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ROLE OF *Chrysoperla carnea* (Stephens) RELEASE IN THE BIOCONTROLLING OF *Cassida vittata* Vill. AND *Scrobipalpa ocellatella* Boyd. LARVAE AS WELL AS ENHANCING THE ASSOCIATED ARTHROPOD PREDATOR POPULATIONS IN COMPARISON WITH CONVENTIONAL INSECTICIDES APPLICATIONS IN SUGAR BEET FIELDS

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ABSTRACT: The current study was carried out at the Experimental Farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during 2016/2017 and 2017/2018 seasons for investigating the efficacy of *Chrysoperla carnea* (Stephens) larvae release against *Cassida vittata* Vill. and *Scrobipalpa ocellatella* Boyd. larvae in sugar beet fields, at the same time in conserving arthropod predators (true spiders "Araneae", *C. carnea*, Coccinellidae, Anthocoridae and Formicidae), in comparison with conventional insecticides (Tac 48% EC, Diracomel 90% SP and Shalinger-Super 24% SC). The results indicated that the conventional insecticides induced reduction in the mean number of *S. ocellatella* larval population with 91.00, 86.00 and 89.03%, respectively in 2016/2017 season, and 92.00, 90.00 and 92.13%, respectively in 2017/2018 season. While in case of *C. vittata* the chemical insecticide treatments induced reduction in the mean number of larval population with 91.00, 93.40 and 94.00%, respectively in 2016/2017 season as well as 92.40, 94.10 and 94.33%, respectively in 2017/2018 season. Also, the mean of reductions in the surveyed and associated arthropod predators as a result of using conventional insecticides against *S. ocellatella* larvae were 96.71, 96.55, and 96.55%, respectively in 2016/2017 season as well as 95.30, 94.00 and 92.00%, respectively in 2017/2018 season. While in case of using chemical insecticides against *C. vittata* larvae, the reductions in the mean population of the surveyed and associated arthropod predators in sugar beet fields were 97.40, 96.30 and 95.00%, respectively in 2016/2017 season as well as 96.00, 94.00 and 93.30%, respectively in 2017/2018 season. While in the treatment of release the predatory insect, *C. carnea* larvae against *S. ocellatella* larvae induced reduction in the mean number of the larval population by 57.13 and 43.40% in 2016/2017 and 2017/2018 seasons, respectively. While in case of *C. vittata* larvae, the reduction in the mean number of larval population recorded 49.00 and 45.13% in 2016/2017 and 2017/2018 seasons, respectively. Also, the surveyed and associated arthropod predator populations increased by 25.13 and 70.00% in 2016/2017 and 2017/2018 seasons, respectively. While the increasing in *C. carnea* populations were 22.00 and 44.13% in 2016/2017 and 2017/2018 seasons, respectively as a result of release the predatory insect, *C. carnea* for controlling both of *S. ocellatella* and *C. vittata*, respectively. Finally, these results show the important role of releasing *C. carnea* larvae as a biocontrol agent for controlling *C. vittata* and *S. ocellatella* larvae, at the same time in enhancing arthropod predator populations in comparison with conventional insecticides.

Key words: Role, chrysoperla carnea, cassida vittata, scrobipalpa ocellatella, populations, conventional, insecticides, sugar beet, fileds.

INTRODUCTION

Sugar beet (*Beta vulgaris,* L.) (Chenopodiaceae) is a main source of sugar production besides sugar cane in Egypt and all over the world. In Egypt, the total planted area of sugar beet is about 555585 faddans to 250082 faddans of sugar cane and total sugar production from sugar

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beet plants valued about 1265597 tons to 9311279 tons from sugar cane plants in 2016 season (**Anonymous, 2017**). Sugar beet plants are subjected to attack of several insect pests, beginning from seed germination up to maturity and harvest (**Shalaby, 2001; El-Dessouki, 2014; Bazazo *et al*., 2015**). *Scrobipalpa ocellatella* Boyd. and *Cassida vittata* Vill. are very important insect pests to sugar beet crop which negatively affect the crop foliage and consequently reduce the amount of extracted sugar (**Shalaby, 2001; El-Mahalawy, 2011**). The severe infestation of sugar beet with *S. ocellatella* caused significant reduction of 38.20 and 52.40% in root weight and sugar content, respectively, while *C. vittata* caused significant reduction of 40.10 and 56.20% in root weight and sugar content **(Abo-Saied, 1987)**. Because of several problems of massive applications of hazardous insecticides against pests, further attention has been given to other safe methods (**Abuldahab *et al*., 2011**).

