moth, *S. ocellatella*

Parasitic activity by *P. vindemmiae* appeared in a rate of 3.8%, but lowered to 1% in late April at Sakha in 2004- 2005 (Table 2). Rate of 3.5% was recorded on early May and reached 2 fold at the end of the month. A rate of 14.3% was attained by mid June at Shirbin (Table 2).

2. 2. The beet leafminer, P. mixta

2. 2.1. Reared from sugar beet at different localities

In 2004- 2005 season, parasitic activity by *O. nitidulator* appeared with a rate of 38.5% on mid December and drastically lowered to 3.4% after three months (Table 3). Then, parasitic activity by *P. vindemmiae* started with a rate of 10.3% and reached 60.2% on late April. Parasitism by the braconid species ranged between 6.7%- 9.3% during late March- mid April, but the pteromalid species appeared with a higher rate of 87.9% on early May at El-Simbalwein. A rate of 6.1% was recorded by *O. nitidulator* by mid April at Bila.

In 2005- 2006 season, parasitic activity of *P. vindemmiae* showed 6.4 % and 4% parasitism versus 14.4% and 14.7% by the braconid species on early December at Shirbin and Bila, respectively (Table 4). Parasitism declined to less than 1% during January, but a rate of 72.9% was recorded on mid March at Shirbin. The pteromalid species appeared in a rate of 45.4% versus 37.7% resulted by the braconid species on late March at Belqas (Table 4).

2- 2- 2 Reared from different chenopodious plants at Giza

Data in Tables 5 and 6 indicate that parasitism by *P. vindemmiae* was observed on the pupae reared from sugar beet, goosefoot (in both seasons) as well as spinach and chard in 2005- 2006. Whereas, parasitic activity by *O. nitidulator* was recorded from *P. mixta* pupae reared from the different growing chenopodious plants in both seasons.

In 2004- 2005, parasitic activity by *O. nitidulator* began with 42.1% and 64.3% on the third week of November and late December and reached 81.6% and 83.3% on

early March, but disappeared and declined to 7.1% after a week, respectively (Table 5). Then, *P. vindemmiae* appeared in rates of 64% and 64.3% which increased gradually to reach 82.5% and 80.7% by late April and March.

In 2005- 2006, parasitic activities by the pteromalid species parasitized pupae reared from chard and goosefoot started in rates of 3.3%, 2.0% on the third week of November and reach 5.7% , 43.8% after 2 and 4 weeks, respectively (Table 6). The highest rates of 69.8% and 91.4% were attained on the third week of March and early April on parasitized pupae reared from sugar beet and goosefoot, respectively. Parasitic activity on parasitized pupae reared from spinach began in a rate of 14.3% on early December, but lowered to 10.5% after two weeks (Table 6). Rates of 55.1%- 64.9% were recorded on the third week of March and early April, respectively.

In general, parasitic activities by *P. vindemmiae* resulted in overall means 3.1% and 47.5% versus 27.8% and 11.4% by *O. nitidulator* in the first and the second cyclic activity periods. In the first activity period, incidence of parasitism by the pteromalid species appeared in mean of 2.5% on the third week of November which increased gradually to reach 25.7% after a month, but declined to 0.2% in late January opposed to 59.2%, 45.7% and 11.5% by the braconid species on the same dates., Fig.(1). However, in the second one *P. vindemmiae* began in a the highest rate of 36.3% on mid March and increased progressively to reach the maximum 87.9% in early May versus 2.4% and 0.0% by the *O. nitidulator*, respectively. On the other hand, the free activity by the uncompetitive braconid species appeared a week earlier than the pteromalid species and continued until late April with an overall means 18.6% and 45.6% in the first and the second activity cyclic periods, respectively (Fig. 2). Interspecific competition between the two parasitoid species suffered an increase about 36% parasitism by *P. vindemmiae* than the other species during the last cyclic activity period. Such increase about 34% was obtained by the uncompetitive braconid species (free activity) when compared with the resulted in the interspecific competition of the same species. Increasing parasitism by *P. vindemmiae* probably replaced by *O. nitidulator* or acts as hyperparasitoid on the parasitized pupae by the other species. In multiparasitized tephritid fly pupae, *P. vindemmiae* consistently dominates the interspecific competition and larvae of the parasitoid *Dirhinus giffardii* experienced the greatest mortality. *P. videmmiae* and *Fopius arisanus* (Sonan) did not show a preference for non parasitized over parasitized tephritid host (Wang and Messing 2004a and 2004b). Intraspecific variations in *P. vindemmiae* parasitism was found on pupuae reared from different chenopodios host plants at Giza. The descending means 50.4%, 20.6%, 17% and 3.5% were recorded on parasitized pupae reared from sugar beet, goosefoot, spinach and chard at Giza, respectively. Larval

