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Insect Host Preference by the Larval-pupal Endoparasitoid *Opius pallipes* Wesmail (Hymenoptera: Braconidae) Ecological and Biological Studies in Ojilate Region Libya

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Authors' contributions

This work was carried out in collaboration between all authors. Author ARE designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors EAAH and MME managed the analyses of the study. Author MOA managed the literature searches. All authors read and approved the final manuscript.

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Short Communication

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ABSTRACT

Insect host preference by the larval pupal endoparasitoid *Opius. pallipes* was studied in Ojilate region in western Libya using broad bean (*Vecia faba*) as a host plant and the two leafmininig species, the American serpentine leaf miner *Liriomyza trifolii* (Burgess) and the tomato leaf miner *Liriomyza bryonia* (Kaltenbach). Three peaks of abundance were recorded by *O. pallipes* on both

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insect hosts *L. bryonia* and *L. trifolii*. On brad bean a peak was exhibited with (81 individuals/ 100 infested leaflets) with *L. trifolii* whereas a peak of (31 individuals/ 100 infested leaflets) was exhibited with *L. bryonia*. The lowest count was observed with (33 individuals/ 100 infested leaflets) on *L. trifolii* and with (27 individuals/ 100 infested leaflets) on *L. bryonia*. Under laboratory conditions, insect host preference of the parasitoid *O. pallipes* was tested. The Results indicated that number of eggs and parasitized larvae per parasitoid female were significantly higher on *L. trifolii* than *L. bryonia* in the choice test with (9.2±3.9 eggs/female and 7.0±2.9 host larvae/female, on *L. trifolii* than *L. bryonia* respectively). On the other hand number of parasitized larvae per female was significantly higher in no choice test with (9.2±2.3 parasitized larva/female and 7.1±3.0 parasitized larva/female, on *L. trifolii* than *L. bryonia* respectively).

Keywords: O. pallipes; endoparasitoid; insect host preference.

1. INTRODUCTION

The parasitic-wasp family Braconidae forms one of the most impressive insect radiations we know. Almost 18,000 species have been described to date but recent estimates suggest that the true diversity may be in the range of 40,000 to 120,000 species [1], *Opius* spp. are the most abundant endoparasitoid species on tomatoes infested with *L. sativa,* while a predominance of *Diglyphus* spp. occurs in cropping systems where *L. trifolii* is the primary leaf miner species [2]. *L. bryonia* is often controlled continuously by the native parasites *Dacnusa. sibirica, O. pallipes* (Braconidae) and the eulophid *D. isaea* [3]. The most effective parasitoids recorded on *Liriomyza congesta* during two successive seasons were the braconid *Opius*. *sp*. and the eulophid *Diglyphus*. *sp*. In addition parasitism begins at with low rate and increase gradually reaching its maximum towards the end of the growing season mainly during March [4].

The largest number of adult parasitoids reared from foliage collected from lettuce plantings were *Opius* spp. in Arizona [5]. *Opius* spp accounted nearly 42% of the parasitoid complex reared from tomatoes foliage and some associated weeds in Florida [6]. *O. pallipes*, *Dacnusa sibirica* (Telenga) and *Diglyphus isaea* (Walker) were the most dominant parasitoid species in Russian tomatoes and cucumber greenhouses as an effective biological antagonists against *Liriomyza* leaf miners [7]. *O. pallipes* and *O. dimidiatus* established well and kept *L. trifolii* and *L. bryonia* at very low populations in Dutch greenhouses and reached in combination with *D. sibirica* 100% parasitism [1]. The endoparasitoid *Opius sp*. was the key parasitoid of *L. trifolii* pupae caused the highest percentage of parasitism during the two successive seasons in Mansoura region [8]. The percentage of parasitism by *O. pallipes* reached 29.6% and 55.0% on *L. trifolii* pupae on broad bean and cowpea, so it considered the most effective larval-pupal parasitoid. On the other hand, *O. pallipes* female could successfully put eggs on either the 2nd or the 3rd *L. trifolii* larval instars [9]. The eggs of *O. pallipes* are elongated and the larvae has a blunt heads with large red mandibles, their length is nearly 0.55 mm[10]. The parasitoids *D. sibirica* and *O. pallipes* were released in tomato crops in greenhouse after infestation with *L. huidobrensis* at ratio of 2 parasitoids/ 3 Agromyzids. *D. sibirica* caused 80%parositism and *O. pallipes* caused 20%of the pupal mortality and *D. isaea* which occurred spontaneously proved to be the most effective larval parasitoid and eliminated the pest in <2 months [11].