Chrysoperla carnea (Stephens) is proven broad-spectrum biological control agent, for using in integrated pest management programs of many main insect pests **(Tauber and Tauber, 1993; Aziza *et al*., 2007)**.

Thus, the current investigation was carried out to investigate the role of *C. carnea* larvae release for reducing *C. vittata* and *S. ocellatella* larvae population in sugar beet fields at the same time in conserving arthropod predators in comparison with conventional insecticides applications.

MATERIALS AND METHODS

The effect of certain chemical compounds belonging to different groups and release of the predatory insect, *Chrysoperla carnea* (Stephens) was evaluated against two of the most common insect pests and their associated arthropod predators in sugar beet fields during the growing seasons of 2016/2017 and 2017/2018. The compounds and the predatory insect and their rats per faddan were presented in Table 1.

The experiment was done in the Experimental Farm of Sakha Agricultural Research Station (ARC), Kafr El-Sheikh Governorate, Egypt to study the effect of three chemical compounds (Tac 48% EC, Diracomel 90% SP and Shalinger-super 24% SC) belonging to different groups and the predatory insect, *C. carnea* on the population size of both *Scrobipalpa ocellatella* Boyd. and *Cassida vittata* Vill. larvae and their common associated arthropod predators; Coccinellidae (adults), Chrysopidae (eggs and larvae), Anthocoridae (adults) and Formicidae (adults), in addition to true spiders belonging to order Araneae (spider lings and adults) on sugar beet plants during 2016/2017 and 2017/2018 seasons. The sugar beet variety of Halawa was sown on 25 October, in 2016 and 2017 seasons.

The experimental area was divided into 20 plots, each of 24 m^2. All of the considered treatments (Table 1) as well as control treatment were replicated four times in a complete randomized block design. Sugar beet plots were treated with the considered compounds using CP3 Knapsack sprayer, while the larvae of *C. carnea* were put into sugar beet plants by a fine brush at a rate of 5 larvae (2^{nd} and 3^{rd} instars)/ plant **(Shalaby 2012; Yonnes *et al*., 2013)**. Barriers were left between plots to avoid drift. The treatments were carried out on 1^{st} February against *S. ocellatella* and 10^{th} April against *C. vittata* of each 2017 and 2018 years.

From each plot of every treatment, 10 sugar beet plants were randomly selected and examined immediately in the field before chemical and biological application as well as 1, 3, 7 and 10 days after treatment. At the same time of field investigation, samples of the associated arthropod species; insect and spider predators were selected and counted. Percentages of population reduction after one day (initial effect) and after the next dates (residual effect) in the larval size population of both the considered two insect pests (*C. vittata* and *S. ocellatella*) were calculated. In addition to the effect of the considered treatments (chemical and biological) on the associated arthropod species; insect and spider predators was considered for each treatment.

Reductions in insect pest populations and the associated arthropod predators (insect and spider predators) were calculated by **Henderson and Tilton (1955)** formula:

Reduction (%) = 1- (No. in treatment plots after spray)/ (No. in treated plots before spray) × 100 (No. in control plots before spray)/ (No. in control plots after spray ×100).

