EGYPTIAN ACADEMIC JOURNAL OF
BIOLOGICAL SCIENCES
ENTOMOLOGY

A

ISSN
1687-8809

WWW.EAJBS.EG.NET

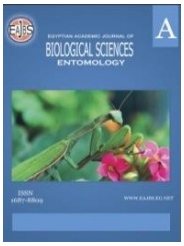
Vol. 16 No. 1 (2023)

Citation: *Egypt. Acad. J. Biolog. Sci. (A. Entomology) Vol. 16(1) pp.179-188 (2023)*
DOI: 10.21608/EAJBSA.2023.295060

Egypt. Acad. J. Biolog. Sci., 16(1):179-188(2023)

Egyptian Academic Journal of Biological Sciences
A. Entomology

ISSN 1687- 8809
http://eajbsa.journals.ekb.eg/



Survey, Population Density and Food Preference of Predatory Formicid Species on *Scrobipalpa ocellatella* Boyd. Life Cycle Stages under Egyptian Sugar Beet Fields

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ARTICLE INFO
Article History
Received:21/1/2023
Accepted:11/3/2023
Available:16/3/2023

Keywords:
Scrobipalpa ocellatella, Hymenoptera, Formicidae, Sugar beet, Fields.

ABSTRACT

The current study was carried out at the Experimental Farm of Sakha Agricultural Research Station during three cultivations in 2018/19 and 2019/20 seasons. The present study includes a survey of the predatory formicid species associated with the beet moth, *Scrobipalpa ocellatella* Boyd. larvae in sugar beet fields. The obtained results showed larvae numbers of *S. ocellatella* increased towards the end of the season and formicid populations were synchronous with that of *S. ocellatella* in the three cultivations. The simple correlation coefficient values between *S. ocellatella* larvae population and the predatory formicid populations were very highly positive significant in the two seasons. Five predatory formicid species were recorded belonging to the family Formicidae under the order Hymenoptera, three of them were: *Tetramorium depressiceps* Menozzi, *Tetramorium brevicoryne* Brondroit and *Camponotus thoracicus* (Fah.) recorded by high percentages. While the other two formicid species: *Tapinoma simrothi* Krausse and *Solenopsis latro* L. recorded low percentages. As for predation and food preference, the predatory formicid species prefer *S. ocellatella* larvae to eggs and pupae throughout the three sugar beet cultivations during the two seasons of study. These results proved that formicid species are important predators to *S. ocellatella* larvae. There for the current investigation aimed to add some contributions to the knowledge of the predatory formicid species as natural biological control agents in Egyptian sugar beet fields.

INTRODUCTION

Sugar beet, *Beta vulgaris* L. is the second main source of sugar after sugar cane in Egypt and all over the world. According to the statistics of the Ministry of Agriculture and Land Reclamation in Egypt, the total area cultivated with sugar beet in 2020 was about 650 thousand feddans of which 24% was cultivated in Kafr El-Sheikh Governorate (Anonymous 2021).

Sugar beet plantations are often subject to considerable insect infestations that affect crop quality and quantity. Plants of sugar beet are usually subject to infestation with a variety of insect pests during their different growth stages thus causing them appreciable yield losses. Among these pests is the sugar beet moth, *Scrobipalpa ocellatella* Boyd. (Lepidoptera: Gelechiidae) that only attacks sugar beet, fodder and wild beet (Kheiri, 1991; Mahmoudi *et al*., 2012 and Ahmadi *et al.,* 2018).

The first two larvae instars of *S. ocellatella* attack the edge of the young leaves causing them to get curly and turn black, but the next ages larvae feed on the terminal of petioles and central shoot which is the main inhabitant of this pest and leave excrement and fibers. When central shoots are fully rotted and destroyed, the larvae penetrate into the core of the plant and make tunnels in the apex of the roots and the parts that are out of the soil surface. This pest ceases the growth of the plants and so, root weight and sugar content as well as sugar extraction percentage are decreased. Most weak plants are turned yellow and wilt by this pest. Also, the feeding by this pest facilitates the invasion of plant pathogens resulting in heavy damage (Kheiri, 1991).

