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Effect of Different Sugar Beet Plantations on the Sugar Beet Moth, *Scrobipalpa ocellatella* Boyd. and its Insect Parasitoids in Kafr El-Sheikh Governorate

Awadalla, S. S.^{1*}; M. H. Bayoumy¹; F. A. Abd Allah² and Hala H. Hawila²



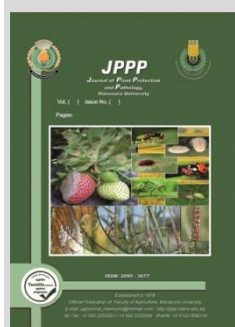
¹ Economic Entomology Departement. Faculty of Agricultural, Mansoura University, Egypt.

² Plant protection Institute. Agricultural Research Center. Giza, Egypt.

ABSTRACT

The highest average number of the total number of the sugar beet moth, *Scrobipalpa ocellatella* larvae and the highest average number of the healthy larvae were recorded in October plantation and presented by 20.1 ± 1.75 and 14.4 ± 1.68 individuals On the other hand, the average number of the parasitized larvae caused by *Agathis* sp. was ranged between 0.3 ± 0.33 individuals in September plantation and 0.8 ± 0.24 individuals in November plantation during the first season, 2018/19. while in the second season 2019/20, the highest average number of the total *S. ocellatella* larvae and the highest average number of the healthy larvae were recorded in August plantation and presented by 14.4 ± 2.01 and 9.4 ± 2.29 individuals On the other hand, the average number of the parasitized larvae caused by *Agathis* sp. was ranged between 1.0 ± 0.58 individuals in September plantation and 1.6 ± 0.40 indiv.in August plantation. The percentage of parasitism caused by the larval parasitoid, *Agathis* sp. was the highest in August plantation during the first season and in October plantation during the second season and presented by 7.5 and 17.7%, respectively. The highest average number of the total *S. ocellatella* pupae and the highest average number of emerged moth were recorded in October plantation and represented by 17.3 ± 1.72 and 14.4 ± 1.68 individuals Furthermore, the average number of parasitized pupae caused by *Diadegma* sp. was ranged between 0.6 ± 0.24 individuals in August plantation and 2.5 ± 0.42 individuals in October plantation in the first season. While in the second season, the highest average number of the total *S. ocellatella* pupae and the highest average number of emerged moth were recorded in August plantation and represented by 11.2 ± 1.93 and 9.4 ± 2.29 individuals

Keywords: Sugar beet moth, parasitoids, plantations, sugar beet.



INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is one of the most important sugar crops in the world. The Egyptian government encourages sugar beet growers to increase the cultivated area with sugar beet for decreasing the gap between sugar production and consumption (Afifi 2001).

Sugar beet is liable to attack by many destructive insect pests during its different growing stages especially in unsuitable planting dates. So many authors are attracted to study a group of insect pests cause serious problems for growers and cause yield reductions (Bassyouny and Khalafalla 1996 and Ebieda *et al.* 1998). The sugar beet moth *Scrobipalpa ocellatella* was found on sugar beet plants in Portugal, North Africa, Middle East, Russia, Ukraine, Serbia and Iran (Minoranskii, 1987, Camprag 2007 and Ahmadi *et al.* 2017). In Egypt many authors are attracted to study the importance of the pest (Bassyouny and Bleih, 1996 Zawrah, 2000, Bazazo, 2005, Abou El Kassem 2010, Mohisen, 2012 and El-Dessouki, 2019) they found that the infestation of *S. ocellatella* larvae observed in the end of December with few numbers then it increased progressively by the end of the sugar beet growing season. Larvae eat leaves and roots causing damage in such a way that the roots rot and consequently decrease the yield of roots and the sugar content in the roots (Valič, *et al* 2005). Parasitoids are the most used around the world for biocontrol of insect pests. (Abbasipour *et al.*, 2012) recorded the occurrence of the hymenopterous

parasitoid of the beet moth, *S. ocellatella* Boyd for the first time. *Diadegma pusio* (Holmgren) in Iran. In Egypt (Khalifa, 2018, Bazazo and Ibrahim 2019) recorded the parasitoid of the beet moth, *S. ocellatella* Boyd, *Diadegma oranginator*. (Shalaby, 2001 and Bazazo, 2010, El-Samahy and Shalaby 2011)) recorded the larval parasitoid *Agathis* sp.