Table 1. Tested treatments against *Scrobipalpa ocellatella* Boyd. and *Cassida vittata* Vill. under sugar beet field conditions during 2016/2017 and 2017/2018 seasons

Trade name	Chemical group or biological agent	Common name	Rate of application
C. carnea release	Insect predator	Green lacewing	5 larvae/plant
Tac 48% EC	Organophosphate	Chlorpyrifos	1 l/fad.
Diracomel 90% SP	Carbamate	Methomyl	300 g/fad.
Shalinger-super 24% SC	Pyrroles (New)	Chlorfenapyr	50 ml/100 l water

Identification of Specimens

Specimens of surveyed and the associated arthropod species; insect and spider predators were identified by the aid of Dr. Kamal Bazazo, assistant professor of Economic Entomology at the Department of Sugar Crops Research, Sakha Agricultural Research Station.

Statistical Analysis

Data obtained were statistically analyzed, by using MINITAB® software program (ver. 16), according to **Duncan (1955)**.

RESULTS AND DISCUSSION

Effect of Certain Treatments on the Population Size of *Scrobipalpa ocellatella* Boyd. and *Cassida vittata* Vill. Larvae and the Associated Arthropod Predators in Sugar Beet Fields

Three chemical compounds; Tac 48% EC, Diracomel 90% SP and Shalinger-super 24% SC belonging to different groups in addition to the role of the predatory insect, *C. carnea* were evaluated on the sugar beet moth, *S. ocellatella* and the tortoise beetle *C. vittata* as well as the common arthropod associated predators (insects and true spiders) in sugar beet fields during 2016/2017 and 2017/2018 seasons, at Kafr El-Sheikh Governorate.

Effect on the sugar beet moth, *S. ocellatella* larvae

Results presented in Table 2 refer to the effect of three chemical compounds and the predatory insect, *C. carnea* on the larval population size of *S. ocellatella* during two successive seasons (2016/2017 and 2017/2018).

In the first season (2016/2017), the tested insecticides (Tac 48% EC, Diracomel 90% SP and Shalinger-super 24% SC) induced overall mean reduction in the larval population size of, *S. ocellatella* with 91.00, 86.00 and 89.03%, respectively. While the release of the predatory insect, *C. carnea* destroyed and killed 57.13% (Table 2).

In the second season (2017/2018), results presented in Table 2 indicate that, all the tested compounds decreased the larval population size of *S. ocellatella* with 92.00, 90.00 and 92.13%, respectively. While the predatory insect, *C. carnea* killed 43.40% of the insect population.

Statistical analysis showed insignificant differences in the effect of the three used insecticides against *S. ocellatella* larvae in the two seasons of study. While significant differences between treatment of the predatory insect, *C. carnea* and each one of the three used insecticides were obtained in the two seasons.

Effect on the surveyed and associated arthropod predators (insects and true spiders)

As for the effect of the tested chemical compounds (Tac 48% EC, Diracomel 90% SP and Shalinger-super 24% SC) and the release of the predatory insect, *C. carnea* on the population size of the surveyed arthropod associated predators; *Coccinella undecimpunctata* Linneus, *Coccinella septempunctata* Reiche, *Scymnus interruptus* Goeze, *Chrysopela carnea* (Stephens), *Orius* sp., *Solenopsis* sp., *Monomorium* sp. and the surveyed associated predatory true spiders; *Araneus* sp., *Lycosa* sp., *Pardosa* sp., *Bathyphantes* sp., *Erigone* sp., *Dictyna* sp. and *Thomisius* sp. (Table 3) in sugar beet fields treated with the previous chemical compounds

Table 2. Reduction percentage in larval population of the insect pest, *Scrobipalpa ocellatella* Boyd. in sugar beet fields treated with certain chemical compounds and release of the predatory insect, *Chrysoperla carnea* (Stephens) during 2016/2017 and 2017/2018 seasons at Kafr El-Sheikh Governorate