feeding may be resulted pupae varied in size which may be affected on the female parasitoids behavior. In generalist parasitoids such as *P. vindemmiae*, the parasitoid is able to discriminate parasitized pupae from unparasitized one of many cycolorrhaphous dipteran species differing greatly in size and preferred small one, *Drosiphila melanogaster*, than the larger *Ceratitis capitaat* (Tephritidae), *Calliphora* sp. (Calliphoridae) and *Delia radicum* (Anthomyiidae) (Ruede and Axtell, 1985; Wang and Messing, 2004b and Goubault *et al*, 2004a).

3- Emergence of *P. vindemmiae* wasps

Total no. of 47 and 1892 *P. vindemmiae* were emerged from 44 and 1879 parasitized pupae of *S. ocellatella* and *P. mixta*, respectively. Wasps emerged from parasitized pupae of the beet moth on late April and continued until the third week of June, but resumed its emergence on early October at Sakha in 2004- 2005 (Table 2). An individual was emerged on early July at Shirbin.

In 2004- 2005, wasps emerged from parasitized pupae of *P. mixta* on the first week of July and continued until the second the third weeks of July and mid September from parasitized pupae reared from sugar beet at El-Simbalwein, Giza and Sakha, except few numbers were emerged on late May at El-Simbalwein (Table 7). Parasitoids emerged from parasitized pupae reared from goosefoot during early- late July at Giza.

In 2005- 2006, wasps emerged in a few numbers on the third week of December, the first and the third weeks of January and continued until late January from parasitized pupae reared from chard, spinach and goosefoot at Giza, respectively (Table 7). It emerged in huge numbers on early and late June and continued until early July and mid August from spinach and goosefoot pupae. On parasitized sugar beet pupae, parasitoids emerged in a few numbers from mid January to the next week and mid March at Bila and Shirbin, but the majority emerged during the third weeks of April and May at Shirbin. Emergence started by mid April and May and continued until early May and the third week of June at Bila and Giza, respectively.

Generally, the emergence period prolonged from the third week of December to mid September and from late April to early October from parasitized pupae of the beet fly and moth, respectively. The majority of wasps represented about 51% and 49% of the total no. of emerged wasp were emerged during June and July from parasitized pupae of beet moth and fly. *P. vindemmiae* is a solitary parasitoid, only one individual can emerge per pupa of the. beet fly or moth. Rarely, two individuals were emerged from a parasitized pupae of the beet fly reared from sugar beet at Sakha in 2004- 2005 or at Giza and Shirbin in 2005- 2006. Whereas four wasps emerged from a pupa

of the beet moth reared from the same host plant at Sakha in the first season. Intraspecific variability in host discrimination between two *P. vindemmiae* populations originating from different geographical areas in France, one discriminated hosts externally, whereas the other discriminate internally. Its occurrence rate of double oviposition tended to be higher when all hosts were parasitized but this only occurred on large size *D. radicum* pupae, but never observed on the little sized *D. melanogaster* pupae (Goubault *et al*, 2004a and 2004b).

In conclusion, interspecific activities by *P. vindemmiae* and *O. nitidulator* resulted in overall means 15.5% and 23.6% in efficacies about 40% and 60% as biological control agents against the beet fly, respectively. Efficacy was markedly fluctuated among the parasitized sugar beet pupae at different localities or these reared from chenopodious host plants at Giza. *P. vindemmiae* was the abundant species, achieved about 85% and 53% at El-Simbalwein and Sakha in 2004- 2005 as well as about 73.% and 71% in 2004-2005 and 2005- 2006 at Giza as biological control agents against the beet leafminer on sugar beet, respectively. On the contrary, *O. nitidulator* was the dominant species represented about 98%, 87% and 58% in biological control of the beet fly at Bila, Belqas and Shirbin in 2005- 2006, respectively. At Giza, efficacy by the pteromalid species was about 69% in (2004- 2005) opposed to 27% in (2005- 2006) on goosefoot parasitized pupae. Activities by the pteromalid and the braconid species achieved about 56% and 96% as biological control agents against the beet fly on spinach and chard in 2005-2006. Parasitism by *O. nitidulator* prolonged from mid November to late April with two peaks of 73.7% and 89.6% on mid December and early April, respectively (Fig. 2). However, *P. vindemmiae* appeared in two cyclic periods (Fig. 1). Its parasitic activity delayed a week than *O. nitidulator* and continued until late January, but resumed its activity by mid march until early May resulted in overall means of 3.1% and 47.5% versus 27.8% and 11.4% by the braconid species in the first and the second cyclic activity periods. The prevalence values 18.6% and 45.6% were attained by free activity of *O. nitidulator* in the same periods Interspecific competition activities between the two parasitoid species and intraspecific activity by *O. nitidulator* resulted in an increase about 36% and 34% in *P. vindemmiae* and the uncompetitive *O. nitidulator* than these resulted by the competitive braconid species. Increasing parasitism by *P. vindemmiae* probably replaced by *O. nitidulator* or acts as hyperparasitoid on its parasitized pupae *P. vindemmiae* is a generalist pupal parasitoid resulted in overall means 4.3% and 15.5% on sugar beet moth and fly pupae. It did not previously recorded on lepidopterous pupae, it obligate to parasitized on the beet moth pupae as alternative host when the beet fly pupae were scarce at the end of sugar beet growing season. It is solitary