MATERIALS AND METHODS

The present studies were carried out at the experimental farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during the two successive sugar beet seasons, 2018/19 and 2019/20. The experimental area was measured about 2 feddans. Which divided into four equal plots (each plot was about 2100 m²) planted with sugar beet Akram variety in four sown dates as the first week of August, first week of September, first week of October and first week of November in both studied seasons. The infected plants were sampled from the farms attacked by sugar beet moth and were transferred to the laboratory where their leaves and the parts not required were removed. Afterwards, the samples were carefully checked by binocular to make sure that they have no other pests than sugar beet moth. Then, they were placed in glass jars. The larvae had enough food (beet tuber) to grow till the emergence of the parasitoids, or turning to pupae. Pupae introduced into Petri dishes till adult emergence or its parasitoids. Data were analyzed using analysis of variance (ANOVA) technique by means of "SPSS" computer software package. The treatment means were compared using Least Significant Differences (LSD).

* Corresponding author.

E-mail address: awadalla28@yahoo.com

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RESULTS AND DISCUSSION

1. The larval parasitoid *Agathis* sp.

Data arranged in Table (1) showed the average number of the total larvae of the sugar beet moth, *S. ocellatella*, the average number of the healthy larvae and the average number of parasitized larvae caused by the parasitoid *Agathis* sp. as well as the percentage of parasitism during the first season 2018/19 .

It can be noticed that, the highest average number of the total *S. ocellatella* larvae and the highest average number of the healthy larvae were recorded in October plantation and presented by 20.1±1.75 and 14.4±1.68 indiv. while, the lowest average number were found in September plantation with 6.3±1.86 and 3.7±0.88 indiv., respectively. On the other hand, the average number of the parasitized larvae caused by *Agathis* sp. was ranged between 0.3±0.33 indiv. in September plantation and 0.8±0.24 indiv.in November plantation during the first season.

Data illustrated in Table (2) showed the average number of the total larvae of *S. ocellatella*, the average number

Table 1. The average number of the sugar beet moth, *S. ocellatella* and the percentage of parasitism by the larval parasitoid, *Agathis* sp. in different planting dates during the first season 2018/19.

| Months | Av. No. of total larvae | Av. No of healthy larvae | Av. No. of parasitized larvae | % of parasitism |
|----------------------|-------------------------|--------------------------|-------------------------------|-----------------|
| August plantation | 8.0±1.30 c | 5.4±1.08 c | 0.6±0.40 ab | 7.5 |
| September plantation | 6.3±1.86 d | 3.7±0.88 d | 0.3±0.33 c | 5.3 |
| October plantation | 20.1±1.75 a | 14.4±1.68 a | 0.7±0.19 a | 3.6 |
| November plantation | 15.5±1.38 b | 10.5±1.01 b | 0.9±0.24 a | 5.6 |

In a column, the average numbers followed by the different letters are significantly differences at 5% level.

Table 2. The average number of the sugar beet moth, *S. ocellatella* and the percentage of parasitism by the larval parasitoid, *Agathis* sp. in different planting dates during the first season 2019/20.

| Months | Av. No. of total larvae | Av. No of healthy larvae | Av. No. of parasitized larvae | % of parasitism |
|----------------------|-------------------------|--------------------------|-------------------------------|-----------------|
| August plantation | 14.4±2.01 a | 9.4±2.29 a | 1.6±0.40 a | 11.1 |
| September plantation | 6.0±2.52 c | 3.3±1.86 c | 1.0±0.58 b | 16.7 |
| October plantation | 6.9±1.53 c | 4.9±1.20 c | 1.2±0.26 b | 17.7 |
| November plantation | 9.1±3.00 b | 7.0±2.74 b | 1.3±0.23 b | 13.9 |

In a column, the average numbers followed by the different letters are significantly differences at 5% level.

