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Research Article

The Efficiency of the Larval Pupal Endoparasitoids *Opius Pallipes* Wesmail (Hymenoptera: Braconidae) and *Chrysocharis Parksi* Crawford (Hymenoptera: Eulophidae) as Bioagents against the Serpentine Leafminer *L.Trifolii* (Burgess) (Dipteral: Agromyzidae) in Tomato Greenhouses

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Abstract: Natural abundance and biocontrol efficiency of the endoparasitoids *O. pallipes* and *C.parksi* was studied in four tomato greenhouses in Alzawia region. *O. pallipes* recorded two peaks of abundance in all greenhouses, the highest peak recorded (7, 5, 7 and 7 individuals/ 50infested 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/ 50infested leaflets) in greenhouses 1,2,3 and 4 respectively**,** while 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/ 50infested leaflets) respectively**,** while percentages of parasitism reached **(**38.1%, 36.8%, 27.7% and 38.1%) in greenhouses 1,2,3 and 4 respectively.The parasitoids showed high populations in April and May the study that kept the populations of the serpentine leaf miner *L.trifolii* at low densities till the end of the season in all studied greenhouses**.**

Keywords: *O. pallipes* - *C.parksi* - bio agents - greenhouses.

INTRODUCTION

With more than 19,000 described species worldwide, parasitic wasps in the family Braconidae are the second largest group of Hymenoptera next to its sister lineage, Ichneumonidae. Among them the members of subfamily oppiine such as *opius spp* which were an effective biocontrol agents against *liriomyza spp* in Canada and other European countries (Sharanowski *et al.*, 2014) Moreover The larval pupal endoparasitoid *O. pallipes* preferred the serpentine leaf miner *L. trifolii* than *L. bryonia* as an insect host both under laboratory conditions and in open fields and, it seems to be promising parasitoid against *L. trifolii* in open fields and greenhouses (El-Khouly, *et al.*, 2017).

The most dominant endpparasitoid species against *Liriomyza trifolii* of the parasitoid complex were *Opius pallipes* Wesmeal and *Chrysocharis parksi* **(**El-Khouly, 2003). McClanahan (1975) found that *Opius* spp.were the most abundant parasitoid species on tomatoes infested with *L.sativa*, and *L.trifolii*. Linden (1986) evaluated the combination of two European parasitoids *O.pallipes*, *D.isaea* and two American ones ;*C.parksi* and *O.dimidiatus* in biological control of the agromyzed leaf miners *L.trifolii* and *L.bryonia* in Dutch greenhouses and found that the occurrence of the tomato leaf miner *L.bryonia* from June: onwords was not a problem because of the high rate of parasitism of spontaneously occurring *D.sibirica* and *O.pallipes*, while *C.parksi* reached 45%. He also concluded that the

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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 e) It is compatible with low rates of IGRs. 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 parasitoid *C.parksi* and *O.pallipes* as biocontrol agents against *L.trifolii* in tomato fields**,** 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 in alzawia region from March to June 2017. Four tomato greenhouses (500 m^2 each) were planted with 30 days old tomato nurslings were sampled every week . 50 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* for 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. Normal practices were followed and chemical control was neglected. . Samples took place in all greenhouses one weak after nurslings were replanted and continued weekly until harvest.