pupal parasitoid, rarely polyparasitizm was found. Wasps emerged at the third week of December to mid September and from late April to early October and about 51% and 49 % were emerged during July and June from parasitized beet fly and moth pupae (Tables 2 and 7) and graphically illustrated in (Fig. 3). In Brazil, the prevalence rates of parasitism by *P. vindemmiae* were 18.2% on (*Sarcodexia lambens* Walker, Sarcophagidae), about 13% on (*Megaselia scalaris* (Loew), Phoridae) and 12.5% on (*Cyrtoneurina pararescita* Couri, Muscidae) (Marchiori, *et al.*, 2003 & 2005 and Marchiori & Silva Filho, 2007).

P. vindemmiae seem to be increasing biological control against the beet fly by about 40%. It introduced into Hawaii and Costa Rica for control of *C. capitata* and to various localities in the New World against *Anastrepha* spp. (Purcell, 1998 and Ovruski, *et al.* 2000).

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Table 1. Means of parasitism by *Pachycrepoideus vindemmiae* and *Opius nitidulator* on pupae of *Pegomya mixta* reared from sugar beet at different localities and some chenopodious host plants at Giza during 2004- 2005 and 2005-2006 seasons.

Host plant	Locality	Season	Total no of					Overall mean	
			Alive pupae (emerged flies)	Parasitized pupae by:					
				O. nitidulator		*P. vindemmiae*			
				No.	%	No.	%	No.	%
B. vulgaris	Sakha Bila El-Simbalwein	2004-2005	1810	400	15.1	447	16.8	847	31.9
			154	10	6.1	0	0.0	10	6.1
			57	5	5.5	29	31.9	34	37.4
	Total		2021	415		476		891	
	General mean %				14.3		16.3		30.6
	Bila Shirbin Belqas	2005-2006	977	327	24.9	6	0.5	333	25.4
			1274	321	17.6	229	12.6	550	30.2
			1048	236	17.9	35	2.6	271	20.5
	Total		3299	884		270		1154	
	General mean %				19.8		6.1		25.9
	Giza	2004-2005	56	36	19.1	97	51.3	133	70.4
		2005-2006	211	144	20.2	358	50.2	502	70.4
		Total	267	180		455		635	
		Mean %			20.0		50.4		70.4
C. murale		2004-2005	53	98	26.8	215	58.7	313	85.5
		2005- 2006	913	576	33.9	211	12.4	787	46.3
		Total	966	674		426		1100	
		General mean %			32.6		20.6		53.2
S. oleracea		2004-2005	371	220	37.2	0	0	220	37.2
		2005- 2006	408	191	22.7	244	28.9	435	51.6
		Total	779	411		244		655	
		General mean %			28.7		17.0		45.7
B. vulgaris. ssp. *perennis*		2004-2005	12	59	83.1	0	0	59	83.1
		2005- 2006	8	9	52.9	0	0	9	52.9
		Total	20	68				68	
		General mean %			77.3				77.3
B. vulgaris var. *cicla*		2005-2006	43	179	77.8	8	3.5	187	81.3
B. vulgaris ssp. *vulgaris*		2005-2006	8	60	88.2	0	0	60	88.2
	Total		7403	2871		1879		4750	
Overall mean %					23.6		15.5		39.1

Table 2. Incidence of parasitism by *Pachycrepoideus vindemmiae* on pupae of *Scrobipalpa ocellatella* and distribution no. of emerged wasps during April- October at Sakha and Shirbin regions in 2004- 2005 season.