2. The pupal parasitoid, *Diadegma* sp.

Data presented in Table (3) showed the average number of the total pupae of the sugar beet moth, *S. ocellatella*, the average number of emerged moth and the average number of parasitized pupae caused by *Diadegma* sp. in addition to the percentage of parasitism during the first season 2018/19.

It can concluded that, the highest average number of the total *S. ocellatella* pupae and the highest average of emerged moth were recorded in October plantation and represented by 17.3±1.72 and 14.4±1.68 individuals while, the lowest average number were found in September plantation with 4.7±0.88 and 3.7±0.88 individuals, respectively. Furthermore, the average number of parasitized pupae caused by *Diadegma* sp. was ranged between 0.6±0.24 individuals in August plantation and 2.5±0.42 individuals in October plantation .

Data obtained in Table (4) showed the average number of the total pupae of the sugar beet moth, *S. ocellatella*, the average number of emerged moth and the average number of parasitized pupae caused by *Diadegma* sp. in addition to the percentage of parasitism during the second season 2019/20.

It can concluded that, the highest average number of the total *S. ocellatella* pupae and the highest average of emerged moth were recorded in August plantation and represented by 11.2±1.93 and 9.4±2.29 individuals while, the lowest average number were found in September plantation with 4.7±2.19 and 3.3±1.86 individuals, respectively. Furthermore, the average number of parasitized pupae caused by *Diadegma* sp. was ranged between 0.7±0.67 individuals in september plantation and 1.0±0.32 individuals in August plantation .

of the healthy larvae and the average number of parasitized larvae caused by the parasitoid *Agathis* sp. as well as the percentage of parasitism during the second season 2019/20.

It can be concluded that, the highest average number of the total sugar beet moth, *S. ocellatella* larvae and the highest average number of the healthy larvae were recorded in August plantation and presented by 14.4±2.01 and 9.4±2.29 indiv. while, the lowest average number were found in September plantation with 6.0±2.52 and 3.3±1.86 indiv., respectively. On the other hand, the average number of the parasitized larvae caused by *Agathis* sp. was ranged between 1.0±0.58 indiv. in September plantation and 1.6±0.40 indiv.in August plantation .

Statistical analysis revealed that, there are a significant differences for those parameters according to different plantations during the two seasons.

The percentage of parasitism caused by the larval parasitoid, *Agathis* sp. was the highest in August plantation during the first season and in October plantation during the second season and presented by 7.5 and 17.7%, respectively.

Statistical analysis revealed that, there are asignificant differences for those parameters according to different plantations.

The percentage of parasitism caused by the pupal parasitoid, *Diadegma* sp. was the highest in September plantation during the two successive seasons, 2018/19 and 2019/20 and presented by 21.4 and 14.3%, respectively

These results are agree with Bazazo and Ibrahim (2019) in Egypt, found new parasitoids of the sugar beet moth *S. ocellatella* in the Egyptian environment and evaluated its effectiveness in reducing the population of the pest during three successive seasons. In 2016/17, 2017/18 seasons, new parasitoid was recorded from the beet moth pupae. It was defined as *Diadegma oranginator* Aubert (Hymenoptera: Ichneumonidae). By estimating the mean of parasitism under field conditions, 55.17, 60.46 and 68.91% were recorded at the three cultivations in 2016/17 season, respectively. It was 57.57, 44.44, and 62.71% at the three cultivations in 2017/18 season, respectively.

These results are disagreement with Khalifa (2018) who indicated that *S. ocellatella* parasitism, by *Diadegma* sp in late sugar beet plantation (October), was recorded initially as 11.11% in February and increased to 12.50% in March, exhibiting the highest peak of 22.92% in May. The seasonal mean of *S. ocellatella* parasitism was 9.37 ±3.52% in the first season (2015/16). Also, the peak of parasitism of this insect pest, by this larval-pupal parasitoid, in the second season (2016/17), was detected in May (22.41%), with a seasonal mean of 11.15 ± 3.68.

