

**HOST PLANT PREFERENCE OF THE ECTOPARASITOID
Diglyphus isaea WALKER (HYMENOPTERA: EULOPHIDAE).
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ABSTRACT

Under field conditions, preference of host plant by the parasitoid *Diglyphus isaea* (Walker) was studied. Three winter crops (broad bean, lentil and chickpea) and three summer ones (cowpea, kidney bean and tomatoes) were studied for their preference to *D. isaea* which is an ectoparasitoid of the leaf-miner *Liriomyza trifolii* (Burgess). Results obtained revealed that, broad bean had the highest average monthly rates of parasitism in three successive seasons recording (31.0±12.2, 41.6±19.3 and 39.3±10.6), followed by lentil (15.2±11.8, 8.1±4.8 and 11.2±4.9) and chickpea (4.1±2.8, 3.5±1.9 and 3.6±2.3) during the growing seasons (2004/05, 2005/06 and 2006/07), respectively.

In contrast, cowpea had the highest average monthly rates of parasitism by *D. isaea* on *L. trifolii* in three successive seasons recording (33.7±8.1, 31.0±8.3 and 35.1±6.1), followed by kidney bean (29.8±11.8, 29.6±6.7 and 29.5±10.1) and tomatoes (25.0±9.7, 20.2±8.3 and 28.4±4.0) with slight differences of preference among them, respectively.

Keywords: Plant preference, *Diglyphus isaea*.

INTRODUCTION

Diglyphus isaea is a primary parasitoid of agromyzid leaf miners and has been commercialized as biological control agent (Sha *et al.*, 2007). This species is a primary ectoparasitoid capable of developing on at least 18 different agromyzid species (Bouek and Askew, 1968). On the other hand, *D. isaea* preferred broad bean as host plant compared with fongreek and sour clover during three successive seasons, may be related to the high abundance of its insect host on such host plant (El-Khouly, 2003). Johnson and Hara (1987) found that the parasitoids *Diglyphus begini* (Asmead) and *Diglyphus inlermedius* (Gerault) preferred celery, tomato, beans, cucumber, cabbage and spanish as host plants. Carballo *et al.* (1990) mentioned that the weeds *Amaranthus* sp., *Bidens* sp. and *Galinsoga* sp. were the most favoured host plants by the parasitoids *Diglyphus* sp. and *Opius* sp. with parasitism on these plants reached 87, 66 and 65 %, respectively compared with 45 % on kidney bean. Relatively few weed species *Solanum* sp., *Bidens alba*, *Commelina* sp. and *Erechitias hieracifolia* growing in association with tomatoes in west central Florida serve as reservoirs of either leaf miners or their parasitoids; furthermore, two weed species *Solanum* sp., *B. alba* were the largest potential sources of both *Liriomyza* spp. and parasitoids with percentage of abundance 77 % of the parasitic fauna, while *Opius* spp. and *Diglyphus* spp. were the most abundant species.

From the available literature, a few authors have studied the host plant preference of the parasitoid *D. isaea* or the other leaf miner parasitoids (Carballo *et al.*, 1990; Awadalla and Fathy, 1998 and El-Khouly, 2003). Therefore, the present investigation was undertaken to study the host plant preference of *D. isaea* on either winter or summer crops.

MATERIALS AND METHODS

The present study was carried out in Seidy Salem region, Kafr El-Sheikh governorate for three successive seasons from 2004 to 2007. The experimental field was about ¼ fed. which divided to 12 equal plots (4 plots for every plant, each plot was about 85m²) planted with broad bean, chickpea and lentil during the third week of November as a winter crops and cowpea, kidney bean and tomato during the third week of May as a summer crops. The role of host plants on the parasitoids activity was evaluated according to the collected samples from the six host plants.

To determine the seasonal abundance of *L. trifolii* parasitoid *D. isaea*, samples of 100 mined leaflets were collected at weekly intervals during the three experimental seasons for each crop. Samples were kept in plastic bags and transferred to be examined in the laboratory. Number of living *L. trifolii* larvae, immature stages of of the ectoparasitoid *D. isaea* and unknown dead larvae were counted and recorded weekly. 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.

RESULTS AND DISCUSSION

1- Host plant preference by the larval parasitoid *D. isaea* on winter crops

Data presented in table (1) and fig. (1) shows the monthly percentages of parasitism on *L. trifolii* caused by the larval parasitoid *D. isaea* as affected by host plants during the three successive seasons 2004/05, 2005/06 and 2006/07.