Locality	Date of collection		Total no. of collected pupae		Parasitism %	Distribution no. of emerged wasps during							Total
	Month	Day	Healthy (emerged moths)	Parasitized		Apr	May		June		July	Oct	
						4th	1st	4th	1st	3rd	1st	1st	
Sakha	April	6	2	0	0								0
		13	101	4	3.8	6	1						7
		20	18	0	0								0
		27	103	1	1.0			1					1
	May	4	50	0	0								0
		11	165	6	3.5			1	5				6
		18	285	15	5.0				2			13	15
		25	226	17	7.0				11	6			17
	Total		950	43		6	1	2	18	6	0	13	46
	Mean %				4.3								
Shirbin	May	15	5	0	0								0
		25	26	0	0								0
	June	4	1	0	0								0
		14	6	1	14.3						1		1
	Total		38	1							1		1
	Mean %				2.6								0
Overall mean %					4.3								0
Total						6	1	2	18	6	1	13	47
%						12.8	6.4		51.1		2.0	27.7	

Table 3. Incidence of parasitism by *Pachycrepoideus vindemmiae* and *Opius nitidulator* on pupae of *Pegomya mixta* reared from sugar beet at Sakha, Bila and El-Simbalwein during December- May in 2004- 2005 season.

Region	Date of collection		Total no. of emerged					Total parasitism %
				Parasitoids				
	Month	Day	Flies	*O. nitidulator*		*P. vindemmiae*		
				No.	%	No.	%	
Sakha	Dec	13	8	5	38.5	0	0	38.5
		27	5	1	16.7	0	0	16.7
	Jan	10	19	4	17.4	0	0	17.4
		24	69	21	23.3	0	0	23.3
	Feb	7	248	25	9.2	0	0	9.2
		21	152	31	16.9	0	0	16.9
	Mar	7	117	24	17.0	0	0	17.0
		14	410	16	3.4	49	10.3	13.7
		21	134	39	19.6	26	13.1	32.7
		28	230	105	25.1	83	19.9	45.0
	Apr	4	274	59	12.6	136	29.0	41.6
		11	114	32	15.4	61	29.5	44.9
		18	19	8	14.0	30	52.7	66.7
		25	11	30	29.1	62	60.2	89.3
Bila	Apr	18	154	10	6.1	0	0	6.1
El-Simbalwein	Mar	26	14	1	6.7	0	0	6.7
	Apr	17	39	4	9.3	0	0	9.3
	May	3	4	0	0	29	87.9	87.9

Table 4. Incidence of parasitism by *Pachycrepoideus vindemmiae* and *Opius nitidulator* on pupae of *Pegomya mixta* reared from sugar beet at Bila, Shirbin and Belqas during December- April in 2005- 2006 season.

Region	Date of collection		Total no. of emerged					Total parasitism %
	Month	Day	Flies	Parasitoids				
				O. nitidulator		*P. vindemmiae*		
				No.	%	No.	%	
Bila	Dec	8	122	22	14.7	6	4.0	18.7
		22	161	9	5.3	0	0	5.3
	Jan	5	152	7	4.4	0	0	4.4
		19	156	28	15.2	0	0	15.2
	Feb	2	137	25	15.4	0	0	15.4
		16	81	49	37.7	0	0	37.7
	Mar	1	37	38	50.7	0	0	50.7
		15	64	41	39.0	0	0	39.0
		29	38	69	64.5	0	0	64.5
	Apr	12	27	37	57.8	0	0	57.8
		26	2	2	50.0	0	0	50.0
Shirbin	Dec	4	137	25	14.4	11	6.4	20.8
		18	127	49	27.8	0	0	27.8
	Jan	1	106	30	21.9	1	0. 7	22.6
		15	241	7	2.8	0	0	2.8
		29	401	52	11.5	1	0.2	11.7
	Feb	12	33	40	54.8	0	0	54.8
		26	136	88	39.3	0	0	39.3
	Mar	12	78	2	0.7	216	72.9	73.6
		26	15	28	65.1	0	0	65.1
Belqas	Dec	4	90	7	7.2	0	0	7.2
		18	34	14	29.2	0	0	29.2
	Jan	1	88	9	9.3	0	0	9.3
		15	178	21	10.6	0	0	10.6
		29	297	38	11.3	0	0	11.3
	Feb	12	188	14	6.9	0	0	6.9
		26	52	57	52.3	0	0	52.3
	Mar	12	9	9	50.0	0	0	50.0
		26	13	29	37.7	35	45.4	83.1
	Apr	9	99	38	27.7	0	0	27.7

Table 5. Incidence of parasitism by *Pachycrepoideus vindemmiae* and *Opius nitidulator* on pupae of *Pegomya mixta* reared from different chenopodious host plants during December- April at Giza in 2004- 2005 season.