Table 3. The average number and the percentage of parasitism by the pupal parasitoid, *Diadegma* sp. in different planting dates during the first season 2018/19.

| Months | Av. No. of total pupae | Av. No of emerged moth | Av. No. of parasitized pupae | % of parasitism |
|----------------------|------------------------|------------------------|------------------------------|-----------------|
| August plantation | 6.4±1.21 c | 5.4±1.08 c | 0.6±0.24 cd | 9.4 |
| September plantation | 4.7±0.88 d | 3.7±0.88 d | 1.0±0.00 c | 21.4 |
| October plantation | 17.3±1.72 a | 14.4±1.68 a | 2.5±0.42 a | 14.5 |
| November plantation | 12.9±1.26 b | 10.5±1.01 b | 2.1±0.42 a | 16.5 |

In a column, the average numbers followed by the different letters are significantly differences at 5% level.

Table 4. The average number and the percentage of parasitism by the pupal parasitoid, *Diadegma* sp. in different planting dates during the first season 2019/20.

| Months | Av. No. of total pupae | Av. No of emerged moth | Av. No. of parasitized pupae | % of parasitism |
|----------------------|------------------------|------------------------|------------------------------|-----------------|
| August plantation | 11.2±1.93 a | 9.4±2.29 a | 1.0±0.32 a | 8.9 |
| September plantation | 4.7±2.19 c | 3.3±1.86 c | 0.7±0.67 bc | 14.3 |
| October plantation | 5.6±1.36 c | 4.9±1.20 c | 0.8±0.21 b | 13.9 |
| November plantation | 7.9±2.87 b | 7.0±2.74 b | 0.8±0.20 b | 10.2 |

In a column, the average numbers followed by the different letters are significantly differences at 5% level.

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تأثير عروات بنجر السكر المختلفة على فراشة بنجر السكر وطفيلياتها الحشرية في محافظة كفر الشيخ

سمير صالح عوض الله^{1*}، محمد حسن بيومي¹، فهمي الدكتوروى عبد الله² و هالة حلمي حويلا²

¹ قسم الحشرات الاقتصادية- كلية الزراعة جامعة المنصورة- مصر

² معهد بحوث وقاية النباتات- مركز البحوث الزراعية- الجيزة- مصر

تم تسجيل أعلى متوسط لتعداد يرقات فراشة بنجر السكر الكلي وكذلك تعداد اليرقات السليمة في عروة شهر أكتوبر وكانت 1.75±20.1 و 1.68±14.4 فرد. على الجانب الآخر فان متوسط تعداد اليرقات المتطفل عليها بطفيل *Agathis* sp. تراوحت بين 0.33±0.3 فرد في عروة شهر سبتمبر و 0.24±0.8 فرد في عروة شهر نوفمبر في الموسم الأول. بينما في الموسم الثاني، تم تسجيل أعلى متوسط لتعداد يرقات فراشة بنجر السكر الكلي وكذلك تعداد اليرقات السليمة في عروة شهر أغسطس حيث كانت 2.01±14.4 و 2.29±9.4 فرد سجلت أعلى نسبة تطفل بالطفيل البرقي في عروة شهر أغسطس خلال الموسم الأول و في عروة شهر أكتوبر خلال الموسم الثاني حيث كانت 7.5 و 17.7%، على التوالي. على الجانب الآخر، تراوح متوسط لتعداد العذارى المتطفل عليها بالطفيل البرقي بين 0.58±1 فرد في عروة شهر سبتمبر و 1.6±0.40 فرد في عروة شهر أغسطس. كما تم تسجيل أعلى متوسط لتعداد العذارى الكلي وكذلك أعلى متوسط لتعداد خروج الحشرة في عروة شهر أكتوبر وكانت 1.73±17.3 و 1.68±14.4 فرد. علاوة على ذلك، تراوح تعداد العذارى المتطفل عليها بالطفيل *Diadegma* sp. بين 0.24±0.6 فرد في عروة شهر أغسطس و 0.42±2.5 فرد في عروة شهر أكتوبر وذلك في الموسم الأول. بينما في الموسم الثاني، فقد تم تسجيل أعلى متوسط لتعداد العذارى الكلي وكذلك أعلى متوسط لتعداد خروج الحشرة في عروة شهر أغسطس وكانت 11.2±1.93 و 9.4±2.29 فرد.