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Effect of Sowing Dates of Egyptian Clover on the Population Density of *Hypera brunneipennis* and some Natural Enemies at Sohag Governorate

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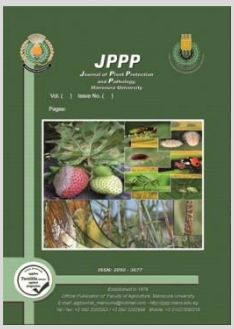

ABSTRACT

The Egyptian clover (Berseem), *Trifolium alexandrinum* L., is the main cultivated winter fodder legumes Crops in Egypt. Egyptian alfalfa weevil (EAW), *Hypera brunneipennis* (Bohemian) (Coleoptera: Curculionidae), considered one of the most important economic insect pests that attack Berseem in Egypt. The effect of the sowing dates of (*T. alexandrinum* L.) on the population density of *H. brunneipennis* and certain associated predators was studied. There were a significant differences between the five planting dates in the mean numbers of the *H. brunneipennis*, The first planting date recorded the highest mean number of insects during both seasons. The fifth planting date recorded the highest mean number of *Coccinella undecimpunctata* 5.42 and 14.18 individuals for both 2022/2023 and 2023/2024 seasons, respectively. In the first season, the fifth planting date was highest in the mean number of *Syrphus corollae* recorded. However, in the second season, the fourth planting date recorded the highest mean number of insects. The highest mean number of *Chrysoperla carnea* was recorded at the fourth planting date at the first season. However, at the second season, the highest mean number of insect was recorded at the first planting date. There is a high significant positive correlation in 2022/2023 season between *C. undecimpunctata* and alfalfa weevil at the first and the second planting date. The simple correlation between *Ch. carnea* and *H. brunneipennis* in 2022/2023 season was highly significant positive at the first and the second planting dates.

Keywords: *Hypera brunneipennis*, predators, sowing dates.

INTRODUCTION

The Egyptian clover (berseem), *Trifolium alexandrinum* L., is the main cultivated winter fodder legumes Crop in Egypt. Clover represent about one third of the cultivated area. Its productivity is estimated at about 42.03 million tons Green Fodder (Mohamed *et al.*, 2017). Berseem is a nitrogen fixing crop, there are many insect species that affect the quality of the berseem crop, as well as the productivity of green fodder and seeds (Kumar and Cheema, 2020). Berseem helps strengthen the soil Fertility and physical properties of the soil. The fodder plant is considered a superior plant in its mineral and protein content, it is also grown for fodder and seeds, known as a trap crop for natural enemies of pests (Wagan *et al.*, 2015). Egyptian clover suffers from various pests associated with its natural enemies in Pakistan (Hameed *et al.*, 2016). Egyptian alfalfa weevil (EAW), *Hypera brunneipennis* (Bohemian) (Coleoptera: Curculionidae), considered one of the most important economic insect pests that attack Berseem in Egypt. Population abundance of EAW in clover fields in Egypt have been reported by various authors, and it was recorded through the period from December to May (El-Mezayyen, 2003, Awadalla *et al.*, 2014a and El Husseini, 2019). Farmers use pesticides to reduce pest damage, but the use of insecticides is expensive and it can be transmitted to plants and then to livestock, where it appears in milk and can cause harm to animals and humans as well. So pest management techniques such as biological control and crop planting time can help reduce the use of pesticides (Hameed *et al.*, 2016).

Therefore, the aim of this work is to study the effect of planting dates of Egyptian clover on the population density of the Egyptian alfalfa weevil and certain associated predators.

MATERIALS AND METHODS

The experiment was conducted at Shandaweel Agricultural Research Station, Sohag Governorate, Egypt during 2022-2023 and 2023-2024 seasons, to study the effect of the sowing dates of Egyptian clover, monocot fahl (*Trifolium alexandrinum* L.) on the population density of Egyptian alfalfa weevil (EAW), *Hypera brunneipennis* and certain associated predators. The seeds were obtained from the Forage Crops Department, Field Crops Research Institute, Agricultural Research Center. The planting dates studied were 1st October (D1), 15th October (D2), 1st November (D3), 15th November (D4) and 1st December (D5). An area of about a quarter of a feddan was divided into experimental plots with an area of 42 square meters. Clover was cultivated in the five different planting dates mentioned above. Each date was planted in three experimental plots. The usual agricultural treatments were carried out without the use of pesticides. The examination was carried out using a sweeping net, 20 double strokes for each experimental plot were done. Samples were taken weekly at 10-11 a.m. throughout the growing season. The samples were transported to the laboratory in a plastic bags and the insects were killed using a piece of cotton soaked in chloroform and placed in a glass jar. The samples were spread on a white sheet of paper for examination.