In Egyptian sugar beet fields, Abo-Saied Ahmed (1987) detected larvae of *S. ocellatella* on young sugar beet plants of mid-November plantation, and the insect continued active until June. The larvae numbers gradually increased and reached the highest level at harvest time. Severe infestation of sugar beet with this insect caused a significant reduction of 38.20 and 52.40% in root weight and sugar content, respectively. Also, El-Khouly *et al.*, (2011) indicated that the infestations with *S. ocellatella* appeared at the end of December in a few numbers and increased gradually to reach a peak in May which recorded 175 and 187 larvae/50 plants in two seasons, respectively. Abdel Rahman (2018) showed that in recent years, the sugar beet moth has become a serious pest of sugar beet. The infestation by this insect was observed in the 4th week of November and in the 3rd week during two seasons, respectively. The population increased from November to May from 4 to 115 larvae/ 80 plants. Shalaby (2001) Found that the averages of the larval population of *S. ocellatella* were 11.83, 16.50 and 33.60 larvae/5 plants for September, October and November plantations, respectively.

Fortunately, the sugar beet ecosystem has several natural enemies that should be conserved to keep the natural balance in fields (Talha, 2001 and Hendawy, 2009).
In Egypt, the status of insect predators and parasitoids in sugar beet fields was investigated by several authors (Abo-Saied Ahmed, 1987; Youssef, 1994; El-Agamy, *et. al.*, 1996; Awadalla, 1997; Abou-Attia, 1999; Bazazo, 2005 and Fatma H. Hegazy and El-Sheikh, 2021)

Formicid species are very effective biocontrol agents for several reasons; colonies contain large numbers of individuals that consume large populations of prey and their predation is not limited to a particular prey species or stage (Paulson and Burts, 1993). As well, in many countries, several studies have demonstrated that ants can be key generalist predators of crop pests (El-Keroumi *et al.*, 2010; Fernandes *et al.*, 2010 and Sanders & Van Veem, 2011). Wu *et al.*, (2013) and Chandish and Verghese (2015), demonstrated that formicid species are important predators of Lepidoptera eggs and larvae. Also, Diame *et al.*, (2018) reported that ants play a major role in regulating crop-damaging insects. But, as a matter of fact, literature on the formicid species associated with sugar beet insect pests and its role as a biological control agent in regulating population insect pests in sugar beet fields in Egypt, is very little and required more investigations.

Therefore, the aim of the present study was to investigate the seasonal abundance of *S. ocellatella* larvae and its associated formicid species predators throughout the three sugar beet cultivations in the two study seasons. Also, survey, predation and food preference by formicid species on the different stages of *S. ocellatella* at the same time of the study.

MATERIALS AND METHODS

1-Seasonal Abundance of *S. ocellatella* Larvae and Its Associated Predatory Formicid Species:

This study was done at the Experimental Farm of Sakha Agricultural Research

Station during two successive seasons; 2018/19 and 2019/20. The experimental field of about a half feddan was sown with Sahar cultivar on 15th August, 15th September and 15th October for the three cultivations, respectively. The experimental field received normal cultural practices, but without insecticides. Biweekly samples were taken till harvest from 1 November to 15 February, 30 November to 15 March and 30 December to 15 April for three cultivations, respectively in 2018/19. Also, from 2 November to 15 February, 30 November to 15 March and 30 December to 15 April for three cultivations, respectively in 2019/20.

On sampling, a Plastic bag was converted on a sugar beet plant to harbor the whole plant which was cut at the soil surface. The bag was tightly tied at the bottom and transferred to the laboratory for further procedures. At each sampling date, 5 bags were used to confine 5 sugar beet plants. In the laboratory, a piece of cotton saturated with chloroform was introduced into every bag for about 30 minutes to anesthetize the confined insects. Then, the larvae of *S. ocellatella* and formicid species were counted and recorded. The formicid species were kept in glass vials in 70% ethyl alcohol and some drops of glycerin for identification at the plant protection Research Institute, Agricultural Research Center, Egypt.