Host plant	Date of collection		Total no. of emerged adults:					Total parasitism %
			Flies	Parasitoids				
				O. nitidulator		*P. vindemmiae*		
	Month	Day		No.	%	No.	%	
Sugar beet, *Beta vulgaris* L.	Dec	26	5	9	64.3	0	0	64.3
	Jan	9	7	6	46.2	0	0	46.2
		23	15	0	0.0	0	0	0.0
	Mar	6	3	15	83.3	0	0	83.3
		13	8	2	7.1	18	64.3	71.4
		20	6	0	0.0	12	66.7	66.7
		27	12	4	4.8	67	80.7	85.5
Goosefoot, *Chenopodium murale* L.	Nov	21	11	8	42.1	0	0	42.1
	Dec	26	1	6	85.7	0	0	85.7
	Jan	9	1	4	80.0	0	0	80.0
	Feb	13	8	5	38.5	0	0	38.5
	Mar	6	7	31	81.6	0	0	81.6
		13	9	0	0.0	16	64.0	64.0
		20	11	26	28.9	53	58.9	87.8
	Apr	10	0	0	0.0	38	100	100
		17	5	11	12.1	75	82.4	94.5
		24	0	7	17.5	33	82.5	100
Spinach, *Spinacia oleracea* L.	Feb	13	69	13	15.9			15.9
	Mar	6	24	62	72.1	0	0	72.1
		13	35	24	40.7	0	0	40.7
		20	29	39	57.3	0	0	57.3
	Apr	3	85	21	19.8	0	0	19.8
		10	122	56	31.5	0	0	31.5
		17	7	5	41.7	0	0	41.7
Wild beet, *Beta vulgaris* L. ssp. *perennis*	Feb	20	1	0	0.0	0	0	0.0
	Mar	6	0	1	100	0	0	100
	Apr	10	6	41	83.8	0	0	87.2
		17	5	17	83.3	0	0	77.3

Table 6. Incidence of parasitism by *Pachycrepoideus* vindmmiae and Opius nitidulator on pupae of Pegomya mixta reared from different chenopodious host plants during December- April at Giza in 2005- 2006 season.

Host plant	Date of collection		Total no. of emerged adults:					Total parasitism %
			Flies	Parasitoids				
	Month	Day		*O. nitidulator*		*P. vindemmiae*		
				No.	%	No.	%	
Sugar beet, *Beta vulgaris* L.	Jan	2	0	6	100	0	0	100
		16	6	16	72.7	0	0	72.7
		30	3	4	57.1	0	0	57.1
	Feb	13	21	21	50.0	0	0	50.0
		27	8	14	63.6	0	0	63.6
	Mar	6	25	37	59.7	0	0	59.7
		20	136	19	3.7	358	69.8	73.5
	Apr	3	11	20	64.5	0	0	64.5
		10	1	7	87.5	0	0	87.5
Goosefoot, *Chenopodium murale* L.	Nov	14	2	9	81.8	0	0	81.8
		21	84	67	43.5	3	2.0	45.5
	Dec	12	11	13	54.2	0	0	54.2
		19	7	2	12.5	7	43.8	56.3
		26	1	0	0	0	0	0
	Jan	30	0	8	100	0	0	100
	Feb	13	148	67	31.2	0	0	31.2
		20	352	150	29.9	0	0	29.9
	Mar	6	176	21	10.7	0	0	10.7
		20	91	39	30.0	0	0	30.0
	Apr	3	31	191	86.0	0	0	86.0
		10	10	9	4.1	201	91.4	95.5
Spinach, *Spinacia oleracea* L.	Nov	21	5	0	0	0	0	0.0
	Dec	5	6	0	0	1	14.3	14.3
		19	3	14	73.7	2	10.5	84.2
		26	22	0	0	0	0	0.0
	Jan	16	21	4	16.0	0	0	16.0
		30	1	1	50.0	0	0	50.0
	Feb	20	35	16	31.4	0	0	31.4
	Mar	6	130	6	4.4	0	0	4.4
		20	56	15	9.5	87	55.1	64.6
	Apr	3	53	30	12.7	154	64.9	77.6
		10	76	105	58.0	0	0	58.0
Chard, *Beta vulgaris* var. *cicla* L.	Nov	21	22	97	78.8	4	3.3	82.1
	Dec	5	12	54	77.2	4	5.7	82.9
		19	4	21	91.3	0	0	84.0
	Jan	2	4	7	63.6	0	0	63.6
		30	1	0	0	0	0	0.0
Beet, *Beta vulgaris* ssp. *vulgars*	Nov	21	6	28	86.4	0	0	82.4
	Dec	12	2	31	93.9	0	0	93.9
	Jan	30	0	1	100	0	0	100
Wild beet, *Beta vulgaris* L. ssp. *perennis*	Feb	20	8	9	52.9	0	0	52.9