The data obtained were subjected to statistical analysis using one-way analysis of variance. To evaluate the significance of differences between treatments, means were separated at $P \leq 0.05$ using the LSD test using (MSTATC software, 1980).

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RESULTS AND DISCUSSION

The results obtained illustrates the effect of five planting dates on the population density of *H. brunneipennis* and certain natural enemies at Sohag Governorate, during the 2022/2023 and 2023/2024 study seasons:

***- H. brunneipennis*:**

Data in Table (1) showed that during the first season, at the first planting date, the insect began to appear on December 20, with a mean number of 0.67±0.33 individuals and the population continued to increase until it reached its highest peak on March 7, with a mean number of 44.67±0.58 individuals. The last date for the insect to appear was April 18. The insect recorded five population peaks. However, at the second planting date, *H. brunneipennis* recorded its first appearance on January 3, with a mean number of 0.67±0.33 individuals. While, the last appearance of the insect was on April 11. The insect recorded three peaks, the highest peak was on March 14, with a mean number of 25.33±0.33 individuals. On the other hand, at the third planting date, the pest recorded its first appearance on 28th of February with average number of 1.33±0.33 individuals. Three peaks of population were recorded, the highest on was recorded on March 14 with average number of 23.33±0.33 individuals. The last appearance of the insect this season was recorded on April 11 with average numbers of 1.33±0.33 individuals. On the fourth planting date, the insect began to appear on March 7, recording three population peaks. The highest peak was recorded on March 14 with average numbers of 7.33±0.33 individuals. The last appearance of the insect this season was recorded on April 18 with average numbers of 0.67±0.33 individuals. At the fifth planting date, the appearance of the insect was recorded on March 14 with average numbers of 2.67±0.33 individuals.

Table 1. Effect of sowing dates on the population density of *H. brunneipennis* in clover field, 2022/2023 and 2023/2024 seasons.

2022/2023 season							2023/2024 season				
	planting dates						planting dates				
	15-Nov	01-Dec	15-Dec	01-Jan	15-Jan		15-Nov	01-Dec	15-Dec	01-Jan	15-Jan
20-Dec	0.67±0.33	----	----	----	----	20-Dec	1.67±0.33	----	----	----	----
27-Dec	0.67±0.33	----	----	----	----	27-Dec	1.00±0.00	----	----	----	----
03-Jan	1.00±0.00	0.67±0.33	----	----	----	03-Jan	2.00±0.00	0.67±0.33	----	----	----
10-Jan	1.00±0.00	0.00±0.00	----	----	----	10-Jan	0.67±0.33	0.00±0.00	----	----	----
17-Jan	0.67±0.33	0.00±0.00	0.00±0.00	----	----	17-Jan	0.00±0.00	0.00±0.00	0.00±0.00	----	----
24-Jan	0.00±0.00	0.00±0.00	0.00±0.00	----	----	24-Jan	0.00±0.00	0.00±0.00	0.00±0.00	----	----
31-Jan	2.67±0.33	0.00±0.00	0.00±0.00	0.00±0.00	----	31-Jan	2.67±0.33	0.00±0.00	0.00±0.00	0.00±0.00	----
07-Feb	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----	07-Feb	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----
14-Feb	0.67±0.33	2.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	14-Feb	0.67±0.33	2.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
21-Feb	0.67±0.33	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	21-Feb	0.67±0.33	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
28-Feb	9.00±0.00	4.00±0.58	1.33±0.33	0.00±0.00	0.00±0.00	28-Feb	16.00±0.58	4.00±0.58	1.33±0.33	0.00±0.00	0.00±0.00
07-Mar	44.67±0.58	23.33±0.33	8.00±0.58	0.67±0.33	0.00±0.00	07-Mar	50.00±0.58	23.33±0.33	13.00±0.58	0.67±0.33	0.00±0.00
14-Mar	28.00±0.33	25.33±0.33	23.33±0.33	7.33±0.33	2.67±0.33	14-Mar	21.33±0.33	17.33±0.33	23.33±0.00	17.33±0.33	6.67±0.33
21-Mar	7.33±0.58	2.67±0.33	0.00±0.00	2.00±0.00	0.00±0.00	21-Mar	10.67±0.33	8.00±0.58	20.67±0.33	18.67±0.33	6.67±0.33
28-Mar	2.00±0.00	1.33±0.33	0.67±0.33	3.33±0.33	0.67±0.33	28-Mar	0.00±0.00	2.00±0.00	2.67±0.33	2.67±0.33	2.67±0.33
04-Apr	8.00±0.33	0.00±0.00	0.00±0.00	0.67±0.33	0.00±0.00	04-Apr	0.67±0.33	2.00±0.00	2.67±0.33	0.67±0.33	1.33±0.33
11-Apr	0.67±0.33	0.67±0.33	1.33±0.33	2.00±0.00	4.00±0.58	11-Apr	1.33±0.33	0.00±0.00	4.00±0.58	2.67±0.33	0.00±0.00
18-Apr	0.67±0.33	0.00±0.00	0.00±0.00	0.67±0.33	2.00±0.00	18-Apr	0.00±0.00	1.33±0.33	0.00±0.00	0.00±0.00	0.00±0.00
25-Apr	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	25-Apr	---	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
02-May	----	----	0.00±0.00	0.00±0.00	0.00±0.00	02-May	---	----	----	----	----
Mean ±SE	5.70±0.07	3.53±0.07	2.17±0.09	1.19±0.02	0.78±0.06	Mean ±SE	6.07±0.05	3.57±0.05	4.51±0.04	3.28±0.03	1.58±0.03
L.S.D. at 0.05%			0.13*			L.S.D. at 0.05%			0.13*		

