J. Agric. Sci. Mansoura Univ., 34 (11): 10707 - 10713, 2009

THE ROLE OF THE ENDOPARASITOIDS *Opius pallipes* WESMEAL (HYMENOPTERA: BRACONIDAE) AND *Chrysocharis parksi* CRAWFORD (HYMENOPTERA: EULOPHIDAE) AS BIOAGENTS AGAINST THE SERPENTINE LEAFMINER, *Liriomyza trifolii* (BURGESS) IN TOMATO GREENHOUSES .

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ABSTRACT

Natural abundance of the endoparasitoids *Opius pallipes* Wesmeal and *Chrysocharis parksi* Crawford was studied in four tomato greenhouses at Sakha Agricultural Research Station. The greenhouses were planted with the tomato varieties, Hybrid G512 (Greenhouse 1), Hybrid TY 70/84 (Greenhouse 2), TY 70/70 (Greenhouse 3) and TY 71 (Greenhouse 4). The parasitoids showed high populations in April and May which kept the populations of the serpentine leafminer *Liriomyza trifolii* (Burgess) at low densities till the end of the season in all studied greenhouses.

O. pallipes recorded two peaks of abundance in all greenhouses, the highest peak recorded 7, 5, 7 and 7 individuals/50 infested leaflets in greenhouses 1, 2, 3 and 4 respectively, while the highest average numbers occurred in April in all greenhouses recording 4.5 ± 2.1, 3.1 ± 1.6, 4.5 ± 2.2 and 4.5 ± 2.1 individuals/50 infested leaflets in greenhouses 1, 2, 3 and 4 respectively**.** The percentages of parasitism reached 30.4 %, 38.5 % , 31.6 % and 30.4% in greenhouses 1, 2, 3 and 4 respectively.

C. parksi recorded two peaks of abundance in all greenhouses. The highest peak recorded 8, 7, 7 and 6 individuals/ 50infested leaflets in greenhouses 1,2,3 and 4 respectively, while the highest average numbers occurred in April in greenhouses 1and 4 recording 5.3 ± 2.1 and 5.2 ± 2.2 individuals/50infested leaflets respectively and in march in greenhouses 2and 3 recording 4.1 ± 1.4 and 4.0 ± 1.4 individuals/50 infested leaflets respectively**,** while percentages of parasitism reached 38.1 %, 36.8 %, 27.7 % and 38.1% in greenhouses 1,2,3 and 4 respectively.

INTRODUCTION

The most dominant endoparasitoid species against *Liriomyza trifolii* of the parasitoid complex are *O.pallipes* Wesmeal and *Chrysocharis parksi* (El-Khouly, 2003). McClanahan (1975) found that *Opius* spp.are the most abundant parasitoid species on tomatoes infested with *Liriomyza sativa,* and *L. trifolii.* Linden (1986) evaluated the combination of two European parasitoids; *O.pallipes*, *D. isaea* and two American ones; *C. parksi* and *Opoius dimidiatus* in biological control of the agromyzid leaf miners, *L. trifolii* and *L. bryonia* in Dutch greenhouses. He found that the tomato leaf miner *Liriomyza bryonia* occurred from June on words, but without a problem because of the high rate of parasitism of spontaneously occurring *Dacnusa sibirica* and *O. pallipes*, while *C. parksi* reached 45%. He also concluded that the exotic leaf miner parasitoids; *C. parksi* and *O. dimidiatus* survive in Dutch glasshouses and sometimes may have a considerable contribution to the biological control of *Liriomyza* spp., together with native parasitic species.

Shahein and El-Magraby (1993) concluded that the percentage of parasitism on *L.trifolii* was initially low and reached its maximum in mid-March. The percentage of parasitism by the braconid *Opius* sp. was 20.8% of the total parasitism. Ckman and Uygun (2003) studied the parasitoid complex of the agromyzid leaf miners in the Turkish fauna. They identified six parasitoids from Braconidae and 12 from Eulophidae. Among the parasitoids, *Opius* spp. and *Chrysocharis* spp. were the most dominant parasitoids. Johnson *et al.* (1980) observed that *C. parksi* is a very abundant parasitoid in California in outdoors and glasshouses, and has shown to influence the leaf miner populations in tomatoes significantly. Parrella (1984) sent a shipment of the parasitoid *C. parksi* from USA to Netherlands to control leaf miners. The reasons for him to use this parasite were a) Mass-rearing is possible b) It is a larval pupal parasitoid c) High fecundity d) Development time is short and e) it is compatible with low rates of insect growth regulation. Lyon (1986) reported that indigenous parasites especially *C. parksi* were introduced at the beginning of each culture to control *L.trifolii* in tomato greenhouses in combination with the eulophid *D. isaea*. Moreover , *C. parksi* was shown to be the predominant parasite on tomatoes in California when *L. sativa* was a predominant leaf miner species (Zehnder and Trumble, 1984). The parasitoid *C. parksi* played an important role as biocontrol agent on *L. trifolii* in tomato fields but showed less preference towards tomatoes in comparison with cowpea or kidney bean (El-Khouly, 2009).