On broad bean, the highest rates of parasitism occurred in April 2005 (43.5±5.2 %), March 2006 (63.1±2.0 %) and March 2007 (54.8±12.3 %), while the lowest rates of parasitism were observed in December 2004 (17.2±2.2 %), January 2006 (19.4±4.1 %) and December 2006 (25.9±4.0 %) during the three successive seasons 2004/05, 2005/06 and 2006/07, respectively.

On lentil, the highest rates of parasitism occurred in February 2005 (34.5 ± 16.9 %), March 2006 (14.0 ± 4.0 %) and February 2006 (15.9 ± 4.9 %), while the lowest rates of parasitism were recorded in December 2004 (3.4 ±1.4 %), in December 2005 (3.1 ±0.7 %) and in December 2006 (5.5 ± 2.1 %) during the three successive seasons.

On chickpea, the highest rates of parasitism found in February 2005 (7.6 ±4.0 %), February 2006 (5.5 ±3.9 %) and February 2007 (6.0 ±6.0 %), while the lowest rates of parasitism were always in December (0.8 ±1.1 %), (0.8 ±1.1 %) and (1.0 ±1.2 %) during the three successive seasons, respectively.

Table (1): Monthly average percentages of parasitism on *L. trifolii* caused by the larval parasitoid *D. isaea* as affected by host plants during three seasons 2004/2005(A), 2005/2006(B) and 2006/2007(C).

Months	Broad bean			Lentil			Chickpea		
	A	B	C	A	B	C	A	B	C
December	17.2±2.2	33.5±9.5	25.9±4.0	3.4±1.4	3.1±0.7	5.5±2.1	0.8±1.1	0.8±1.1	1.0±1.2
January	18.6±6.0	19.4±4.1	37.5±4.3	9.7±5.1	5.7±1.6	14.8±3.2	4.3±3.9	4.1±2.4	2.3±3.3
February	36.8±9.8	31.1±8.3	35.6±12.8	34.5±16.9	9.7±2.3	15.9±4.9	7.6±4.0	5.5±3.9	6.0±6.0
March	39.1±14.6	63.1±2.0	54.8±12.3	16.7±5.4	14.0±4.0	8.7±4.9	3.6±1.8	3.5±4.1	5.1±2.5
Anril	43.5±5.2	60.7±3.7	42.8±5.6	11.5±7.5	—	—	—	—	—
Mean±S.D	31.0±12.2	41.6±19.3	39.3±10.6	15.2±11.8	8.1±4.8	11.2±4.9	4.1±2.8	3.5±1.9	3.6±2.3

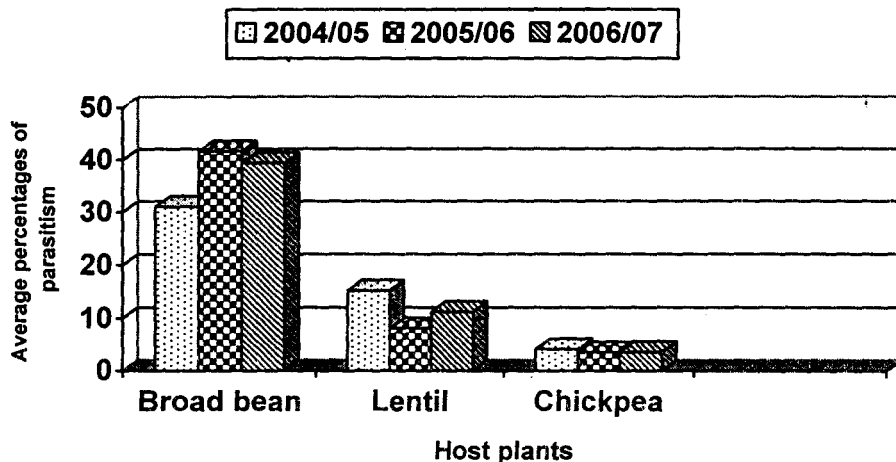


Figure (1): The average percentages of parasitism by *D. isaea* all over the growing season during three seasons(2004/2007) on broad bean, lentil and chickpea as winter host plants.