The highest population peak was recorded on April 11 with average number of 4.00±0.58 individuals. During the first season there were a significant differences between the five planting dates in the mean numbers of the insect during the season. The first planting date recorded the highest mean number of 5.70±0.07 individuals. However, the fifth planting date recorded the lowest mean number of insects with average number of 0.78±0.06 individuals.

During the second season, at the first planting date, the insect began to appear on December 20 with average number of 1.67±0.33 individuals, recording five population peaks. The highest peak was recorded on March 7 with average number of 50.00±0.58 individuals. The last appearance of the pest was recorded on April 11 with average numbers of 1.33±0.33 individuals. At the second planting date, the pest recorded the first appearance on January 3 and recorded the last appearance on April 18. The population peak was recorded on March 7 with average number of 23.33±0.33 individuals. However, at the third planting date the pest appeared on February 28 with average number of 1.33±0.33 individuals. The insect reached the highest population peak on March 14 with average number of 23.33±0.00 individuals. On the other hand, at the fourth planting date *H. brunneipennis* appeared on March 7 with average number of 0.67±0.33 individuals. In addition, reached the highest population peak on March 21 with average number of 18.67±0.33 individuals. Finally, at the fifth planting date, the pest recorded the first appearance on March 14 and last appearance was on April 4.

During the second season, there were a significant differences between the five planting dates in the mean numbers of the insect during the season. The first planting date recorded the highest mean number of 6.07±0.05 individuals. However, the fifth planting date recorded the lowest mean number of insects with average number of 1.58±0.03 individuals.

- Coccinella undecimpunctata:

Data in Table (2) showed that during 2022/2023 and 2023/2024 seasons, at the first planting date, *C. undecimpunctata* began to appear on January 10 with average numbers of 0.67±0.33 and 1.00±0.00 individuals, respectively. The insect recorded the highest population peak on March 7 and March 28 with average numbers of 16.00±0.58 and 26.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. However, the last appearance of the insect during the both seasons were recorded on April 18 and April 25 with average numbers of 2.00±0.00 and 2.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons,

respectively. At the second planting date *C. undecimpunctata* recorded the first appearance on January 17 with average numbers of 0.67±0.33 and 0.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. The insect reached the highest population peaks on March 7 and March 28 with average numbers of 31.33±0.33 and 36.00±0.58 individuals, for both 2022/2023 and 2023/2024 seasons, respectively. The last appearance was recorded on April 18 and April 25 with average numbers of 0.67±0.33 and 1.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. However, the insect at the third planting date recorded the first appearance on January 17 with average number of 0.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. The highest population peaks were recorded on March 14 and March 28 with average numbers of 15.33±0.33 and 23.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. *C. undecimpunctata* recorded the last appearance on April 18 and April 25 with average numbers of 2.00±0.00 and 6.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. On the other hand, *C. undecimpunctata* at the fourth planting date recorded the first appearance on February 21 and February 28 with average numbers of 0.33±0.33 and 0.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively.