2-Predation and Food Preference by Different Formicid Species on Different Stages of *S. ocellatella* under Sugar Beet Field Conditions:

This experiment was based on field observation by continuously watching and monitoring the different predatory formicid species attacking and feeding on different life cycle stages (egg, larvae and pupae) of *S. ocellatella* on the infested sugar beet plants. This experiment was carried out at a particular time, in the morning from 9.00 to 12.00 a.m. because ants were most active in the morning (Oliveira *et. al*., 2012). The samples were taken on the same dates of seasonal abundance of formicid species and *S. ocellatella* larvae by using a fine brush or aspirator, the formicid species (during their feeding on eggs, larvae and pupae) were collected separately at every stage in vials containing 70% ethyl alcohol. The numbers of ant species and eggs, larvae and pupae of *S. ocellatella* were recorded on every date of inspection.

Statistical Analysis:

The correlation coefficient values between *S. ocellatella* numbers and its formicid species were calculated using the SPSS statistical software package 16.0 (SPSS Inc., Chicago, IL, USA)

RESULTS

1-Seasonal Abundance of *S. ocellatella* Larvae and Its Associated Predatory Formicid Species:

In 2018/19 season, data summarized in Table (1) cleared that, for the three sugar beet cultivations collectively, the population of *S. ocellatella* larvae appeared with very few individuals then the population density of larvae slightly gradually increased toward the end of cultivation. The average number throughout the season in the first cultivation was 2.87 larvae/5 plants, which increased to 3.87 and 7.62 larvae in the second and third cultivation, respectively.

Concerning, the predatory ant species inhabiting three sugar beet cultivations collectively, appeared in low numbers and then increased gradually to the end of the season. The ants' average numbers in the first cultivation were 4.37 individuals/5 plants, which increased to 5.37 and 8.25 individuals during the second and third cultivations, respectively.

Similar results were obtained in 2019/20 season shown in Table (2). The results obtained took the same direction as what happened in the first season. The average number throughout the season in the first cultivation was 2.75, 3.75 and 6.62 larvae/5 plants for the three cultivations, respectively. While, in the case of the predatory formicid species the

average numbers of ants were 4.75, 5.12 and 7.50 individuals/5 plants for the three cultivations, respectively.

Table 1: Seasonal abundance of *S. ocellatella* larvae and its associated predatory formicid species in sugar beet fields during 2018/19 season.

Sampling Date	1st Cultivation		2nd Cultivation		3rd Cultivation	
	Mean of larvae/5 plants	Mean of Formicids/5 plants	Mean of larvae/5 plants	Mean of Formicids/5 plants	Mean of larvae/5 plants	Mean of Formicids/5 plants
1/11	0.00	1.75±0.33	-	-	-	-
15/11	1.33±0.33	3.00±0.57	-	-	-	-
30/11	1.67±0.33	3.25±1.20	0.00	1.75±0.66	-	-
15/12	2.33±0.88	2.25±0.33	1.67±0.33	3.25±0.88	-	-
30/12	4.00±0.57	5.25±0.66	2.33±0.66	3.25±0.33	1.00±0.57	1.75±0.66
15/1	4.33±0.88	6.00±1.00	4.33±0.88	5.00±0.57	1.33±0.33	3.25±0.66
30/1	5.00±0.57	6.75±0.88	4.67±0.33	4.25±0.88	2.33±0.33	3.25±0.88
15/2	6.33±0.66	7.25±1.20	5.00±1.15	6.00±0.57	3.67±0.33	3.75±1.15
28/2	Harvest	Harvest	6.33±1.20	7.25±0.33	4.00±0.57	8.25±1.45
15/3	-	-	7.00±1.00	13.25±1.20	12.67±0.88	12.25±1.45
30/3	-	-	Harvest	Harvest	18.33±1.20	13.5±1.20
15/4	-	-	-	-	20.67±1.45	22.25±2.03
Total	25.00±2.89	35.66±2.33	31.33±2.91	44.00±1.67	64.00±3.06	68.25±4.93
Mean/season	3.12±0.36	4.46±0.29	3.92±0.36	5.55±0.20	8.00±0.38	8.53±0.62

Table 2: Seasonal abundance of *S. ocellatella* larvae and its associated predatory formicid species in sugar beet fields during 2019/20 season.