Treatment	Rate of application	No. pre. spry	Reduction in population at indicated days after treatment				Overall mean (%)
			Initial effect (%)	Residual effect (%)			
			After 1 day	After 3 days	After 7 days	After 10 days	
			2016/2017 season				
***C. carnea* release**	5 larvae/plant	21	37.00	53.00	63.50	75.00	57.13b
Tac 48% EC	1L/fad.	23	96.20	93.33	88.00	86.00	91.00a
Diracomel 90% SP	300g./fad	20	91.20	89.00	83.00	80.30	86.00a
Shalinger-super 24% SC	50ml./100Lwater	24	96.31	90.42	88.40	81.00	89.03a
Control		23	26	30	33	35	-
			2017/2018 season				
***C. carnea* release**	5 larvae/plant	19	20.00	36.00	51.42	66.04	43.40b
Tac 48% EC	1L/fad.	19	95.00	91.00	92.00	90.00	92.00a
Diracomel 90% SP	300g./fad	18	95.00	86.00	91.50	86.00	90.00a
Shalinger-super 24% SC	50ml./100Lwater	21	95.50	92.00	93.00	88.00	92.13a
Control		20	21	23	26	31	-

Table 3. The surveyed arthropod predators (insects and true spiders) associated with sugar beet insect pests during 2016/2017 and 2017/2018 seasons at Kafr El-Sheikh Governorate

Order	Family	Common name	Scientific name
Coleoptera	Coccinellidae	Ladybird beetles	*Coccinella undecimpunctata* L. *Coccinella septempunctata* Reiche *Scymnus interruptus* Goeze
Neuroptera	Chrysopidae	Green lacewing	*Chrysopela carnea* Steph.
Hemiptera	Anthocoridae	Pirate bugs	*Orius* sp.
Hymenoptera	Formicidae	Ants	*Solenopsis* sp. *Monomorium* sp.
Araneae	Araneidae	Typical-orb weaver	*Araneus* sp.
	Lycosidae	Wolf spider	*Lycosa* sp. *Pardosa* sp.
	Linyphiidae	Sheet-Web spider	*Bathyphantes* sp. *Erigone* sp.
	Dictynidae	Mesh-Web wearers	*Dictyna* sp.
	Tomisidae	Crab spider	*Thomisius* sp.

and the release of *C. carnea* larvae during the two successive seasons of 2016/2017 and 2017/2018 at Kafr El-Sheikh Governorate is presented in Table 4.

In the first season (2016/2017), results presented in Table 4 clear that, the overall mean numbers of reduction in the population size of the surveyed and associated arthropod predators as a result of using the conventional insecticides (Tac, Diracomel and Shalinger-super) in sugar beet fields were 96.71, 96.55 and 96.55%, respectively. While in case of release the *C. carnea* larvae for biocontrolling larvae of, *S. ocellatella*, the population size of the associated arthropod predators (insects and true spiders) increased by 25.13%.

In the second season (2017/2018), the effect of chemical compounds (Tac, Diracomel and Shalinger-super) and the release of *C. carnea* larvae on the population size of the surveyed and associated common arthropod predators in sugar beet fields is shown in Table 4. Results revealed that the overall mean numbers of reduction in the population size of the surveyed and associated arthropod predators recorded 95.30, 94.00 and 92.00%, respectively. While the population size of the surveyed and associated arthropod predators increased by 70% due to the releasing of predatory insect, *C. carnea* larvae.

Effect on the sugar beet tortoise beetle, *C. vittata* larvae

In the first season (2016/2017), results presented in Table 5 show that, the chemical compounds; Tac 48% EC, Diracomel 90% SP and Shalinger-super 24% SC induced reduction percentage in larval population size of the insect pest, *C. vittata* in sugar beet fields with 91.00, 93.40 and 94.00%, respectively. While the release of *C. carnea* larvae for biocontrolling *C. vittata* larvae induced reduction by 49.00%.

In the second season (2017/2018), results presented in Table 5 clear that the percentage of reduction in larval population size of *C. vittata* in case of using the chemical compounds (Tac 48% EC, Diracomel 90% SP and Shalinger-super 24% SC) were 92.40, 94.10 and 94.33%, respectively. Also, results presented in Table 5 show that releasing of *C. carnea* larvae as a biocontrol agent induced reduction in the population size of the C. vittata larvae by 45.13%.

