

liriomyza libya

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Original Research Article

**Population abundance of the ectoparasitoid
Diglyphus isaea Walker (Hymenoptera:
Eulophidae) on the serpentine leaf miner
Liriomyza bryonia. (Diptera: Agromyzidae) On
some summer host plants in Ojilate region,
Libya**

ABSTRACT

Natural abundance of the ectoparasitoid *Diglyphus isaea* walker was studied on three summer host plants [tomatoes (*Solanum lycopersicum*), Bell pepper (*Capsicum annuum*), egg plants (*Solanum melongena*)] in Ojilate region. The parasitoid showed low populations in April on all studied host plants. Then developed high populations in May and June , the population decreased till the end of the growing season.

D. isaea recorded 2-3 peaks of abundance on all studied host plants, the highest peak recorded 36, 29, and 16 individuals/ 50 infested leaflets on tomatoes, eggplant, and bell pepper respectively . The highest average numbers in June on tomatoes recording 26.25 ± 3.86 , in may on eggplants recording 20.25 ± 6.50 , and in June on bell pepper recording (20.25 ± 6.50) individuals/ 50 infested leaflets). On the other hand the monthly average percentages of parasitism recorded its highest numbers in may recording $(45.71 \pm 27.66, 41.04 \pm 25.13)$ on tomatoes and eggplants and 25.19 ± 11.19 on bell pepper.

Keywords: *Diglyphus isaea*, abundance, host plants

1. INTRODUCTION

Genus *Liriomyza* contains more than 300 species, widely distributed in the new and old world but are commonly found in temperate areas [1]. *Diglyphus* spp. Are the most important leafminer larval parasitoids. *Diglyphus begini* (Ashmead), *D. intermedius* (Girault) and *D. isaea* (Walker) were found parasitizing leafminer larvae on cultivated and spontaneous plants [2]. *L. bryoniae* is a highly polyphagous species and important primary hosts of economic importance include: cabbages (*Brassica oleracea* var. *capitata*), cucumbers (*Cucumis sativus*), lettuces (*Lactuca sativa*), courgettes (*Cucurbita pepo*), melons (*Cucumis melo*), tomatoes (*Lycopersicon esculentum*) and watermelons (*Citrullus lanatus*) [3]. In the pan-temperate region, *L. bryoniae* has been reported to complete its life cycle on plants from 16 families [4]. *Diglyphus isaea* is a primary parasitoid of agromyzid leaf miners and has been commercialized as biological control agent [5]. This species is a primary ectoparasitoid capable of developing on at least 18 different agromyzid species [6]. Minkenberg & van Lenteren, [7] describe *D. isaea* as being associated with *Liriomyza* hosts in herbaceous plants but scarce in trees. *Diglyphus isaea* has certainly been used as a biological control agent in a wide range of crops, whilst in the wild, populations of *D. isaea* have been found to use at least 14 species of weedy plant in northern Italy [8]. *Diglyphus isaea* has been used as a biological control against *L. bryoniae* since the mid-1980s [9].

Diglyphus isaea Walker was the most dominant parasitoid species against *L. trifolii* of the parasitoid complex which contained *Opius pallipes* Wesmeal and *Chrysocharis parksi* Crawford (Hymenoptera: Eulophidae) as an endoparasitoids [10]. Ozawa et al. [11] found that the dominant parasitoid species emerging from *L.trifolii* larvae in Homaoka tomato greenhouses was *D.isae*.This parasitoid was released in tomato greenhouses to control *L.trifolii* at different release doses , the percentage of parasitism ranged 94.1-100% by the end of the growing season. Goncalves and Almeida [12] reported that through a survey started in 1993 in several protected crops, two ectoparasitoids of *Liriomyza* spp, *D. isaea* and *D. poppoe* have been found every year, reaching rate of parasitism of 80-85% with predominance of the first one. Among the parasitoid complex of *Liriomyza* spp.in the Iranian fauna which contained several parasitoid species, the Eulophid *D.isaea* was the most common one [13].

From the available literature , few authors have studied the role of the parasitoid *D.isaea* as biocontrol agent against *L. trifolii* Therefore the present investigation was undertaken to study the role of the parasitoid *D.isaea* on *L. trifolii* on economic hosts under the Libyan condition.