Sampling Date	1st Cultivation		2nd Cultivation		3rd Cultivation	
	Mean of larvae/5 plants	Mean of Formicids/5 plants	Mean of larvae/5 plants	No. of Formicids	Mean of larvae/5 plants	Mean of Formicids/5 plants
2/11	0.00	1.67±0.33	-	-	-	-
16/11	0.67±0.33	2.33±0.33	-	-	-	-
30/11	1.33±0.33	3.00±0.75	0.00	2.00±0.57	-	-
15/12	2.67±0.33	4.33±0.66	0.00	2.33±0.33	-	-
30/12	3.33±0.33	5.00±1.00	2.67±0.33	4.00±0.57	0.67±0.33	2.00±0.57
15/1	4.00±0.57	5.33±0.66	3.67±0.88	5.33±0.66	2.00±0.57	2.33±0.33
30/1	5.00±0.57	7.33±0.88	4.00±0.57	5.33±1.20	3.33±0.33	4.00±0.57
15/2	5.33±0.66	9.67±1.76	6.33±0.66	7.00±0.57	4.00±0.57	4.67±0.88
28/2	Harvest	Harvest	6.33±0.33	7.33±0.88	7.67±1.33	9.33±1.20
15/3	-	-	7.33±1.20	9.33±0.88	9.33±0.66	9.33±0.88
30/3	-	-	Harvest	Harvest	12.67±1.20	14.33±1.20
15/4	-	-	-	-	15.33±1.20	16.67±1.86
Total	22.33±1.20	38.67±5.24	30.33±2.91	42.67±0.88	55±2.89	62.67±3.48
Mean/season	2.79±0.15	4.83±0.65	3.79±0.36	5.33±0.11	6.87±0.36	7.83±0.43

Data in Table (3**)** demonstrated that the population of predatory formicid species seemed to be the major on the populations of *S. ocellatella* larvae, thought the whole growing season of the three sugar beet cultivations from the beginning of Nov. to the mid of Apr. during the two study seasons. Results refer that, the Predator-Prey ratio ranged between (1: 0.33 to 1: 1.00), (1: 0.33 to 1: 1.25), and (1: 0.33 to 1: 1.38) during the three cultivations in 2018/19. While were (1: 0.33 to 1: 0.80), (1: 0.75 to 1: 0.85) and (1: 0.50 to 1: 1.00) throughout the three cultivations, respectively in 2019/20. The overall ratio was 1: 0.65, 1: 0.72 and 1: 0.92 during three cultivations, respectively in 2018/19. While was 1: 0.78, 1: 0.73 and 1: 0.88 during three cultivations, respectively in 2019/20.

Table 3: Predator-prey ratio of formicid species population and *S. ocellatella* larvae in sugar beet fields during 2018/19 and 2019/20 seasons.

2018/2019 season			2019/2020 season		
1st Cultivation	2nd Cultivation	3rd Cultivation	1st Cultivation	2nd Cultivation	3rd Cultivation
-	-	0.57	-	-	0.33
0.44	0.51	0.41	0.29	-	0.86
0.51	0.72	0.72	0.44	0.67	0.83
1.04	0.87	0.98	0.62	0.69	0.86
0.76	1.10	0.48	0.67	0.75	0.82
0.72	0.83	1.03	0.75	0.90	1.00
0.74	0.87	1.36	0.68	0.86	0.88
0.87	0.53	0.93	0.55	0.79	0.92
1: 0.70	1: 0.71	1: 0.94	1: 0.58	1: 0.71	1: 0.88

A highly significant correlation coefficient values between *S. ocellatella* numbers and its predatory formicid species values of "r" were 0.811, 0.712 and 0.911 for the three cultivations, respectively in 2018/19 season. While were 0.801, 0.823 and 0.951 for the three cultivations, respectively in 2019/20 season shown in Table (4). This analysis was calculated, considering population fluctuations of the two study seasons and presented in Tables (1 and 2).

Table 4: Correlation coefficient values (r) between *S. ocellatella* larvae and its associated predatory formicid species in sugar beet fields during three cultivations during 2018/19 and 2019/20 seasons.