From the available literature a very few authors have studied the biological characters of *O. pallipes* [9,11,7,12,13,10,14]. Therefore, the present investigation was undertaken to study some biological characters of the parasitoid *O. pallipes* under Libyan conditions.

2. METHODS

2.1 Field Studies

The present study was carried out in Ojailat region in the winter growing season 2014. [broad bean (*Vecia faba*)], 200 infested leaves (100 with *L. bryonia* and 100 with *L. trifolii* larvae) were taken weekly . Samples were kept in plastic bags and transferred to the laboratory. The Number of living larvae of both species was counted. The samples were placed on filter paper in Petri dishes (12.0 X 1.5 cm) till the emergence of the pest or its endoparasitoid, *O. pallipes*. In both choice and no choice test treatments were under room conditions (temperature 22C and L.D 10:14) Filter papers which used in Petri dishes were remoistened when necessary to avoid

drying. The number of parasitoids were also counted and recorded. Normal practices were followed and chemical control was neglected. Samples took place as soon as the true newly vegetative growth was completely appeared in the experimental area and continued weekly until harvest [15].

2.2 Biological Studies: Influence of Insect Host Species on the Biology of the Endoparasitoid *O. pallipes*

2.2.1 No choice test

To study the influence of insect host species on some biological characters (number of eggs and parasitized larvae/female) of *O. pallipes*, a newly emerged pairs of the parasitoid were transferred to Petri dishes contained an irregular sections of broad bean leaflets (≈3 cm^2), each section contained a single *L. trifolii* or *L. bryonia* larva. Each dish contained 30 sections containing *L. trifolii* or *L. bryonia* larvae. Each treatment was replicated 20 times [7].

2.2.2 choice test

Fifteen irregular sections of broad bean leaflets (≈3 cm^2) contained *L. trifolii* larvae and another similar numbers contained *L. bryonia* larvae were kept in Petri dishes (12.0 by 1.5 cm) and a newly emerged pairs of *O. pallipes* were transferred to each dish (number of eggs and parasitized larvae/female) were counted and recorded. The treatment was replicated 20 times. Recognition of the parasitoid eggs or larvae was followed as described by [8]. Statistical analysis was carried out by using one way ANOVA.

3. RESULTS AND DISCUSSION

Data presented in Fig. 1 show the numbers *O. pallipes* on *L. bryonia* and *L. trifolii* larvae on broad bean as a host plant.

O. pallipes recorded three peaks of abundance on both *L. bryonia* and *L. trifolii* On brad bean. The highest one recorded (81 individuals/ 100 infested leaflets) on *L. trifolii* and (31 individuals/ 100 infested leaflets) on *L. bryonia*. While the lowest recorded (33 individuals/ 100 infested leaflets) on *L. trifolii* and (27 individuals/ 100 infested leaflets) on *L. bryonia*.

It could be concluded that, *O. pallipes* recorded low percentages of parasitism on *L. bryonia* larvae compared with *L. trifolii* during the growing season, a possible explanation is that *O. pallipes* preferred the serpentine leaf miner *L. trifolii* as an insect host. Previous study by [14] indicated that *O. pallipes* showed some preference towards broad bean as a winter host plant compared with some other host plants of its abundance. The presence of broad bean as a host plant may encouraged *O. pallipes* to be more abundant on *L. trifolii* than *L. bryonia*. The heavy infestation by *L. trifolii* on broad bean foliage may attracted high numbers of *O. pallipes* in comparison with its abundance on *L. bryonia*.

Data presented in above Fig. 2 show the average rates of parasitism by *O. pallipes* on *L. bryonia* and *L. trifolii* larvae on broad bean as a host plant. *O. pallipes* recorded the highest monthly average numbers on *L. trifolii* larvae during the growing season. On the other hand highest monthly average number of parasitism recorded