2. MATERIAL AND METHODS

The present study was carried out in Ojilat region. Three summer host plants were targeted for this study plants [tomatoes (*Solanum opersicum*), Bell peppers (*Capsicum annuum*), egg plants (*Solanum melongena*)] fifty leaflets infested with *L. bryoina* were taken from each plant . Samples were kept in plastic bags and transferred to be examined in the laboratory .Number of living *L. bryoina* larvae , immature stages of the ectoparasitoid *D. isaea* were counted and recorded . Normal agricultural practices of fertilizing and irrigation were followed and no chemical control measurements were applied . Samples took place one week after nurslings were replanted and continued weekly until harvest.

3. RESULTS AND DISCUSSION

Data presented in fig (1)shows the numbers of the ectoparasitoid *D. isaea* and the percentage of parasitism on three summer host plants .

On tomatoes the parasitoid *D. isaea* recorded low numbers in the beginning of the season in early December, then the population increased recording four peaks of abundance (19 ,28 ,36, and 30 individuals/ 50infested leaflets) occurred on 22th of April , 6th of May ,27th of May and the 24th of June respectively. On the other hand the percentage of parasitism ranged between 1.09 and 44.61% .

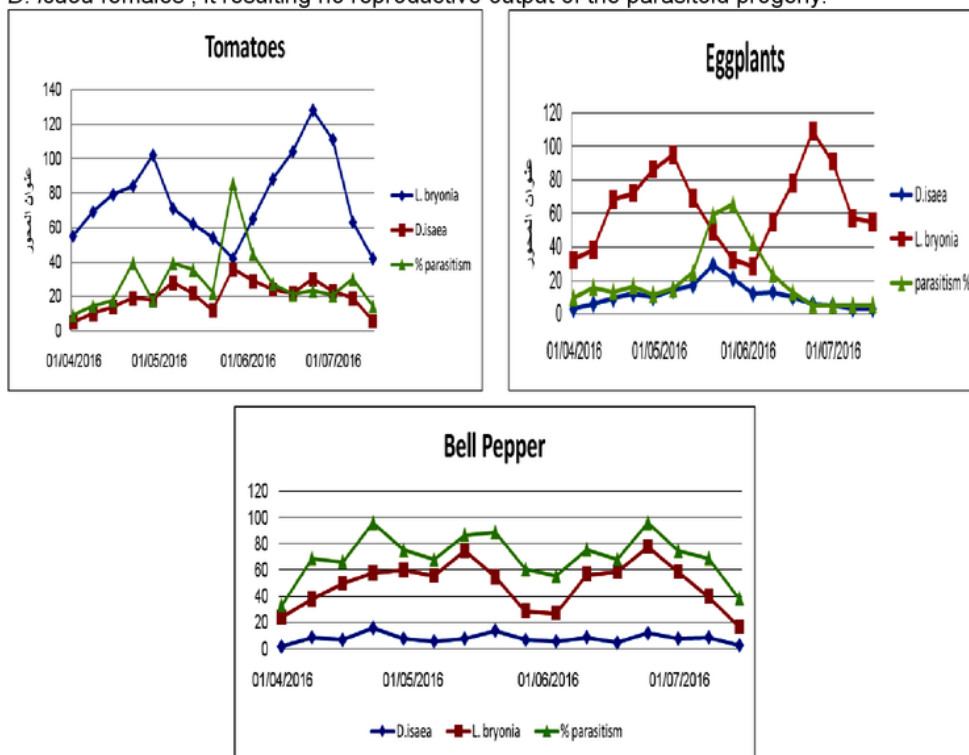
On eggplants the population of *D. isaea* recorded three peaks of abundance (14, 29, and 17 individuals/50 infested leaflets) occurred on 6^h of may , 20th of may , and 10th of june respectively , while the percentage of parasitism ranged between 5.26 and 59.18%

On Bell peppers pepper , the population of *D. isaea* recorded three peaks of abundance (16 , 14 and 12 individuals/50 infested leaflets) occurred in 22th of April , 20th of may and 24th of June respectively , while the percentage of parasitism ranged between 9.09 and 85.71% .

It could be concluded that , the percentage of natural parasitism by *D. isaea* reached more than 38% in all studied host plants thus , so it seems to be a very effective natural antagonist on the tomato leaf miner *L. bryonia* . Elkhoully [14] found that the percentage of parasitism by *D. isaea* in tomato greenhouses ranged between 10.3 and 55.3% when no release treatments were applied . Studies by Awadalla et al. [15] and Khouly, [10] revealed that *D. isaea* had high rates of parasitism on *L.trifolii* in open fields .they indicated that the parasitoid slightly preferred broad bean and fenugreek than sour clover as a winter host plant.