Table 7 . Distribution no. of *Pachycrepoideus* vindemmiae wasps emerged from parasitized pupae of Pegomya mixta pupae reared from sugar beet at Sakha (SK), El-Simbalwein (SN), Bila (BI), Shirbin (SH) and Bilqas (BL) and different chenopodious plants at Giza during December- September in 2004- 2005 and 2005- 2006.

Emergence weeks		No. of emerged wasps from parasitized pupae reared from:											%
		Sugar beet							Goosefoot		Spinach	Chard	
Month	Week	SK	SN	BI	SH	BL	Giza						
		2004- 2005		2005- 2006			2004 2005	2005 2006	2004 2005	2005 2006	2005-2006	2005-2006	
Dec	3 rd			0	0	0				0	0	1	2.0
	4 th			0	0	0				0	0	3	
Jan	1 st			0	0	0				0	2	0	
	2 nd			1	8	0				0	0	0	
	3 rd			5	3	0				1	0	0	
	4 th				0	0				6	1	4	
Feb	2 nd				1	0							
Mar	2 nd				1	0							
Apr	1 st				0	0							3.2
	2 nd				0	11							
	3 rd				23	15							
	4 th				4	7							
May	1 st				63	2							16.5
	2 nd				85			22					
	3 rd				45			37					
	4 th		9					50					
Jun	1 st		0					51			51		29.0
	2 nd		0					183			153		
	3 rd		0					22			14		
	4 th		0							54	20		
Jul	1 st	78	8				5		72	55	3		48.7
	2 nd	218	12				3		63	24			
	3 rd	126					89		75	62			
	4 th	23							5	1			
Aug	1 st	2								5			0.6
	2 nd	1								3			
Sep	2 nd	1											
Total		449	29	6	233	35	97	365	215	211	244	8	

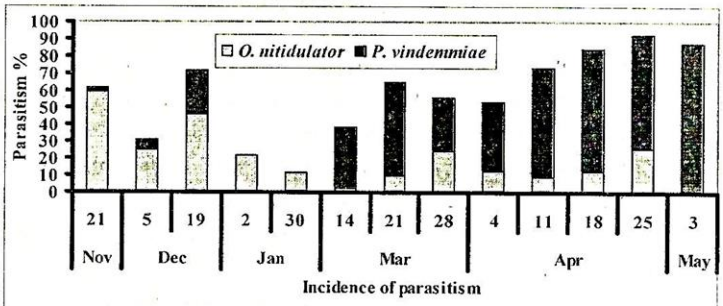

Fig. 1. Overall means of parastism resulted by the competitive parasitoids *Pachycrepoideus vindemmiae* and *Opius nitidulator* during November- January and March- May cyclic activity periods.

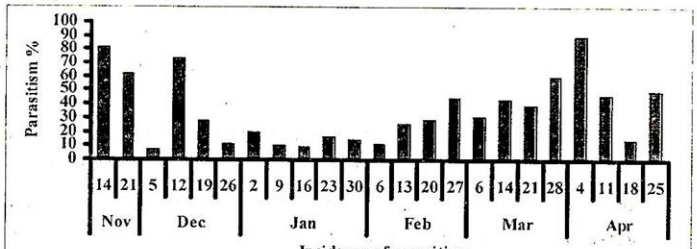

Fig.2. Overall means of parasitism resulted by uncompetitve *Opius nitidulator* during November- April.

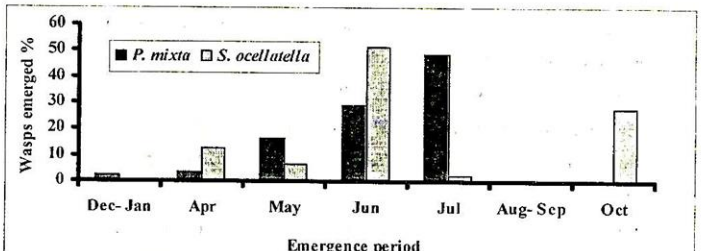

Fig.3. Distribution percenages of emerged *P. vindemmiae* from parasitised puparia of *P. mixta* and *S. ocellatella* during December- October.