Table 2. Effect of sowing dates on the population density of *C. undecimpunctata* in Clover field, 2022/2023 and 2023/2024 seasons.

	2022/2023 season						2023/2024 season				
	planting dates						planting dates				
	15-Nov	01-Dec	15-Dec	01-Jan	15-Jan		15-Nov	01-Dec	15-Dec	01-Jan	15-Jan
20-Dec	0.00±0.00	----	----	----	----	20-Dec	0.00±0.00	----	----	----	----
27-Dec	0.00±0.00	----	----	----	----	27-Dec	0.00±0.00	----	----	----	----
03-Jan	0.00±0.00	0.00±0.00	----	----	----	03-Jan	0.00±0.00	0.00±0.00	----	----	----
10-Jan	0.67±0.33	0.00±0.00	----	----	----	10-Jan	1.00±0.00	0.00±0.00	----	----	----
17-Jan	0.67±0.33	0.67±0.33	0.67±0.33	----	----	17-Jan	0.67±0.33	0.33±0.33	0.67±0.33	----	----
24-Jan	0.33±0.33	0.67±0.33	0.00±0.00	----	----	24-Jan	0.00±0.00	0.67±0.33	0.00±0.00	----	----
31-Jan	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----	31-Jan	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----
07-Feb	0.00±0.00	1.33±0.33	0.00±0.00	0.00±0.00	----	07-Feb	0.00±0.00	1.33±0.33	0.00±0.00	0.00±0.00	----
14-Feb	1.33±0.33	0.67±0.33	2.67±0.33	0.00±0.00	0.00±0.00	14-Feb	0.67±0.33	0.67±0.33	1.33±0.33	0.00±0.00	0.00±0.00
21-Feb	0.33±0.33	0.00±0.00	0.33±0.33	0.33±0.33	0.33±0.33	21-Feb	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
28-Feb	7.67±0.33	10.33±0.33	2.67±0.33	2.00±0.00	2.67±0.33	28-Feb	0.67±0.33	0.67±0.33	1.33±0.33	0.67±0.33	0.00±0.00
07-Mar	16.00±0.58	31.33±0.33	5.00±0.58	3.33±0.33	10.00±0.00	07-Mar	3.33±0.33	2.67±0.33	2.67±0.33	3.33±0.33	0.33±0.33
14-Mar	9.33±0.33	5.33±0.33	15.33±0.33	6.00±0.58	9.33±0.33	14-Mar	3.33±0.33	1.33±0.33	2.67±0.33	3.33±0.33	0.00±0.00
21-Mar	8.67±0.33	6.67±0.33	6.00±0.58	19.33±0.33	11.33±0.33	21-Mar	6.67±0.33	10.00±0.00	1.33±0.33	2.67±0.33	0.67±0.33
28-Mar	1.33±0.33	0.67±0.33	4.67±0.33	1.33±0.33	2.67±0.33	28-Mar	26.67±0.33	36.00±0.58	23.33±0.33	15.33±0.33	59.00±0.58
04-Apr	9.33±0.33	4.67±0.33	10.00±0.58	5.33±0.33	18.00±0.58	04-Apr	22.67±0.33	34.67±0.33	23.00±0.58	69.67±0.33	57.00±0.58
11-Apr	2.00±0.00	0.67±0.33	0.67±0.33	5.33±0.33	6.00±0.00	11-Apr	18.00±0.58	28.00±0.58	21.33±0.33	18.33±0.33	19.33±0.33
18-Apr	2.00±0.00	0.67±0.33	2.00±0.00	0.67±0.33	1.33±0.33	18-Apr	7.33±0.33	5.33±0.33	1.33±0.33	6.00±0.00	9.00±0.58
25-Apr	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	1.33±0.33	25-Apr	2.67±0.33	1.67±0.33	6.67±0.33	10.33±0.33	10.67±0.33
02-May	----	----	0.00±0.00	0.67±0.33	2.00±0.00	02-May	----	----	----	----	----
Mean ±SE	3.14±0.02	3.75±0.05	3.13±0.07	3.17±0.02	5.42±0.05	Mean ±SE	4.93±0.02	7.25±0.02	5.71±0.04	9.97±0.03	14.18±0.05
L.S.D. at 0.05%			0.20*			L.S.D. at 0.05%			0.12*		

The highest population peaks were recorded on March 21 and April 4 with average numbers of 19.33±0.33 and 69.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. The last appearance of the insect was recorded on May 2 and April 25 with average numbers of 0.67±0.33 and 10.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. Finally, at the fifth planting date the insect recorded the first appearance on February 21 and March 7 with average numbers of 0.33±0.33 and 0.33±0.33 for both 2022/2023 and 2023/2024 seasons, respectively. The highest population peaks were recorded on April 4 and March 28 with average numbers of 18.00±0.58 and 59.00±0.58 individuals for both 2022/2023 and 2023/2024 seasons, respectively. The last appearance of the insect was recorded on May 2 and April 25 with average numbers of 2.00±0.00 and 10.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively.