Statistical analysis of the obtained data of 2016/2017 and 2017/2018 seasons revealed insignificant differences in the effect of the three used insecticides against *C. vittata* larvae in the two seasons. While significant differences between releasing of *C. carnea* larvae and each one of the considered three insecticides were found.

Effect on the surveyed and associated arthropod predators (insects and true spiders)

In the first season (2016/2017), results in Table 6 reveal that the overall mean percent of reduction in the population size of the surveyed and associated arthropod predators (insects and true spiders) as a result of application the different control treatments (chemical compounds and the predatory insect, *C. carnea*) in sugar beet fields for controlling *C. vittata* larvae, recorded 97.40, 96.30 and 95.00%, respectively. While the population size of the associated arthropod predators (released) *C. carnea* and (non-released) such as true spiders and other common predatory insects increased by 22.00% as a result of releasing *C. carnea* in sugar beet fields.

In the second season (2017/2018) results presented in Table 6 indicate that the overall mean percentages of reduction in the population size of the surveyed and associated arthropod predators previously mentioned in Table 3 as a result of using the chemical compounds against *C. vittata* larvae were 96.00, 94.00 and 93.30%, respectively. While the releasing of *C. carnea* larvae induced increasing in the population size of the associated arthropod predators by 44.13%.

With regard to the effect of the conventional insecticides, the obtained results agree with the findings of **Maareg *et al.* (1993)** who found that the soluble powder (SP) formulation of methomyl (Methavine and Lannate) was more effective on larvae, pupae and adult of *C. vittata*. Also **Abd El-Gawad (2007)** mentioned that the chemical insecticides were the most effective against *C. vittata* and *S. ocellatella* and their associated predators (*C. udecimpunctata*, *C. carnea* and *Paederus alfierii* Fabricius).

Table 4. Increasing and reduction percentages in the population size of the surveyed arthropod predators (insects and true spiders) as a result of releasing the larvae of *Chrysoperla carnea* (Stephens) and using of the conventional insecticides against *Scrobipalpa ocellatella* Boyd. larvae during 2016/207 and 2017/2018 seasons at Kafr El-Sheikh Governorate

Treatment	Rate of application	No. pre. spry	Increasing and reduction in population at indicated days after treatment (%)				Overall mean (%)
			Initial effect (%)	Residual effect (%)			
			After 1 day	After 3 days	After 7 days	After 10 days	
2016/2017 season							
Increasing percentages							
***C. carnea* release**	5 larvae/plant	32	9.400	19.00	28.13	44.00	25.13
Reduction percentages							
Tac 48% EC	1 L/fad.	33	100	97.42	95.42	94.00	96.71
Diracomel 90% SP	300 g./fad.	34	100	98.00	96.00	92.20	96.55
Shalinger-super 24% SC	50 ml./100 L water	34	100	98.00	96.00	92.20	96.55
Control		34	36	40	45	51	-
2017/2018 season							
Increasing percentages							
***C. carnea* release**	5 larvae/plant	30	26.00	57.00	83.33	113.33	70.00
Reduction percentages							
Tac 48% EC	1 L/fad.	31	100	94.00	93.00	94.00	95.30
Diracomel 90% SP	300 g./fad.	31	100	92.00	93.00	91.00	94.00
Shalinger-super 24% SC	50 ml./100 L water	31	100	90.00	88.00	89.40	92.00
Control		31	39	48	56	66	-

Table 5. Reduction percentage in larval population of the insect pest, *Cassida vittata* Vill. in sugar beet fields treated with certain chemical compounds and release of the predatory insect, *Chrysoperla carnea* (Stephens) during 2016/2017 and 2017/2018 seasons at Kafr El-Sheikh Governorate