REFERENCES

1. Goubault, M., J. Fourrier, L. Krespi, D. Poinsot and A. M. Cortesero. 2004. a. Selection strategies of parasitized hosts in a generalist parasitoid depend on patch quality but also on host size. J. Insect. Beh., 17 (1): 99- 113.
2. Goubault, M., L. Krespi, G. Boivin, D. Poinsot, J. Nenon and A. M. Cortesero. 2004b. Intraspecific variations in host discrimination behavior in the pupal parasitoid *Pachycrepoideus vindemmiae* Rondani (Hymenoptera: Pteromalidae). Environ. Entomol., 33 (2): 362- 369.
3. Hanson, P. E. and I. D. Gauld. 1995. The Hymenoptera of Costa Rica. Oxford : Oxford University: 893 pp.
4. Marchiori, C.H., L.A. Pereira, O. M. S. Filho and L. C. S. Ribeiro. 2002. *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera: Pteromalidae) as parasitoid of Diptera, in Brazil. Arq. Bras. Med.Vet.Zootec.,54 (6) :665-667.
5. Marchiori, C. H., L. A. Pereira and O. M. Silva Filho. 2003. First report on *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera: Pteromalidae) parasitizing pupae of Sarcodexia lambens Wiedemann (Diptera: Sarcophagidae) in human feces in Brazil. Cienc. Rural, 33 (1): 173- 175. (English abstract)
6. Marchiori, C. H., O. M. Silva Filho, and F. L. Barbaresco. 2005. *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera: Pteromalidae) as a parasitoid of *Megaselia scalaris* (Loew) (Diptera: Phoridae) in Brazil. Arq. Inst. Biol. Sâo Paulo, 72, supl. 2: 1- 64 pp. (English abstract)
7. Marchiori, C. H. and O. M. Silva Filho. 2007. New host for the parasitoid *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera: Pteromalidae) in Brazil. Arq. Bras. Med. Zootec., 59 (1):271- 272.
8. Ovruski, S., M. Aluja, J. Sivinski, R. Wharton. 2000. Hymenopteran parasitoids on fruit-infesting Tephritidae (Diptera) in Latin America and the southern United States: Diversity, distribution, taxonomic status and their use in fruit fly biological control. Int. Pest Man. Rev., 5 :81-107
9. Purcell, M. F. 1998. Contribution of biological control to integrated pest management of tephritid fruit flies in the tropics and subtropics Int. Pest Man. Rev., 3:63-83
10. Rueda, L.M. and R.C. Axtell. 1985. Guide to common species of pupal parasites (Hymenoptera: Pteromalidae) of the house fly and other muscoid flies associated with poultry and livestock manure. North Carolina Agric. Res. Ser Tech. Bull., 278. 88p.

11. Sarhan, A. A. A., 1981. A study of the natural enemies of the Mediterranean fruit fly, Ceratitis capitata (Weid.) (Diptera: Tephritidae= Trypetitdae). Ph. D. Thesis, Fac. of Agric., Cairo Univ.: 179pp.
12. Wang, X.G. and R. H. Messing. 2004. a. Two different life- history strategies determine the competitive outcome between *Dirhinus giffardii* (Chalcididae) and *Pachycrepoideus vindemmiae* (Pteromalidae), ectoparasitoids of cyclorrhaphous Diptera. Bull. Entomol. Res., 94 (5): 473- 80.
13. Wang, X. G. and R. H. Messing. 2004b. The ectoparasitic pupal parasitoid, *Pachycrepoideus vindemmiae* (Hymenoptera: Pteromalidae), attacks other primary tephritid fruit fly parasitoids: host expansion and potential non-target impact . Bio. Con., 31:227-236.

تسجيل جديد للطفيل ***Pachycrepoideus vindemmiae*** **(Rondani)** على عذارى ذبابة البنجر ***Pegomya mixta*** **Villeneuve** وفراشة البنجر ***Scrobipalpa ocellatella*** **(Boyd)**

سمير عوض السروى

معهد بحوث وقاية النباتات – مركز البحوث الزراعية– الدقى – جيزة– مصر.