Broad bean had the highest average monthly rates of parasitism followed by lentil and then chickpea all over the three seasons of the study. Broad bean has large leaflets size than lentil and chickpea, so it attacked by larger number of *L. trifolii* larvae associated with large number of *D. isaea* immature stages than the other two host plants. On the other hand, the parasitoid *D. isaea* prefers the high densities of its host, so broad bean is the most suitable host plant in comparison with the other two host plants because it attacked by a high population of *L. trifolii*. Another possible explanation is that the heavy trichomes of chickpea leaflets may prevent the parasitoid females of handling their hosts (*L. trifolii* larvae) because *D. isaea* female has a short ovipositor.

Data recorded by El-Khouly (2003) concluded that *D. isaea* showed high preference towards broad bean than fenugreek and sour clover during three seasons of the study. These results are also in agreement with those of Carballo *et al.* (1990), Coaker and Cheah (1993) and Awadalla and Fathy (1998).

As a conclusion, the average monthly rates of parasitism were the highest on broad bean (31.0±12.2, 41.6±19.3 and 39.3±10.6), followed by lentil (15.2±11.8, 8.1±4.8 and 11.2±4.9) and chickpea (4.1±2.8, 3.5±1.9 and 3.6±2.3) during the three successive seasons 2004-05, 2005-06 and 2006-07, respectively.

2- On summer crops

Data presented in table (2) and fig. (2) showed the monthly percentages of parasitism on *L.trifolii* caused by the larval parasitoid *D. isaea* as affected by host plants during the three successive seasons.

On cowpea, the highest rates of parasitism occurred in July 2005 (41.1 ±4.1 %), September 2006 (39.1 ±9.2 %) and July 2007 (43.0 ±16.8 %), while the lowest average rates occurred always in June (20.0 ±5.6 %), (17.7 ±1.5 %) and (26.0 ±4.6 %) during the three successive seasons 2005, 2006 and 2007, respectively.

On Kidney bean, the highest rates of parasitism occurred in August 2005 (43.0 ±9.0 %), August 2006 (38.1 ±6.2 %) and September 2007 (42.9 ±9.9 %), while the lowest average rates was observed in July 2005 (16.8 ±1.8 %), October 2006 (23.8 ±6.5 %) and June 2007 (15.2 ±1.4 %) in the three successive seasons.

On Tomatoes, the highest rates of parasitism occurred in September 2005 (30.3 ±3.5 %), August 2006 (29.6 ±9.0 %) and July 2007 (31.7 ±11.6 %), while the lowest average rates occurred always in June (10.5 ±10.2 %), (9.4 ±8.1 %) and (22.6 ±16.7 %) during the three successive seasons, respectively.

Cowpea had the highest average monthly rates of parasitism on *L.trifolii* followed by kidney bean and tomatoes then the three successive seasons. The parasitoid *D. isaea* showed a slight preference towards cowpea in comparison with kidney bean, this may be related to the similar morphological characters of the two host plants, especially the nearly equal leaflets size of the two host plants. Moreover, *L. trifolii* recorded relatively similar densities on either cowpea or kidney bean in association with similar densities of *D. isaea*. On the other hand, *D. isaea* showed a relatively low preference towards tomato plants in case of their small leaflets size in comparison with those of cowpea and kidney bean that attacked by low or moderate populations of *L. trifolii* combined with low or moderate populations of *D. isaea*. These results are in agreement with those of Awadalla (1998) and Awadalla and Fathy (1998).

Table (2): Monthly average percentages of parasitism on *L. trifolii* caused by the larval parasitoid *D. isaea* as affected by host plants during three seasons 2005(A), 2006(B) and 2007(C).

Months	Cowpea			Kidney bean			Tomatoes		
	A	B	C	A	B	C	A	B	C
June	20.0±5.6	17.7±1.5	26.0±4.6	19.5±1.9	25.1±9.1	15.2±1.4	10.5±10.2	9.4±8.1	22.6±16.7
July	41.1±4.1	29.7±9.1	43.0±16.8	16.8±1.8	35.8±6.4	27.9±15.4	29.4±5.9	20.7±7.7	31.7±11.6
August	37.6±9.9	32.3±13.6	35.8±11.0	43.0±9.0	38.1±6.2	27.2±7.6	29.9±1.9	29.6±9.0	28.9±9.7
September	35.9±7.7	39.1±9.2	34.1±8.5	29.6±7.1	25.8±6.1	42.9±9.9	30.3±3.5	21.1±11.3	30.4±11.3
October	33.8±9.4	36.3±9.6	35.6±2.1	40.2±4.2	23.8±6.5	34.1±1.8	--	--	--
Meant±S.D	33.7±8.1	31.0±8.3	35.1±6.1	29.8±11.8	29.6±6.7	29.5±10.1	25.0±9.7	20.2±8.3	28.4±4.0