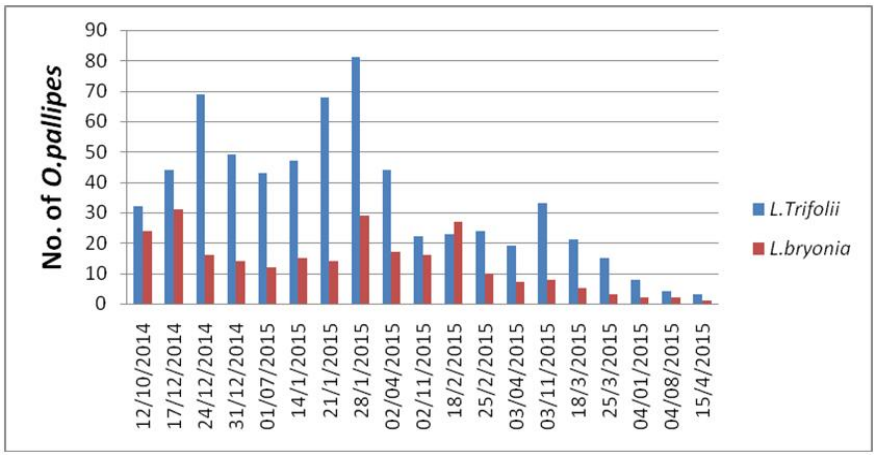

Fig. 1. Population abundance of the larval- pupal endoparasitoid *O. pallipes* on *L. bryonia* and *L. trifolii* larvae on brad bean as a host plant

Table 1. Effect of insect host on some biological characters of *O. pallipes*

Type of exposure	*L. trifolli*	*L. bryonia*	LSD 0.05 0.01
No choice test			
No. eggs / female	13.9±3.7 ^{ns}	10.3±7.0	3.59 4.81
No. parasitized larvae / female	9.2±2.3 *	7.1±3.0	1.72 2.30
Choice test			
No. eggs/female	9.2±3.9 **	5.3±1.9	1.99 2.66
No. parasitized larvae / female	7.0±2.9 **	4.0±1.1	1.42 1.90

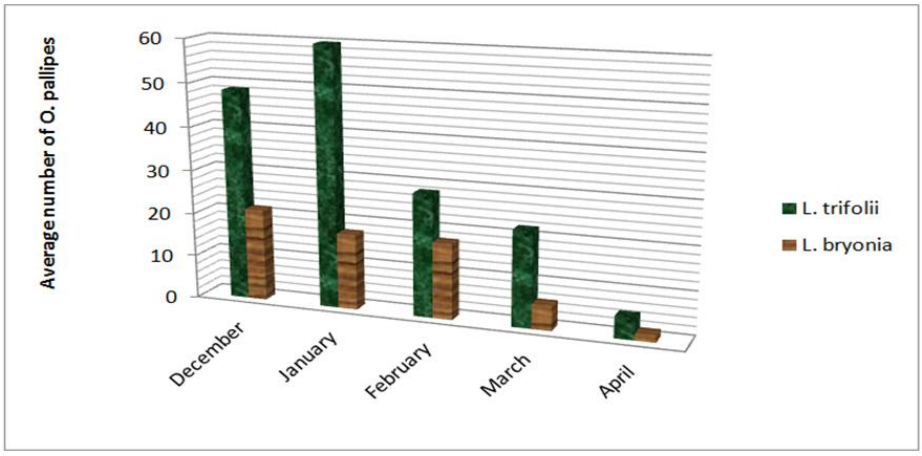

Fig. 2. The average monthly rates of parasitism by *O. pallipes* on *L. bryonia* and *L. trifolii* larvae on brad bean as a host plant all over the season

in January on *L. trifolii* (59.75 ± 17.91 individuals/ 100 infested leaflets) and in December on *L. bryonia* recording (21.25 ± 7.80 individuals/ 100 infested leaflets).

In the choice test, the number of eggs and the number of parasitized larvae per female were highly significant (P=0.1%) in *L. trifolii* larvae recording (9.2±3.9 eggs/female) and (7.0±2.9 larvae/female) in comparison with (5.3 ±1.9 eggs/ female) and (4.0±1.1 larvae/female) recorded in *L. bryonia* larvae, respectively. *O. pallipes* females showed highly preference towards *L. trifolii* larvae than *L. bryonia* in the choice test and less preference towards *L. trifolii* in no choice test. A possible explanation is that in no choice test either *L. trifolii* or *L. bryonia* larvae were the only available host so *O. pallipes* females had to lay eggs and feed on the available insect host, while in the choice test the parasitoid females had the chance to choose their preferred host. The preference of *L. trifolii* may be due to mining behavior of its larvae that mines the upper palisade mesophyll of the leaflets, while *L. bryonia* larvae mines the spongy mesophyll [16], another possible explanation is that the nutrition contents of *L. trifolii* larvae may be more preferred by *O. pallipes* females. [8] used *O. pallipes* which thought to be the promising parasitoid against *L. bryonia* in Dutch greenhouses but *O. pallipes* failed to control *L. bryonia*. Dissection of the leaf miner larvae showed that *O. pallipes* females could successfully put the eggs but the eggs were encapsulated.