From the available literature, few authors have studied the role of the parasitoids, *C. parksi* and *O. pallipes* as biocontrol agents against *L. trifolii* in tomato fields in the Egyptian fauna**,** but rarely in tomato greenhouses. Therefore, the present investigation was undertaken to study the role of the endoparasitoids; *C. parksi* and *O. pallipes* in tomato greenhouses.

MATERIALS AND METHODS

The present study was carried out at Sakha Agricultural Research Station, Kafr El-Sheikh governorate from March to June 2009. Four.The greenhouses 1, 2, 3 and 4 (500 m^2 each) were planted with 30 days tomato nursling old. The greenhouses 1, 2, 3 and 4 were planted with tomato cultivars, Hybrid G512, Hybrid TY70/84, Hybrid TY70/70 and TY71, respectively .Normal cultural practices were followed inside the greenhouses, but without any pesticides. Fifty tomato leaflets infested with *L. trifolii* were taken from each greenhouse seven days after planting till harvest. Samples were kept in plastic bags and transferred to be examined in the laboratory. The collected living larvae of *L. trifolii* of each sample were kept under laboratory conditions in Petri dishes till the emergence of the pest or its parasitoids, *O. pallipes* or *C. parksi*. Filter papers used in Petri dishes were remoistened when necessary to avoid drying. The number of parasitoids were counted and recorded.

RESULTS

Data illustrated in Fig (1) show the numbers of the endoparasitoids *O. pallipes*, and *C. parksi* in four tomato greenhouses .

In greenhouse (1), the parasitoid *O. pallipes* recorded two peaks of abundance (7 and 6 individuals/50 infested leaflets) on 20th of April and 25th

of May, respectively. On the other hand, the parasitoid *C. parksi* recorded two peaks of abundance (8 and 8 individuals/50 infested leaflets) on 13th of April and 25th of May, respectively.

In greenhouse (2), the parasitoid *O. pallipes* recorded two peaks of abundance (5 and 5 individuals/50infested leaflets) on 13th of April and 1st of June respectively. The parasitoid *C. parksi* recorded two peaks of abundance (5and 7 individuals/50infested leaflets) on 30th of March and 13th of April, respectively.

In greenhouse (3), the parasitoid *O. pallipes* recorded two peaks of abundance (7 and 6 individuals/50infested leaflets) on 13th of April and 18th of May, respectively. On the other hand, the parasitoid *C. parksi* recorded two peaks of abundance (6 and 5 individuals/50 infested leaflets) on 13th of April and 18th of May, respectively.

In greenhouse (4), the parasitoid *O. pallipes* recorded two peaks of abundance (7 and 6 individuals/50 infested leaflets) on 20th of April and 25thof May, respectively. On the other hand the parasitoid *C. parksi* recorded two peaks of abundance (8 and 8 individuals/50 infested leaflets) on 13th of April and 25th of May, respectively.

As shown in Table (1), the parasitoid *O. pallipes* showed its highest monthly average numbers in April in the four greenhouses recording 4.5 ± 2.1, 3.1 ± 1.6, 4.5 ± 2.2 and 4.5 ± 2.1 individuals/50 infested leaflets) in greenhouses 1, 2, 3 and 4, respectively. On the other hand the parasitoid *C. parksi* showed its highest monthly average numbers in April in greenhouses 1and 4, recording 5.3 ± 2.1 and 5.2 ± 2.2 individuals/50 infested leaflets respectively and in March in greenhouses 2 and 3 recording 4.1 ± 1.4 and 4.0 ± 1.4 individuals/50 infested leaflets, respectively.

Data illustrated in Fig (2) show the percentages of parasitism by the endoparasitoids *O. pallipes* and *C. parksi* in four tomato greenhouses .

In greenhouse (1), the percentage of parasitism by the endoparasitoids *O. pallipes* ranged 0.0 – 30.4 % and recorded its peak in 20th of April. On the other hand, the percentages of parasitism by the endoparasitoid *C. parksi* ranged 0.0 – 38.1 % and recorded its peak on 13th of April .

In greenhouse (2), the percentage of parasitism by the endoparasitoids *O. pallipes* ranged 0.0 – 38.5 % and recorded its peak on 1st of June. On the other hand, the percentages of parasitism by the endoparasitoid *C. parksi* ranged 0.0 – 36.8% and recorded its peak on 13th of April .

In greenhouse (3), the percentage of parasitism by the endoparasitoids *O. pallipes* ranged 0.0 – 31.6 % and recorded its peak on 6th of April. On the other hand, the percentages of parasitism by the endoparasitoid *C. parksi* ranged 0.0 – 27.7 % and recorded its peak on 30th of March .

Table (1): Monthly average numbers of the endoprasitoids *O. pallipes* and *C. parksi* in four tomato cultivars.

