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THE EFFICIENCY OF THE ECTOPARASITOID *Diglyphus isaea* WALKER (HYMENOPTERA: EULOPHIDAE) ON THE SERPENTINE LEAFMINER *Liriomyza trifolii* (BURGESS) IN TOMATO GREENHOUSES .

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ABSTRACT

Natural abundance of the ectoparasitoid *Diglyphus isaea* Walker was studied in four tomato greenhouses at Sakha, Mehalla Al-Kobra, and Metobus. The parasitoid showed low populations in March, then developed good populations that kept the populations of the serpentine leafminer, *Liriomyza trifolii* at low densities till the end of the season in all studied greenhouses.

D. isaea recorded two peaks of abundance in three of the greenhouses, the highest peak recorded 21, 36, 28 and 31 individuals/ 50infested leaflets in greenhouses 1, 2, 3 and 4, respectively . The highest average numbers occurred in April in all greenhouses recording 18 ± 2.9, 24.3 ± 8.3, 23.0 ± 5.2 and 26.0 ± 5.2 individuals/ 50infested leaflets in greenhouses 1,2,3 and 4 ,respectively. On the other hand, the percentage of parasitism ranged between 17.8 ± 0.9 and 47.3 ± 1.3% recording its highest numbers in May in greenhouse 1 (43.3 ± 5.3%), and in April in greenhouses,2,3 and 4 recording 46.4 ± 5.1 , 43.6 ± 2.3 and 47.3 ±1.3% , respectively. The percentage of killed larvae according to host-feeding recorded its highest monthly average numbers in May in greenhouses 1, 2 and 3 (43.5 ± 5.3 , 29.0 ± 9.2 and 24.0 ± 7.3% respectively) and in June in greenhouse 4 recording 30.6 ± 6.4% .

INTRODUCTION

Genus *Liriomyza* contains more than 300 species, widely distributed in the new and old world but are commonly found in temperate areas (Parrella, 1987). Among them, *L. trifolii* Burgess (Diptera: Agromyzidae), the American serpentine leaf miner is known as one of the most serious pests of many vegetable and horticultural crops worldwide (Spencer, 1973). *L. trifolii* has a wide range of host plants with more than 400 species reported as hosts (Baufeld and Motte, 1992). Thirty nine species of parasitoids have been reported to attack *L. trifolii* on a variety of commodities (Johnson and Hara, 1987). *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 endoparasitoids (El-Khouly, 2003). Ozawa *et al*. (2001) 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 (Ozawa *et al* 1999and Ozawa *et al* 2001). The parasitoid *D.isae* is a primary ectoparasitoid capable of developing on at least 18 different agromyzid species (Boueck

and Askew, 1968). Goncalves and Almeida (2005) reported that the survey conduted on several protected crops showed that two ectoparastiods 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 (Asadi *et al*. 2006)

From the available literature , few authors have studied the role of the parasitoid *D.isaea* as biocontrol agent against *L. trifolii* in tomato fields in Egypt (Awadalla and Fathy 1998 , Awadalla *et al*.2008 and Khouly, 2009) but rarely in tomato greenhouses. Therefore, the present investigation was undertaken to study the role of the parasitoid *D. isaea* in tomato greenhouses.

MATERIALS AND METHODS

The present study was carried out at four districts; Sakha, Mehalla, AL-Kobra,Desouk and Metobus from March to June 2009. One tomato greenhouse (500 m^2) in each location was planted with 30- day old tomato nurslings. One week after transplanting, samples of the greenhouses were taken weekly. Fifty tomato leaflets infested with *L. trifolii* were taken from each greenhouse . Samples were kept in plastic bags and transferred to be examined in the laboratory .Number of living *L. trifolii* larvae , immature stages of the ectoparasitoid *Diglyphus isaea* and number of dead larvae according to feeding (no ovipositon) were counted and recorded . Normal agricultural practices of fertilizing and irrigation were followed and no chemical control measurements were applied .