Treatment	Rate of application	No. pre. Spry	Reduction in population at indicated days after treatment (%)				Overall mean (%)
			Initial effect (%)	Residual effect (%)			
			After 1 day	After 3 days	After 7 days	After 10 days	
2016/2017 season							
***C. carnea* release**	5 larvae/plant	18	19.20	42.22	63.00	71.00	49.00b
Tac 48% EC	1 L/fad.	19	100	92.00	86.00	85.00	91.00a
Diracomel 90% SP	300 g./fad.	19	100	96.00	89.50	88.00	93.40a
Shalinger-super 24% SC	50 ml./100 L water	19	100	96.00	93.00	85.00	94.00a
Control		20	22	25	30	34	-
2017/2018 season							
***C. carnea* release**	5 larvae/plant	23	20.00	37.40	51.10	72	45.13b
Tac 48% EC	1 L/fad.	22	100	96.40	90.00	83.00	92.40a
Diracomel 90% SP	300 g./fad.	24	100	97.00	94.00	85.30	94.10a
Shalinger-super 24% SC	50 ml./100 L water	24	100	93.33	91.00	93.00	94.33a
Control		24	26	30	32	37	-

Table 6. Increasing and reduction percentages in the population size of the surveyed arthropod predators (insects and true spiders) as a result of releasing the larvae of *Chrysoperla carnea* (Stephens) and using of the conventional insecticides against *Cassida vittata* Vill. larvae during 2016/207 and 2017/2018 seasons at Kafr El-Sheikh Governorate

Treatment	Rate of application	No. pre. Spry	Increasing and reduction in population at indicated days after treatment (%)				Overall mean (%)
			Initial effect (%)	Residual effect (%)			
			After 1 day	After 3 days	After 7 days	After 10 days	
2016/2017 season							
Increasing percentages							
***C. carnea* release**	5 larvae/plant	31	3.23	16.13	29.03	39.00	22.00
Reduction percentages							
Tac 48% EC	1 L/fad.	29	100	97.04	97.30	95.20	97.40
Diracomel 90% SP	300 g/fad.	29	97.04	95.00	93.00	97.04	96.30
Shalinger-super 24% SC	50 ml./100 L water	29	100	97.04	92.00	90.40	95.00
Control		30	32	35	38	43	-
2017/2018 season							
Increasing percentages							
***C. carnea* release**	5 larvae/plant	29	14.00	34.50	52.00	76.00	44.13
Reduction percentages							
Tac 48% EC	1 L/fad.	28	100	95.00	93.30	94.10	96.00
Diracomel 90% SP	300 g/fad.	28	100	92.40	91.03	92.13	94.00
Shalinger-super 24% SC	50 ml./100 L water	27	100	92.12	91.00	90.00	93.30
Control		27	31	38	43	49	-

Attia (2009) showed that Oxime Carbamate Methomyl had the greatest reduction of *C. vittata* population. Concerning the efficacy of *C. carnea* for biocontrolling various insect pests in the sugar beet fields, the obtained results agree with those of **El-Khouly (2006)** who indicated that the high densities of *C. carnea* coincided with the high densities of *C. vittata* (larvae) and *P. mixta* (eggs and larvae) in sugar beet fields. **Aziza *et al.* (2007)** recommended *C. carnea* larvae for using in Integrated Pest Management (IPM) programs. Also **Ghanim *et al.* (2011)** indicated that *C. carnea* is one of the most beneficial and prolific predators found in field crops in many parts of the world. The larval stages can feed on aphids, thrips, mites, scale insects, mealybugs, whiteflies, leafhoppers and other insects. Also **Shalaby (2012)** showed that the release of *C. carnea* larvae reduced the population densities of the major sugar beet insect pests by 3.51-35.97%. The most reduced populations, due to release, were those of aphid (35.97%), *Bemisia tabaci* Genn. (35.22%) and *C. vittata* larvae (33.18%). **Abbas (2018)** reported that the general means of reduction of *C. vittata* larvae in the first release of *C. carnea* at rates of 3 larvae/plant, 5 larvae/plant and 7 larvae/plant were 34.50, 47.50 and 41.60%, respectively. While, in the second release at the same rates the general means of reduction were; 12.30, 22.80 and 19.00%, respectively. On the other hand, the use of the insecticides, Tak 48% EC, Sumithion 50% EC and Marshal 20% EC had a very strong effect on sugar beet pests and their natural enemies on sugar beet plants.