Month	Hybrid G 512		Hybrid TY 70/84		Hybrid TY 70/70		Hybrid TY 71	
	O. pallipes	*C. parksi*	*O. pallipes*	*C. parksi*	*O. pallipes*	*C. parksi*	*O. pallipes*	*C. parksi*
March	2.5 ± 0.7	3.5 ± 0.7	3.0 ± 1.4	4.1 ± 1.4	3.5 ± 2.1	4.0 ± 1.4	2.5 ± 0.7	3.5 ± 0.7
April	4.5 ± 2.1	5.3 ± 2.1	3.1 ± 1.6	3.5 ± 2.6	4.5 ± 2.2	3.8 ± 1.7	4.5 ± 2.1	5.2 ± 2.2
May	2.2 ± 2.6	2.8 ± 3.6	1.0 ± 1.2	1.0 ± 1.4	2.5 ± 2.4	2.5 ± 1.9	2.2 ± 2.6	2.8 ± 3.6
June	1.3 ± 1.5	1.6 ± 1.2	2.0 ± 2.6	1.7 ± 2.1	--	0.3 ± 0.6	1.3 ± 1.5	1.7 ± 1.2
Mean ± S.D	2.6 ± 1.4	3.3 ± 1.5	2.3 ± 1.0	2.6 ± 1.5	3.5 ± 1.0	2.7 ± 1.7	2.6 ± 1.3	3.3 ± 1.5

Fig. (1): Natural abundance of the endoparasitoids *O. pallipes* and *C. parksi* in four tomato greenhouses .

Fig. (2): Percentage . of parasitism by the endoparasitoids *O. pallips* and *C. parksi* in four tomato greenhouses

In greenhouse (4), the percentage of parasitism by the endoparasitoids *O. pallipes* ranged 0.0 – 30.4% and recorded its peak on 20th of April. On the other hand the percentages of parasitism by the endoparasitoid, *C. parksi* ranged 0.0- 38.1% and recorded its peak on 13th of April .

DISCUSSION

The larval pupal parasitoids, *O. pallipes* and *C. parksi* recorded two peaks of abundance in all tomato greenhouses during the current study . In previous investigations by Awadalla (1998) , Awadalla *et al (* 2003), El-khouly(2003) and El-khouly (2009) both parasitoids recorded three peaks of abundance on the summer crops and tomatoes in the open fields . The two peaks observed in the current study may be resulting from the short term of the growing season . On the other hand, the low abundance of *O. pallipes* and *C. parksi* may be explained by the high competition of the ectoparasitoid *D. isaea* . Another possible explanation is that both *O. pallipes* and *C. parksi* females cannot discriminate between unparasitized hosts and those previously attacked (Linden, 1986). Data suggested by El-Khouly (2003) concluded that correlation values between either *O. pallipes* and *C. parksi* and their host (*L. trifolii*) on broad bean and cowpea as host plants were lower than those of the ectoparasitoid *D. isaea* on the same host plants . The endoparasitoids *O. pallipes* and *C. parksi* prefer the low density of their insect hosts.

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دور الطفيلين الداخليين اوبيس باليبس و كرايزوكاريس باركسى فى المكافحة الحيوية لحشرة نافقة أوراق الفول فى صوبات الطماطم.

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تمت دراسة كفاءة الطفيلين *Opius pallipes* و *Chrysocharis parksi* على حشرة نافقة أوراق الفول فى صوبات الطماطم بمحطة البحوث الزراعية بسخا وقد وجد أن تعداد كل من الطفيلين قد سجل ذروتين في أصناف الطماطم الأربعة التي استهدفتها الدراسة وذلك خلال الفترة بين ٢٣ مارس حتى ١٥ يونيو ٢٠٠٩ . وقد كانت المتوسطات الشهرية لأعداد الطفيل *O. pallipes* أعلى ما يمكن فى إبريل في كل من الأصناف Hybrid G512 , TY 70/84 ، TY 70/70 ، TY 70 .2± 4.5 , 4.5 ± 2.2 , 3.1 ± 1.6 , 4.5 ± 2.1 يرقه لكل ٥٠وريقة فى الأصناف ١ و ٢ و ٣ و ٤ على التوالى. أما النسب المئوية للتطفل فسجلت ٣٠,٤ و ٣٨,٥ و ٣١,٦ و ٣٠,٤ % كأعلى نسب للتطفل فى الأصناف الأربعة على التوالى.

كما كانت المتوسطات الشهرية لأعداد الطفيل *C. parksi* أعلى ما يمكن فى ابريل فى الصنفين الأول والرابع مسجلة 2.2 ± 5.2 , 2.1 ± 5.3 يرقه /٥٠ وريقه وفى مارس فى الصنفين الثانى والثالث مسجلة ا4.1±1.4 , 1.4 ±4.0 . أما النسب المئوية للتطفل فسجلت ٣٨,١ و ٣٦,٨ و ٢٧,٧ و ٣٨,٢ % كأعلى نسب للتطفل فى الأصناف الأربعة على التوالى.

قام بتحكيم البحث

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