RESULTS AND DISCUSSION

Data presented in fig. (1.1) shows the numbers of the ectoparasitoid *D. isaea* and the percentage of parasitism at sakha location. The parasitoid, *D. isaea* recorded low numbers at the beginning of the season in late march and early April , then the population increased recording two peaks of abundance (21 and 13 individuals/50 infested leaflets) on 13th of April and the 1st of June, respectively. On the other hand, the percentage of parasitism ranged between 24.0 and 52.9% and recorded 50% at the end of the season.

At Mehalla AL- Kobra greenhouse (Fig. 1.2) the population of *D. isaea* recorded two peaks of abundance (36 and 13 individuals /50infested leaflets) on 20th of April and 18th of May, respectively, while the percentage of parasitism ranged between 15.8 and 51.3% and also recorded 50% at the end of the season .

At Desouk (Fig.1.3), the population of *D. isaea* recorded two peaks of abundance (28 and 14 individuals/50infested leaflets) on 13th of April and 18th of May, respectively , while the percentage of parasitism ranged between 26.9 and 54.5% and recorded 54.5% at the end of the season.

At Metobus (Fig.1.4), the population of *D. isaea* recorded three peaks of abundance (31, 21 and 20 individuals/50infested leaflets) on 13th of April, 27th of April and 25th of May respectively, while the percentage of parasitism ranged between (22.5 and 58.3%) and reached 58.3% at the end of the season .

It could be reported that , the percentage of natural parasitism by *D. isaea* reached about 50% in all studied greenhouses thus , it seems that no need to release the parasitoid in such greenhouses. Similar results were obtained by El-khouly(2009) who 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 of Awadalla *et al*.2009 and EL-Khouly, 2009 revealed that *D. isaea* had high rates of parasitism on *L. trifolii* in open fields .They indicated that the parasitoid slightly preferred cowpea and kidney bean than tomatoes.

As shown in Table (1) the parasitoid *D. isaea* showed its highest monthly average numbers in April in the four greenhouses recording (18.0± 2.9, 24.3± 8.3, 23.0±5.2 and 26.0±5.2 individuals/50 infested leaflets) at Sakha, Mehalla AL-Kobra, Desouk and Metobus, respectively. On the other hand monthly average percentage of parasitism recorded its highest numbers in June (49.8± 3.2%) in location (1) and in April in locations 2, 3 and 4 recording 46.4± 5.1, 43.6± 2.3 and 47.3±1.3 %, respectively. Monthly average percentages of dead larvae according to host-feeding (no oviposition) recorded its highest numbers in May in greenhouses 1, 2 and 3 recording 43.5±5.3 , 29.0±9.2 and 24.0±7.3% respectively, and in June in greenhouse (4) recording 30.6± 6.4% .

Theses results show that that the larval ectopoarasitoid, *D. isaea* recorded its highest average numbers in April when the host, *L. trifolii* reached high population because *D. isaea* prefers the high population of its host (Linden 1993). On the other hand, the monthly average percentages of killed larvae according to host-feeding ranged between (17.8±0.9 and 47.3±1.3 %). Data presented by EL- Khouly, 2009 showed that *D. isaea* females killed 21.3±4.7% of *L. trifolii* larvae, 9.6±3.7 of them were host fed and 12.3±3.6 larvae were oviposited. Thus, the current results are in agreement with those of EL- Khouly, (2009). Other supporting results were reported by Patel *et al*.(2005) who found that the parasitoid *Diglyphus intermedius* kills more hosts than it parasitizes . In an aearlier study (Heinz and Parrella (1990), it was observed that *Diglyphus begini* killed 1.3 *L.trifolii* larvae for every larva used for oviposition .

Fig. (1): Abundance of the ectoparasitoid *D.isaea* and percentage of parasitism in four tomato greenhouses, at Sakha Agricultural Research station, 2009 season

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كفاءة الطفيل الخارجي ديجليفس إيزى على حشرة نافقة أوراق الفول فى صوبات الطماطم .