There were a significant differences between the five planting dates in the mean numbers of the insect during both seasons. The fifth planting date recorded the highest mean number of 5.42±0.05 and 14.18±0.05 individuals for both 2022/2023 and 2023/2024 seasons, respectively.

- Syrphus corollae:

Data in Table (3) showed that during 2022/2023 and 2023/2024 seasons, at the first planting date, *S. corollae* began to appear on March 21 with average numbers of 0.67±0.33 individuals for both seasons. The insect recorded the highest population peaks on March 28 and April 18 with average numbers of 5.33±0.33 individuals for 2022/2023 and on April 18 with average number of 23.33±0.33 individuals for 2023/2024 season. However, the last appearance of the insect during both seasons was recorded on April 25 with average numbers of 2.67±0.33 and 0.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. At the second planting date, the first *S. corolla* appearance was recorded on March 21 and March 28 with average number of 0.67±0.33 individual for both 2022/2023 and 2023/2024 seasons. The highest population peaks were recorded on April 11 and April 18 with average numbers of 4.00±0.00 and 18.00±0.58 individuals for both 2022/2023 and 2023/2024 seasons, respectively. On May 2 and April 25, the last occurrence of the insect was recorded with average numbers of 1.67±0.33 and 0.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. At the third planting date, the first occurrence of the insect was recorded on March 21 and April 11 with average numbers of 0.67±0.33 and 5.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. The insect reached its highest population peaks on April 11 and April 18 with average numbers of 4.33±0.33 and 8.00±0.00 individuals for both 2022/2023 and 2023/2024 seasons, respectively. However, at the fourth planting date, the insect recorded the first appearance on March 21 and March 28 with average number of 0.67±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. The insect reached its highest population peaks on April 18 with average numbers of 4.67±0.33 and 26.00±0.58 individuals for both 2022/2023 and 2023/2024 seasons, respectively. The last appearance of the insect was recorded on May 2 and April 25

with average numbers of 1.33±0.33 and 0.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively. Finally, at the fifth planting date, the insect recorded the first occurrence on March 28 and April 4 with average numbers of 7.33±0.33 and 1.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively.

Table 3. Effect of sowing dates on the population density of *S. corollae* in clover field, 2022/2023 and 2023/2024 seasons.

2022/2023 season						2023/2024 season					
	planting dates						planting dates				
	15-Nov	01-Dec	15-Dec	01-Jan	15-Jan		15-Nov	01-Dec	15-Dec	01-Jan	15-Jan
07-Mar	----	----	----	----	----	07-Mar	----	----	----	----	----
14-Mar	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	14-Mar	0.00±0.00	0.00±0.00	----	----	----
21-Mar	0.67±0.33	0.67±0.33	0.67±0.33	0.67±0.33	0.00±0.00	21-Mar	0.67±0.33	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
28-Mar	5.33±0.33	2.67±0.33	0.00±0.00	0.67±0.33	7.33±0.33	28-Mar	0.00±0.00	0.67±0.33	0.00±0.00	0.67±0.33	0.00±0.00
04-Apr	0.67±0.33	2.00±0.00	0.67±0.33	0.00±0.00	2.00±0.00	04-Apr	1.33±0.33	3.33±0.33	0.00±0.00	2.67±0.33	1.33±0.33
11-Apr	1.33±0.33	4.00±0.00	4.33±0.33	3.00±0.00	7.33±0.33	11-Apr	4.67±0.33	8.00±0.58	5.33±0.33	5.33±0.33	2.00±0.00
18-Apr	5.33±0.33	0.67±0.33	0.00±0.00	4.67±0.33	6.00±0.00	18-Apr	23.33±0.33	18.00±0.58	8.00±0.00	26.00±0.58	17.33±0.33
25-Apr	2.67±0.33	2.67±0.33	2.00±0.00	0.00±0.00	0.67±0.33	25-Apr	0.33±0.33	0.33±0.33	0.67±0.33	0.33±0.33	0.33±0.33
02-May	----	1.67±0.33	1.33±0.33	1.33±0.33	3.33±0.33	02-May	----	----	----	----	----
Mean ±SE	2.29±0.08	1.79±0.08	1.13±0.00	1.29±0.04	3.33±0.18	Mean ±SE	4.33±0.05	4.33±0.05	2.33±0.00	5.83±0.00	3.50±0.00
L.S.D. at 0.05%			0.16*			L.S.D. at 0.05%			0.10*		