Seasons	"r" Values		
	1st Cultivation	2nd Cultivation	3rd Cultivation
2018/2019	0.956**	0.848**	0.949**
2019/2020	0.955**	0.984**	0.994**

2-Survey of Predatory Formicid Species in Sugar Beet Fields:

Data in Table (5) show that 5 species occurring in sugar beet fields during 2018/19 and 2019/20 seasons in the three cultivations the relative occurrence of a species related to the other species was calculated *T. depressiceps* (31.42, 27.90 and 30.30%), *T. bervicoryne* (28.57, 27.90 and 30.30%) and *C. thoracicus* (28.57, 25.58 and 28.78%) were the most dominant species during the three cultivations, respectively in 2018/19 season. Very low percentages were detected for the remaining species; *T. simrothi* (5.71, 6.97 and 4.54%) and *S. latro* (5.71, 11.62 and 4.54%) in the three cultivations, respectively.

The corresponding percentages of the second season were; *T. depressiceps* (28.94, 29.26 and 30.00%), *T. brevicoryne* (26.31, 29.26 and 31.66%) and *C. thoracicus* (28.94, 31.70 and 30.00%) followed by *T. simrothi* (7.87, 2.43 and 5.00%) and *S. latro* (7.89, 7.31 and 3.33%) in the three cultivations, respectively.

3-Predation and Food Preference of Predatory Formicid Species on *S. ocellatella* Life Cycle Stages under Sugar Beet Field Conditions:

Data presented in Table (6) revealed that formicid species prefer larvae to eggs and pupae for preying on them during the three cultivations in the two seasons. In 2018/19 season the total number of individuals of *S. ocellatella* that were preyed by formicid species were 14, 16 and 33 during three cultivations, respectively. Also, most of the prey was larvae with 71.42, 68. 75 and 84.84 % during three cultivations, respectively.

As, in 2019/ 20 seasons, the total number of individuals of this insect were preyed by formicid species was 13, 23 and 35. Most of the prey was larvae with 84.61, 100 and 85.71% during three cultivations, respectively. Low percentages were noticed for eggs and pupae during the three cultivations in two seasons.

Table 5: Survey of predatory formicid species in sugar beet fields during 2018/19 and 2019/20 seasons in the three cultivations.

Order	Family	2018/2019 season						
		Species	1st Cultivation		2nd Cultivation		3rd Cultivation	
			No.	%	No.	%	No.	%
Hymenoptera	Formicidae	*T. depressiceps*	11.00±1.15	30.84±2.00	12.33±1.20	28.03±2.40	21.00±1.53	30.73±1.05
		T. brevicoryne	10.33±1.33	28.97±2.77	12.00±0.57	27.27±1.17	20.67±0.88	30.25±2.33
		C. thoracicus	10.00±0.58	28.04±2.55	11.33±0.88	25.76±2.12	19.67±1.76	28.78±2.06
		T. simrothi	2.33±0.33	6.54±1.23	3.33±0.66	7.58±1.52	3.33±0.88	4.88±1.12
		S. latro	2.00±0.57	5.61±1.66	5.00±0.57	11.36±1.46	3.67±0.33	5.37±0.60
		Total	35.66±1.45	-	44±0.58	-	68.33±2.73	-
		2019/2020 season						
		Species	1st Cultivation		2nd Cultivation		3rd Cultivation	
			No.	%	No.	%	No.	%
		T. depressiceps	11.33±1.20	29.31±2.06	12.33±0.88	28.90±1.90	18.67±1.20	29.79±1.81
		T. brevicoryne	10.00±1.00	25.86±3.13	12.00±1.15	28.12±1.38	19.67±1.20	31.38±1.81
		C. thoracicus	11.00±1.15	28.45±1.18	13.67±0.88	32.03±3.18	18.33±1.45	29.25±1.85
		T. simrothi	3.33±0.66	8.62±1.51	1.00±0.57	2.34±1.34	3.67±0.88	5.85±1.51
		S. latro	3.00±1.15	7.76±2.43	3.67±0.66	8.59±1.20	2.33±0.33	3.72±0.49
		Total	38.67±3.71	-	42.67±2.03	-	62.67±1.33	-

Table 6: Predation and food preference for predatory formicid species on eggs, larvae and pupae of *S. ocellatella* under sugar beet field conditions during 2018/19 and 2019/20 seasons.