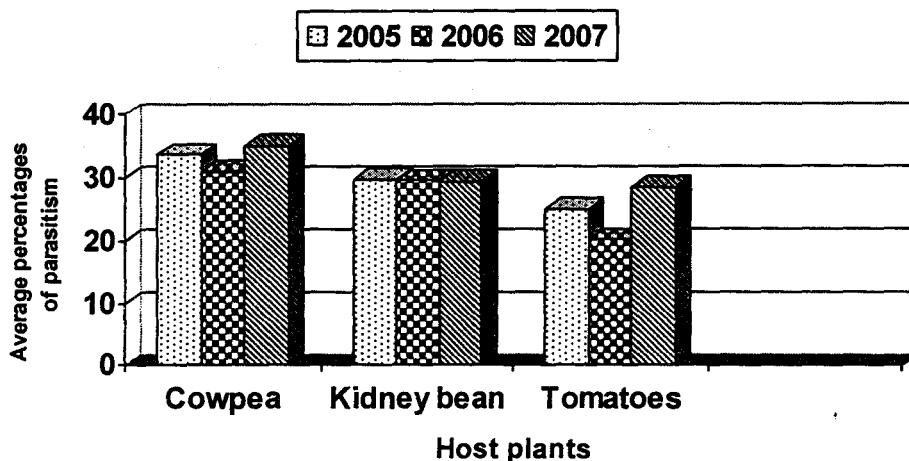


Figure (2): The average percentages of parasitism by *D. isaea* all over the growing season during three seasons(2005- 2007) on cowpea, kidney bean and tomatoes as summer host plants.

As a conclusion, the average monthly rates of parasitism were the highest on cowpea (33.7 ± 8.1 , 31.0 ± 8.3 and 35.1 ± 6.1), followed by kidney bean (29.8 ± 11.8 , 29.6 ± 6.7 and 29.5 ± 10.1) and tomatoes (25.0 ± 9.7 , 20.2 ± 8.3 and 28.4 ± 4.0) during the three successive seasons 2005, 2006 and 2007, respectively.

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تفضيل الطفيل الخارجي ديجليفس إيزي (إبولوفيدي: غشائية الاجنحة) للعائل النباتي.

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تمت دراسة تفضيل الطفيل *Dyglyphus isaea* للعائل النباتي وذلك بمقارنة النسب المئوية للتطفل على نافقة اوراق الفول *L.trifolii* علي ثلاثة من العوائل الشتوية هي (الفول البلدي، العدس والحمص) وثلاثة من العوائل الصيفية هي (اللوبياء، الفاصوليا والطماطم) وذلك علي مدي ثلاثة مواسم زراعية، وقد اوضحت النتائج أن الفول البلدي كان العائل الشتوي الأكثر تفضيلا حيث كانت النسب المتوسطة للطفيل المسجلة عليه هي ($12,2 \pm 3,1$ ، $19,3 \pm 4,6$ و $39,3 \pm 10,6$) في المواسم الثلاثة علي الترتيب ثم تلاه العدس ($11,8 \pm 10,2$ ، $4,8 \pm 8,1$ و $4,9 \pm 11,2$ %) والحمص ($2,8 \pm 4,1$ ، $1,9 \pm 3,0$ و $2,3 \pm 3,6$) بينما كانت اللوبيا هي العائل الصيفي الاكثر تفضيلا حيث كانت النسب المتوسطة للتطفل المسجلة عليه هي ($8,1 \pm 33,7$ ، $8,3 \pm 31$ و $6,1 \pm 35,1$) في المواسم الثلاثة علي الترتيب ثم تلاه الفاصوليا ($11,8 \pm 29,8$ ، $6,7 \pm 29,6$ و $10,1 \pm 29,0$ %) والطماطم ($9,7 \pm 25,0$ ، $8,3 \pm 20,2$ و $4,0 \pm 28,4$ %) في المواسم الصيفيه الثلاثة على التوالي.