RESULTS

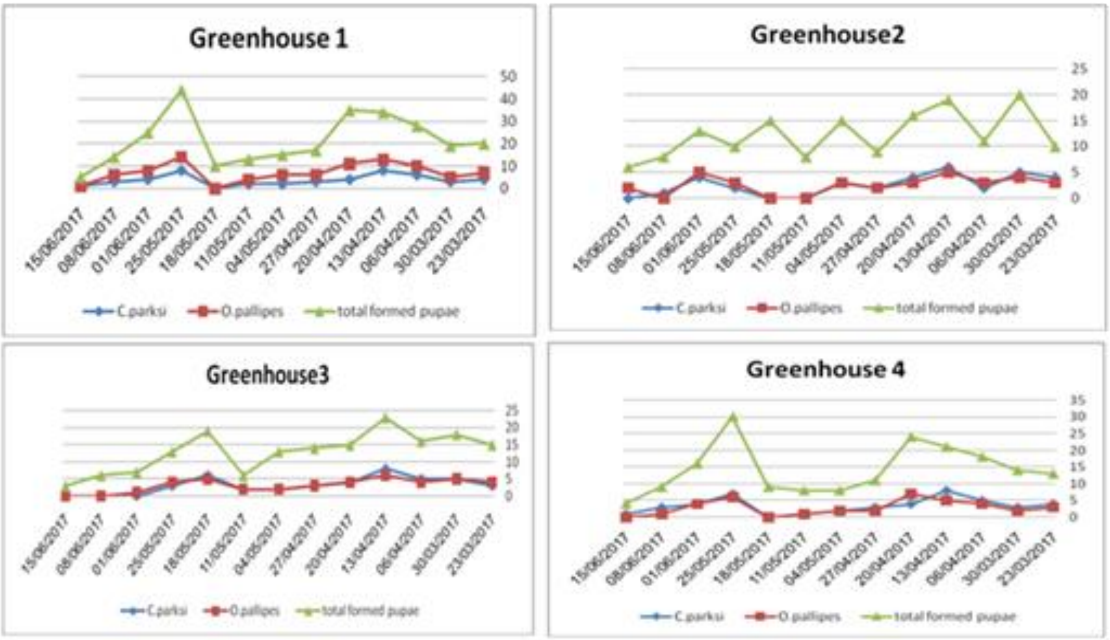
Data presented in fig (1)show the numbers of the endoparasitoids *O.pallipes*, and *C.parksi* in four tomato greenhouses .

In greenhouse (1) the parasitoid *O.pallipes* recorded two peaks of abundance (7 and 6 individuals/ 50infested leaflets) on in 20 th of April and 25 th of May, respectively. On the other hand the parasitoid *C.parksi* recorded two peaks of abundance (8and 8 individuals/ 50infested leaflets) on 13th of April and 25 th of May respectively.

In greenhouse (2), the parasitoid *O.pallipes* recorded two peaks of abundance (5 and 5 individuals/ 50infested leaflets) on 13 th 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 13 th 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 18thof May respectively. On the other hand the parasitoid *C.parksi* recorded two peaks of abundance (6and 5 individuals/ 50infested leaflets) on 13th of April and 18thof May respectively.

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



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

Table (1) Monthly average numbers of the endoprasitids *O.pallipes* and *C.parksi* in four tomato greenhouses

	Greenhouse (1)		Greenhouse (2)		Greenhouse (3)		Greenhouse (4)	
	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 U 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

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

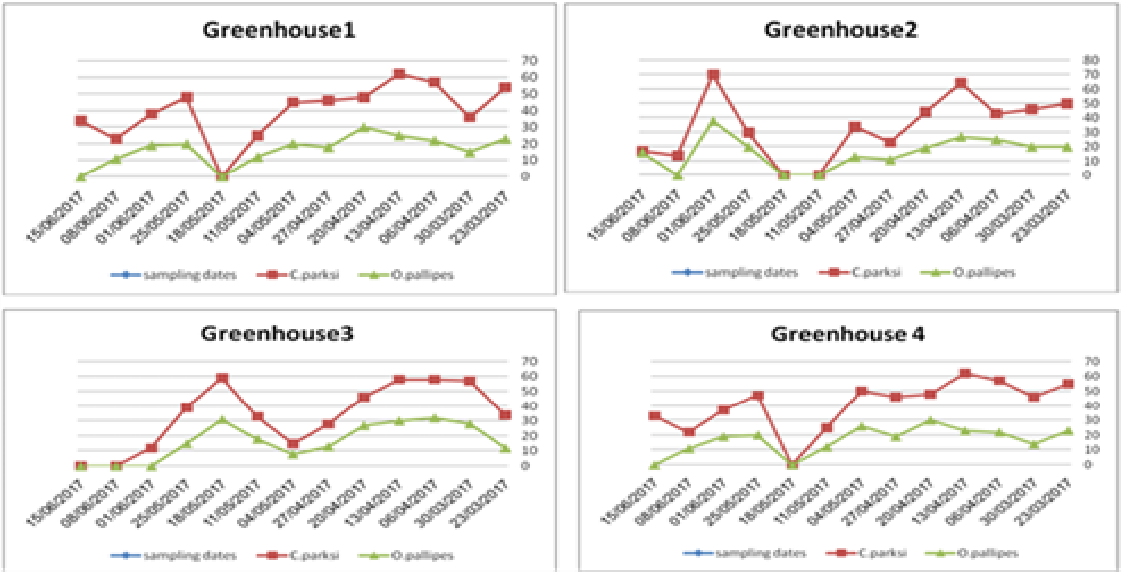
Data presented in fig (2) show the percentages of parasitism by the endoparasitoids *O.pallipes*, and *C.parksi* in four tomato greenhouses .