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دور إطلاق أسد المن فى المكافحة الحيوية ليرقات خنفساء البنجر السلحفائية وفراشة البنجر وفى زيادة أعداد المفترسات الحشرية والعناكب بالمقارنة بالمبيدات الحشرية في حقول بنجر السكر

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أجريت الدراسة الحالية فى المزرعة البحثية لمحطة البحوث الزراعية بسخا، محافظة كفر الشيخ خلال موسمى ٢٠١٧/٢٠١٦ و٢٠١٨/٢٠١٧ وذلك لمعرفة كفاءة إطلاق يرقات أسد المن ضد يرقات كل من فراشة البنجر وخنفساء البنجر في حقول بنجر السكر وفى نفس الوقت معرفة دور الإطلاق فى زيادة أعداد المفترسات الحشرية (أسد المن، أبو العيد والنمل) وكذلك العناكب الحقيقية بالمقارنة بالمبيدات التقليدية (تاك ٤٨% ، ديراكوميل ٩٠% وشالنجر سوبر ٢٤%)، أوضحت النتائج ما يلي: أحدثت المبيدات التقليدية انخفاضا فى تعداد يرقات فراشة البنجر بنسب ٩١,٠٠ ، ٨٦,٠٠ و ٨٩,٠٣% فى موسم ٢٠١٧/٢٠١٦ ، ٩٢,٠٠ ، ٩٠,٠٠ ، ٩٢,١٣% فى موسم ٢٠١٨/٢٠١٧ على التوالى بينما أحدثت المبيدات الكيميائية انخفاضا فى تعداد يرقات خنفساء البنجر بنسب ٩١,٠٠، ٩٣,٤٠ و٩٤,٠٠% فى موسم ٢٠١٧/٢٠١٦ و٩٢,٤٠ ، ٩٤,١٠ و٩٤,٣٣% فى موسم ٢٠١٨/٢٠١٧ على التوالي، أيضا أحدثت المبيدات الكيميائية و المستخدمة ضد يرقات فراشة البنجر انخفاضا فى تعداد المفترسات في موسم ٢٠١٧/٢٠١٦ بنسب ٩٦,٧١ ، ٩٦,٥٥ ، ٩٦,٥٥% وفي موسم ٢٠١٨/٢٠١٧ بنسب ٩٥,٣٠ ، ٩٤,٠٠ و٩٢,٠٠% على التوالي، ونتج عن استخدام المبيدات الكيميائية ضد يرقات خنفساء البنجر انخفاضاً فى تعداد المفترسات المصاحبة لحقول بنجر السكر بنسب ٩٧,٤٠ ، ٩٦,٣٠ ، ٩٥,٠٠% خلال موسم ٢٠١٧/٢٠١٦ و٩٦,٠٠ ، ٩٤,٠٠ و ٩٣,٣٠ خلال موسم ٢٠١٨/٢٠١٧على التوالي، أحدث إطلاق يرقات مفترس أسد المن انخفاض فى تعداد فراشة البنجر بنسب ٥٧,١٣ و٤٣,٤٠% و لخنفساء البنجر بنسب ٤٩,٠٠ و٤٥,١٣% خلال الموسمين الأول و الثاني على التوالي، أيضا أحدث إطلاق يرقات أسد المن زيادة فى أعداد المفترسات الحشرية والعناكب بنسب ٢٥,١٣ ، ٢٢,٠٠% فى موسم ٢٠١٧/٢٠١٦ وخلال موسم ٢٠١٨/٢٠١٧ أحدث زيادة بنسب ٧٠,٠٠ و٤٤,١٣%، أخيراً توضح النتائج السابقة أن إطلاق يرقات أسد المن يعتبر أحد العوامل الهامة فى المكافحة الحيوية ليرقات كل من فراشة البنجر وخنفساء البنجر وفى نفس الوقت المساهمة فى زيادة أعداد المفترسات الحشرية والعناكب وذلك بالمقارنة بالمبيدات التقليدية علاوة على الحفاظ على البيئة من التلوث.

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