As shown in figure(2) the parasitoid *D. isaea* showed its highest average numbers in June on tomatoes recording 26.25 ± 3.86 , in may on eggplants recording 20.25 ± 6.50 , and in june on bell pepper recording $(20.25 \pm 6.50 \text{ individuals/ } 50 \text{ infested leaflets})$. On the other hand the

88 monthly average percentages of parasitism recorded its highest numbers in may recording
 89 (45.71±27.66, 41.04±25.13) on tomatoes and eggplants and 25.19±11.19 on bell pepper.
 90 These results show that the larval ectoparasitoid, *D. isaea* recorded highest average
 91 numbers in June and may when its host *L. bryonia* reached high population because *D.*
 92 *isaea* prefers the high population of its host [16]. Data presented by EL Khouly, [14]
 93 showed that *D. isaea* females killed 21.3±4.7% of *L. trifolii* larvae 9.6±3.7% of them were
 94 host fed and 12.3±3.6% larvae were oviposited. So these results are in agreement with his
 95 finding. Another supporting results were presented by Patel et al. [17] who found that the
 96 parasitoid *Diglyphus intermedius* kills more hosts than it parasitize. In earlier study, Heinz
 97 and Parrella [18] observed that *Diglyphus begini* killed 1.3 *L. trifolii* larvae for every larva
 98 used for oviposition. Eventually, despite host – feeding is an effective killing behavior
 99 against agromized larvae which supporting in combination with oviposition the efficiency of
 100 *D. isaea* females, it resulting no reproductive output of the parasitoid progeny.



Fig(1) Population abundance of the ectoparasitoid *D. isaea* and percentage of parasitism on three summer host plants in Ojilate region during the growing season 2016.

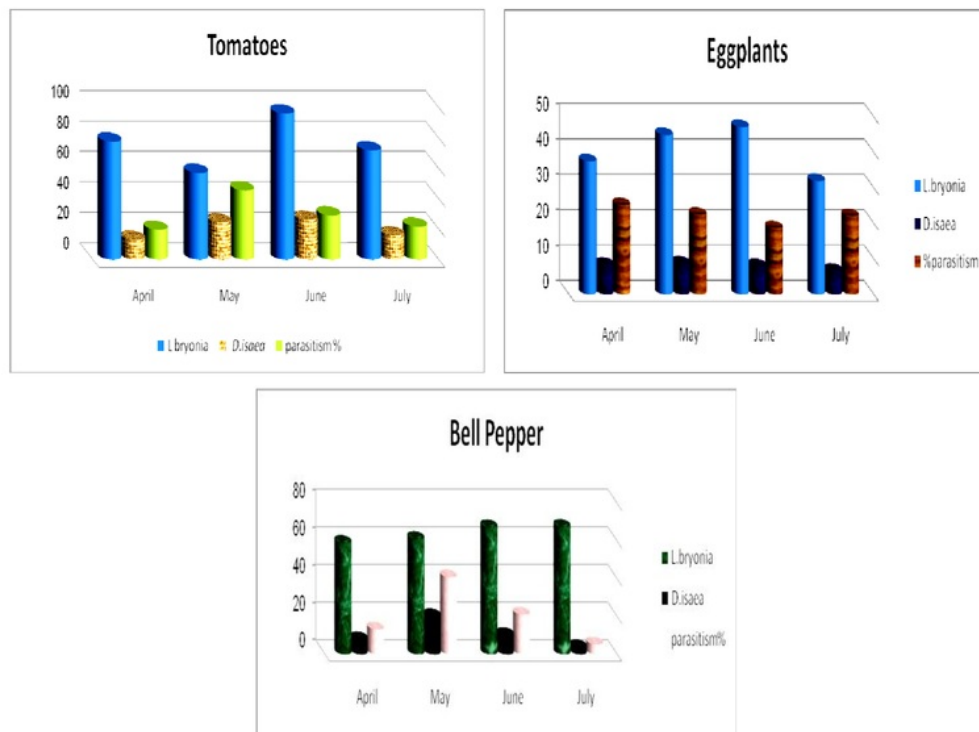


Fig (2) Monthly average numbers of the tomato leafminer *L. bryonia* and the larval ectoparasitoid *D. isaea* on three summer host plants.

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