In greenhouse (1), the percentage of parasitism by the endoparasitoids *O.pallipes* ranged 0.0-30.4% and recorded its peak in 20 th 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 13 th 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 6st 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.

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.



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

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 this 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 *Diglyphus 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* preferring the low density of their insect host.

REFERENCES

1. Çıkman, E., & Uygun, N. (2003). The determination of leafminers (Diptera: Agromyzidae) and their parasitoids in cultivated and non-cultivated areas in Şanlıurfa province, southern Turkey. *Türkiye Entomoloji Dergisi*, *27*(4), 305-318.
2. Johnson, M. W., Oatman, E. R., & Wyman, J. A. (1980). Natural control ofLiriomyza sativae [Dip.: Agromyzidae] in pole tomatoes in southern California. *Entomophaga*, *25*(2), 193-198.
3. Linden, A. (1986). Ambition of exotic leaf miner parasites Chrysocharis parksi and Opius dimidiatus to the native Dutch parasite complex on tomato. *Med. Fac. Land bouww. RijKs Univ. Gent., 51/3a, 1009-1015.*
4. McClanhan, R. J. (1975). Notes on the vegetable leaf miner Liriomyza sativa (Diptera: Agromyzidae) in Ontario. In *Proc. Entomol. Soc. Ont* (Vol. 105, pp. 40-44).
5. El Khouly, A. R. (2003). *Studies on some natural enemies associated with the serpentine leaf miner Liriomyza trifolii (Burgess)* (Doctoral dissertation, M. Sc. Thesis, Fac., Agric., Mansoura Univ).
6. Elkhouly, A. R., Shafsha, H. A., Hireereeq, E. L., Albasha, M. O., & Elkesh, M. M. (2017). Insect host preference by the larval-pupal endoparasitoid Opius pallipes Wesmail (Hymenoptera: Braconidae) ecological and biological studies in Ojilate Region Libya. *J. Adv. Biol. Biotech*, *11*, 1-5.
7. Parrella, M. P., Jones, V. P., & Christie, G. D. (1987). Feasibility of parasites for biological control of Liriomyza trifolii (Diptera: Agromyzidae) on commercially grown chrysanthemum. *Environmental entomology*, *16*(3), 832-837.
8. Zehnder, G. W., & Trumble, J. T. (1984). Host selection of Liriomyza species (Diptera: Agromyzidae) and associated parasites in adjacent plantings of tomato and celery. *Environmental entomology*, *13*(2), 492-496.
9. Shahein, A., & El-Maghraby, M. M. A. (1993). Impact of the parasitoids of Liriomyza trifolii (Burgess) on broad beans. *Zeitschrift fuer angewandte Zoologie (Germany)*.
10. Sharanowski, B. J., Zhang, Y. M., & Wanigasekara, R. W. M. U. M. (2014). Annotated checklist of Braconidae (Hymenoptera) in the Canadian Prairies Ecozone. *Arthropods of the Canadian Grasslands*, *4*, 399-425.

11. El Khouly, A. R. (2009). *Efficiency of some hymenopterous parasitoids on serpentine leaf miner Liriomyza trifolii (Burgess)* (Doctoral dissertation, PhD. Thesis, Fac., Agric., Mansoura Univ).
12. Awadalla, S.S., Shanab, L.M., AbdEl-Kariem, A.I., & El- Khouly, A.R., (2003). Opius pallipes (Wesmeal) (Hymenoptera: Braconidae) as a larval pupal endoparasitoid on the serpentine leaf miner Liriomyza trifolii. First Egyptian and Syrian Conference. El. Minia University&Al.Baath University on Agriculture & Food in the Arab world, El. *Minia: 8-11 December.111-118* .
13. Awadalla, S.S. (1998). Relationship between the serpentine leaf miner Liriomyza trifolii (Burgess) and its parasitoids on broad bean in Mansoura region. *J. Agric. Sci. Mansoura Univ., 23(9):4019 – 4026.*