2018/2019 season						
Stage	1st Cultivation		2nd Cultivation		3rd Cultivation	
	No. prey	% predation	No. prey	% predation	No. prey	% predation
Eggs	2.33±0.66	15.56±4.54	3.00±0.57	18.00±2.84	4.00±1.00	11.88±2.74
larvae	10.67±1.33	71.11±6.94	11.33±0.88	67.99±6.49	28.33±1.76	84.15±4.67
Pupae	2.00±0.57	13.33±4.38	2.33±0.66	14.00±3.87	1.33±0.66	3.96±1.94
Total	15±0.58	-	16.67±0.66	-	33.67±2.19	-
2019/2020 season						
stage	1st Cultivation		2nd Cultivation		3rd Cultivation	
	No. prey	% predation	No. prey	% predation	No. prey	% predation
Eggs	1.33±0.66	10.00±5.32	0.00	0.00	2.67±0.33	7.62±0.91
larvae	11.00±1.73	82.52±5.47	23.33±2.60	100.00±0.00	30.33±2.96	86.67±2.78
Pupae	1.00±0.00	7.50±0.96	0.00	0.00	2.00±0.57	5.71±1.86
Total	13.33±1.86	-	23.33±2.60	-	35.00±3.00	-

DISCUSSION

Based on the results from the study, the population of *S. ocellatella* larvae increased progressively towards the end of sugar beet plantations. Similar results, concerning the seasonal abundance of *S. ocellatella* were obtained by Abo-Saied Ahmed (1987) and Bassyouny (1993) they reported that the population density of *S. ocellatella* gradually increased until reached the highest population at harvest time for all plantation dates of sugar beet crop. As, Abd El-Ghany (1995) found the larval population of *S. ocellatella* larval population was very low at relatively low temperatures, while the highest population was detected from May to August. Also, El-Dessouki *et al*., (2014) reported that sugar beet plants harbored three main insect species: *C. vittate*, *P. mixta* and *S. ocellatella* and the highest infestation with these species occurred from May to April. Bazazo and Ibrahim (2019) found that the population of *S. ocellatella* pupae increased gradually to reach the highest population of 24, 36, and 36 pupae/40 infested petioles on Feb. 18th, Mar. 11th and Apr. 9th for the three sugar beet cultivations, respectively.

Also, increasing in formicid species numbers coincided with that of *S. ocellatella* in the two study seasons and the simple correlation coefficient values between *S. ocellatella*

larvae populations and corresponding predatory formicid species populations during the two study seasons were very high positive significant correlations. In Egypt, literature on the predatory formicid fauna associated with sugar beet insect pests is very few and the available knowledge related to this topic was given by Shenishen (2009), Bazazo (2010) and Ibrahim (2015). As well, until recently, until recently under the Egyptian sugar beet field conditions, predaceous ants in biological control of sugar beet insect pests have received very little attention, but abroad many investigations related to this topic on different crops are available such as Paulson and Burts (1993) in the USA, reported that predatory formicid species are effective bio-control agent because their colonies contain huge populations of individuals, that predate large populations of prey. Also, Choate and Frank (2011) in South Dakota, USA, mentioned that ants positively impact agricultural systems by rapidly consuming large numbers of pest insects, disturbing pests during feeding and oviposition and increasing soil quality and nutrients. Also, Oliveira *et al.,* (2012) in Brazil, recorded that, the fire ant, *Solenopsis Saevissima* (Smith), was a potentially important predator against the sugar cane borer, *Diatraea saccharalis* (Lepidoptera: Crambidae).

According to the results of the study, the survey revealed the occurrence of five predatory ants species belonging to the family Formicidae and order Hymenoptera. The results more or less agree with the findings of a group of investigations conducted on sugar beet and other crops in Egypt as well as abroad. El-Sherif *et al.,* (1994) observed some individuals of ants belonging to Formicidae in faba bean fields. in Brazil, Bownes (2002) demonstrated that Formicidae can be key generalist predators of crop pests in different parts of the world. Shenishen (2009) recorded three formicid species from clover fields and one species from faba bean fields. As Bazazo (2010) detected eight predatory formicid species associated with sugar beet insect pests. Also, Oliveira *et al.,* (2012) assessed the diversity and species composition of ants in sugar cane. Ibrahim (2015) surveyed the predatory formicid, *Soelonopses* sp. in tomato summer and winter plantations in El-Suez governorate, under organic farming.