سمير السيد قاسم ، رفعت ابراهيم السيد معجوز والانصارى رفعت الخولى
مركز البحوث الزراعيه - معهد بحوث وقاية النباتات ـــ محطة البحوث الزراعيه بسخا.

تمت دراسة كفاءة الطفيل *Dyglyphus isaea* على حشرة نافقة أوراق الفول *Liriomyza trifolii* فى صوبات الطماطم بمراكز سخا (صوبه ١)، والمحلة الكبرى (صوبه ٢)، ودسوق (صوبه ٣) ومطوبس (صوبه ٤) وقد سجل تعداد الطفيل ذروتين في الصوب الاربعه التي استهدفتها الدراسة وذلك خلال الفترة بين ٢٣ مارس حتى ١٥ يونيو ٢٠٠٩. أما المتوسطات الشهرية لأعداد الطفيل فكانت الأعلى في ابريل في جميع الصوب بمعدل ٢,٩±١٨,٠ , ٢,٩ ±٢٤,٣, ٥,٣ ±٢٣,٠, ٥,٢ ±٢٦,٠ يرقه / ٥٠ وريقه . فيما تراوحت النسب المئوية للتطفل بين ٠٩± ١٧,٨- ١,٣± ٤٧,٣% مسجلة اعلي معدلاتها في مايو في الصوبة الأولى بمعدل (٥,٣± ٤٣,٥%) وفى ابريل في الصوب ١,٢,٣ بواقع ٥,١±٤٦,٥, ٢,٣ ±٤٣,٥ , ١,٣±٤٧,٣ في الصوب الثلاثة على التوالي. بينما سجلت اعداد اليرقات الميته للذبابة نتيجة تغذية الطفيل عليها دون وضع بيض أعلى معدلاتها فى الصوبات ١و٢و٣ بواقع ٥,٣ ± ٤٣,٥, ٩,٢ ± ٢٩,٠, ٢٤,٠ ± ٧,٣ فى الصوب الثلاث على التوالى أما الصوبه٤ فكانت (٦,٤± ٣٠,٦).

قام بتحكيم البحث

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Table (1): Parasitism parameters of *Diglyphus isaea* on *Liriomyza trifolii* infesting tomato in greenhouses, Sakha Agricultural Research station, 2009 season.

Months	Sakha(1)			Mehalla AL- Kobra(2)			Desouk (3)			Metobus(4)		
	No. of *D. isaea*/ 50 leaflets	% Parasitism	% dead larvae (feeding)	No. of *D. isaea*/ 50 leaflets	% Parasitism	% dead larvae (feeding)	No. of *D. isaea*/ 50 leaflets	% Parasitism	% dead larvae (feeding)	No. of *D. isaea*/ 50 leaflets	% Parasitism	% dead larvae (feeding)
March	8.0 ± 2.8	30.9±6.8	25.7±4.8	20±4.2	36.4±9.1	20.7±1.0	11.0±2.8	32.6±2.7	17.8±0.9	8.5±3.5	30.2±5.9	19.6±3.2
April	18.0 ±2.9	39.5±2.7	29.9±4.1	24.3±8.3	46.4±5.1	23.4±3.2	23.0±5.2	43.6±2.3	22.9±5.0	26.0±5.2	47.3±1.3	19.9±3.9
May	9.0 ± 2.4	27.5±2.4	43.5±5.3	8.8±3.4	33.2±10.1	29.0±9.2	10.0±2.9	33.3±6.4	24.0±7.32	14.3±5.9	40.5±7.5	22.5±8.3
June	9.6 ±3.1	49.8±3.2	23.6±13.5	4.3±1.5	32.1±17.1	21.1±8.4	5.7±0.6	41.0±11.6	3.6±3.2	8.0±1.0	38.1±18.3	30.6±6.4
Mean± S.D	11.2 ± 4.6	36.9±10.0	33.1±7.6	11.6±8.7	37.0±6.5	23.6±3.8	12.4±7.4	37.6±5.5	22.1±2.9	14.2±8.4	39.0±7.1	23.1±5.1