سجل النوع *Pachycrepoideus vindemmiae* من عائلة Pteromalidae ورتبة غشائية الأجنحة كطفيل جديد عل عذارى ذبابة البنجر *Pegomya mixta* في الجيزة ، بيلا ، السنبلاوين وبلقاس ومع عذارى فراشة البنجر *Scrobipalpa ocellatella* في سخا وشربين. ويتطفل هذا الطفيلي فرديا على العذارى ونادرا ما يكون عديد التطفل. بلغت متوسطات التطفل إلى ١٦،٧% و١٢،٦% على عذارى (ذبابة البنجر) في مقابل ٤،٣% و٢،٦% على عذارى (فراشة البنجر) المرباة على بنجر السكر في سخا وشربين. وجد أن متوسطات التطفل الكلى ١٥،٥% و٢٣،٦% لكلا من *P. vindemmiae* و*O. nitidulator* من عائلة (Braconidae) وبفعالية حوالي ٤٠% و٦٠% في المكافحة الحيوية ضد ذبابة البنجر. ويزداد معدل التطفل بالطفيلي السائد *P. vindemmiae* ١،٧ % و٢٦،٤% في سخا والسنبلاوين في موسم (٢٠٠٤– ٢٠٠٥) وكذلك ٣٢،٢% و٣٠% في موسمي (٢٠٠٤– ٢٠٠٥ و٢٠٠٥– ٢٠٠٦) في الجيزة حيث تتوافق مع زيادة فعاليتة بحوالي ٥% ، ٧١% ، ٤٥% و٤٣% مقارنة بالطفيلي *O. nitidulator* ، بينما يحدث العكس فتقل نسبها إلى ٢٤،٤% ، ١٥،٣% و٥% وكذلك فعاليتة إلى حوالي ٩٦% ، ٧٥% و١٧% مقارنة بالطفيلي الشائع *O . nitidulator* في بيلا ، بلقاس وشربين في موسم ٢٠٠٥– ٢٠٠٦. في الجيزة، وجد تباين في نسب التطفل بالطفيلي *P. vindemmiae* على العذارى المرباة يرقاتها على بعض العوائل النباتية التابعة للعائلة السوسبية وبمتوسطات عامة ٥٠،٤% ، ٢٥،٢% ، ١٦،٧% و٣،٥% على تلك المرباة على بنجر السكر ، الزربيح ، السبانخ والسلق ، على التوالي. وعموما، يبدأ نشاط الطفيلي *O. nitidulator* في منتصف نوفمبر ويستمر حتى نهاية أبريل ، بينما ينشط الطفيلي *P. vindemmiae* في فترتين تبدأ الأولى في الأسبوع الثالث من نوفمبر وتنتهي في أواخر يناير أما الثانية فتمتد من منتصف مارس وحتى أوائل مايو. وتتباين متوسطات التطفل الناجمة عن التنافس بين الطفيليين فتراوحت مابين ٣،١% - ٤٧،٥% للطفيل *P. vindemmiae* في مقابل ٢٧،٨% و١١،٤% للنوع ألآخر خلال فترتي النشاط،، بنفس الترتيب. أما متوسطات التطفل الناجمة عن النشاط الحر للطفيل *O. nitidulator* بدون منافسة مع النوع الآخر فتراوحت مابين ١٨،٦% و٤٥،٦% خلال نفس فترتي التنافس للطفيليين . وتزداد نسبة التطفل حوالي ٣٦% و٣٤% للطفيل *P. vindemmiae* وكذلك الطفيلي *O. nitidulator* الفردي النشاط مقارنة بنسبة التطفل الناتجة عن *O. nitidulator* عند تنافسة مع الطفيلي ألآخر خلال فترة النشاط الثانية. إن زيادة التطفل بالطفيلي *P. vindemmiae* يحتمل أنة يحل محل الطفيل *O.*

nitidulator أوبسلوكية كطفيل ثانوي على العذارى المتطفل عليها. وهذا الطفيل طفيل عام عل العذارى وتبلغ متوسطاتة العامة ٤،٣% و١٦% على عذارى فراشة وذبابة البنجر ولم يسبق تسجيلة على عذارى لأنواع أخرى تابعة لرتبة حرشفية الأجنحة . يتطفل هذا الطفيل إجباريا على عذارى فراشة البنجر كعائل بديل عند شحة عذارى ذبابة البنجر في نهاية الموسم . تخرج زنا بيرة من عذارى ذبابة البنجر في الأسبوع الثالث من ديسمبر وتستمر حتى منتصف سبتمبر ومن عذارى فراشة البنجر خلال الفترة من أواخر أبريل وحتى أوائل أكتوبر كما سجلت أعلا نسب الخروج حوالي ٤٩% و ٥١% خلال شهري يوليو ويونيو ، عل التوالي. لحفظ وإدامة تلك الطفيليات ينبغي الابتعاد كلية عن استخدام المبيدات