4. CONCLUSION

The larval pupal endoparasitoid *O. pallipes* preferred the serpentine leaf miner *L. trifolii* than *L. bryonia* both under laboratory conditions and in natural habitats, so it seems to be promising

parasitoid against *L. trifolii* in open fields and greenhouses. Finally *O. pallipes* may be reared used to control *L. trifolii* on different host plants.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Yu DS, Van Achterberg C, Horstmann K. World Ichneumonoidea 2004. Taxonomy, biology, morphology and distribution. TAXAPAD CD. Vancouver, Canada; 2005.
2. McClanhan RJ. Notes on the vegetable leaf miner *Liriomyza sativa* (Diptera: Agromyzidae) in Ontario. Proc. Entomol. Soc. Ont. 1975;105:40–44.
3. Hendrikse A, Zucchi R, Van Lenteren JC, Woets J. *Dacnusa sibirica* (Telenga) and *Opius pallepis* (Wesmael) (Hymenoptera: Braconidae) in the control of the tomato leaf miner *Liriomyza bryonia* Kalt. Bull. IOBC / WPRs. III. 1980;3:83-98.
4. Saleh MRA, Guirguis MW, Tantawy MA, Alattar N. Population dynamics of *Liriomyza congesta* larvae and their parasites on broad bean. Annals. Agric. Sci., Fac. Agric. Ain. Shams Univ. 1983; 28(3):1735–1745.
5. Palumbo JC, Mullis CH, Nayes FJ. Composition, seasonal abundance and parasitism of *Liriomyza* (Diptera: Agromyzidae) species on lettuce in Arizona. J. Econ. Entomol. 1994;87:1070–1077.
6. Schuster DJ, Gilreath JP, Wharton RA, Seymour PR. Agromyzidae (Diptera) leafminers and their parasitoids in weeds associated with tomato in Florida. Environ – Entomol. 1991;20(2):720-723.
7. Ushchekov AT. Leaf miner of solanaceae and its parasites. Zashchita – I – Karantin – Rastenii. 2002;11:17-19.
8. Awadalla SS, Fathy HM. Studies on hymenopterous parasitoids of the serpentine leaf miner, *Liriomyza trifolii* (Burgess) in Mansoura region. J. Agric. Mansoura Univ. 1998;23(12):6257-6262.
9. El Khouly AR. Studies on some natural enemies associated with the serpentine leaf miner *Liriomyza trifolii* (Burgess). M. Sc. Thesis. Fac. Agric. Mansoura Univ. 2003;116.
10. Linden A. 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. 1986;51(3a): 1009-1015.
11. Linden A, Achterberg C. Recognition of eggs and larvae of the parasitoids of *Liriomyza* spp. (Diptera: Agromyzidae; Hymenoptera: Braconidae and Eulophidae). ENT. BER. AMST. 1989; 49(9):138-140.
12. Linden A. Biological control of the leaf miner *Liriomyza huidobrensis* (Blanchard) in Dutch glass house tomatoes. Med. Fac. Land bouww. Rijks Univ. Gent. 1991; 56(2a):265 -271.
13. Awadalla SS, Shanab LM, Abd El-Kareim AI, El-Nagar MS, El-Khouly ER. Host plant preference of the ectoparasitoid *Diglyphus isaea* Walker (Hymenoptera: Eulophidae). J. Agric. Mansoura Univ. 2009;34(1):505-510.
14. Awadalla SS, Shanab LM, Abd El-Kariem AI, El-Khouly AR. *O. pallipes* Wesmeal (Hymenoptera: Braconidae) as a larval pupal endoparasitoid on the serpentine leaf miner *L. trifolii*. First Egyptian and Syrian conference, El-Minia Univ. & Al-Baath Univ. on Agriculture & Food in the Arab World, El-Minia: 8-11 December. 2003;311-319.
15. El Khouly AR. Efficiency of some hymenopterous parasitoids on serpentine leaf miner *Liriomyza trifolii* (Burgess). PhD. Thesis, Fac. Agric., Mansoura Univ. 2009; 185.
16. Hannou MA, Hegazi EM. Effects of faba bean cultivars and potassium fertilization on population of *Liriomyza* spp. J. Agric. Sci., Mansoura Univ. 1996;21(12):4565-4574.

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