The data in the two study seasons indicated that the predatory formicid species prefer *S. ocellatella* larvae to eggs and pupae stages as a source for feeding. While Paulson and Burts (1993) they reported that formicid species are very effective bio-control agents and their predation is not limited to a particular prey species or stage. The results agree with the finding of findings of Numez *et al.,* (2001), Lenda *et al.,* (2013) and Wu *et al.,* (2013) recorded that formicid species are highly effective predators of Lepidoptera stages (eggs, larvae and pupae). Also, Silva – Torres *et al.,* (2010) found larvae of *Cnaphalocrocis medinalis* (Lepidoptera: Pyralidae) and *Plutella Xylostella* (Lepidoptera: Plutellidae) attacked by adults of the predatory ant *Pheidole* sp. the same ant was reported as pupal natural predator suppressing the populations of *Tuta absoluta* (Lepidoptera: Gelechiidae) (Oztemiz, 2012). As, Oliveira *et al*., (2012) mentioned, the greatest number of ants were collected from baits consisting of immature stages of sugarcane borer, *Diatraea saccharalis*.

Conclusions

According to the study results, the population of beet moth, *S. ocellatella* larvae and its predatory formicid species increased with the progression of the season until the harvest in the two study seasons 2018/19 and 2019/20. The correlation coefficient values were very high significant between *S. ocellatella* larvae and its predatory formicid species. The presence of 5 predatory formicid species belonging to the family formicidae under the order Hymenoptera: *Tetramorium depressiceps* Menozzi, *Tetramorium brevicoryne* Brondroit, *Camponotus thoracicus* (Fah.), *Tapinoma simrothi* Krausse and *Solenopsis latro* L. were the dominant formicids. Also, found that the predatory formicid species prefer the larval stage of *S. ocellatella* to eggs and pupae stages for feeding. These results indicated the vital role of formicid species in decreasing *S. ocellatella* populations in sugar beet fields as a biological

control agent.

Acknowledgment

The author would like to express his heart full gratitude and sincere appreciation to all staff members of Sugar Crops Research Department, Sakha Agricultural Research Station (mainly, Pro. Dr. Kamal Bazazo) for allowing using the experimental field to perform this study.

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ARABIC SUMMARY

حصر, كثافة العشيرة والتفضيل الغذائي لانواع من النمل المفترس للاطوار المختلفة لحشرة فراشة البنجر في حقول بنجر السكر المصرية

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أجريت الدراسة الحالية بالمزرعة التجريبية بمحطة البحوث الزراعية بسخا خلال ثلاث زراعات في موسمي 2019/2018 و2020/2019. تضمنت الدراسة الحالية حصرا لأنواع النمل المفترس المرتبطة بيرقات حشرة فراشة البنجرفي حقول بنجر السكر. أظهرت النتائج المتحصل عليها أن أعداد يرقات فراشة البنجر تزداد مع نهاية الموسم وأن عشائر النمل كانت متزامنة مع أعداد فراشة البنجر في العروات الثلاثة. وكانت قيم معامل الارتباط البسيط بين عشيرة يرقات فراشة البنجر وعشائر النمل المفترس موجبة للغاية في الموسمين. تم تسجيل خمسة أنواع من النمل المفترس تنتمي إلى عائلة Formicidae التابعة لرتبة Hymenoptera والثلاثة كانوا: *Tetramorium depressiceps* Menozzi و *Tetramorium brevicoryne* Brondroit و *Camponotus thoracicus* (Fah.) وسجلوا بنسب عالية. بينما سجل النوعان الآخران من عائلة Formicidae وهم *Tapinoma simrothi* Krausse و *Solenopsis latro* L بنسب منخفضة. بالنسبة للافتراس وتفضيل الغذاء، وجد ان أنواع النمل المفترس تفضل طور يرقات فراشة البنجر على طوري البيض والعذاري في جميع عروات بنجر السكر الثلاثة خلال موسمي الدراسة. أثبتت هذه النتائج أن أنواع النمل تكون مفترسات هامة ليرقات فراشة البنجر. لذلك يهدف البحث الحالي إلى إضافة بعض المساهمات في المعرفة حول أنواع النمل المفترس كعوامل مكافحة حيوية طبيعية في حقول بنجر السكر المصرية.