The highest population peaks were recorded on March 28 and April 11 with average number of 7.33±0.33 for the first season and on April 18 with average number of 17.33±0.33 individuals for the second season. The last occurrence of the insect was recorded on May 2 and April 28 with average numbers of 3.33±0.33 and 0.33±0.33 individuals for both 2022/2023 and 2023/2024 seasons, respectively.

There were a significant differences between the five planting dates in the mean number of insects recorded. The fifth planting date was highest in the mean number of *S. corollae* recorded with average number of 3.33±0.18 individuals for the first planting date. However, in the second season, the fourth planting date recorded the highest mean number of insects with average number of 5.83±0.00 individuals.

- *Chrysoperla carnea*:

Data in Table (4) showed that during 2022/2023 and 2023/2024 seasons, at the first planting date, *Ch. carnea* began to appear on February 14 with average numbers of 0.67±0.33 and 2.33±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. The highest population peaks were recorded on March 7 with average number of 2.67±0.33 for the first season and February 14, April 4 and April 11 with average number of 2.33±0.33 for the second season. The last appearance of the insect was recorded on April 11 and April 25 with average numbers of 0.67±0.33 and 0.67±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. At the second planting date, the first appearance of *Ch. carnea* was recorded on February 28 with average numbers of 1.00±0.00 and 0.67±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. The highest population peaks for the insect were recorded on March 21 and April 4 with average numbers of 2.67±0.33 and 2.33±0.33individuals for 2022/2023 and 2023/2024 seasons, respectively.

Table 4. Effect of sowing dates on the population density of *Ch. carnea* in clover field, 2022/2023 and 2023/2024 seasons.

2022/2023 season						2023/2024 season					
	planting dates						planting dates				
	15-Nov	01-Dec	15-Dec	01-Jan	15-Jan		15-Nov	01-Dec	15-Dec	01-Jan	15-Jan
31-Jan	----	----	----	----	----	31-Jan	----	----	----	----	----
07-Feb	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----	07-Feb	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----
14-Feb	0.67±0.33	0.00±0.00	0.00±0.00	0.00±0.00	----	14-Feb	2.33±0.33	0.00±0.00	0.00±0.00	0.00±0.00	----
21-Feb	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----	21-Feb	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	----
28-Feb	1.00±0.00	1.00±0.00	1.00±0.00	0.33±0.33	0.00±0.00	28-Feb	0.33±0.33	0.67±0.33	0.00±0.00	0.00±0.00	0.00±0.00
07-Mar	2.67±0.33	2.00±0.00	0.67±0.33	0.33±0.33	0.33±0.33	07-Mar	1.33±0.33	1.00±0.00	1.00±0.00	1.33±0.33	1.00±0.00
14-Mar	2.00±0.00	2.00±0.00	2.67±0.33	3.33±0.33	0.67±0.33	14-Mar	0.33±0.33	1.33±0.33	0.00±0.00	2.00±0.00	0.00±0.00
21-Mar	0.00±0.00	2.67±0.33	2.00±0.00	1.33±0.33	0.00±0.00	21-Mar	1.00±0.00	0.33±0.33	0.33±0.33	0.00±0.00	0.33±0.33
28-Mar	0.67±0.33	2.00±0.00	3.33±0.33	6.00±0.58	0.00±0.00	28-Mar	0.67±0.33	0.00±0.00	0.67±0.33	0.67±0.33	0.33±0.33
04-Apr	0.00±0.00	0.67±0.33	4.00±0.00	15.33±0.33	0.00±0.00	04-Apr	2.33±0.33	2.33±0.33	1.67±0.33	3.00±0.58	1.67±0.33
11-Apr	0.67±0.33	0.67±0.33	1.33±0.33	1.33±0.33	2.67±0.33	11-Apr	2.33±0.33	1.00±0.00	1.00±0.00	2.00±0.58	1.00±0.00
18-Apr	0.00±0.00	0.67±0.33	0.00±0.00	1.33±0.33	0.00±0.00	18-Apr	0.00±0.00	0.33±0.33	0.00±0.00	0.67±0.33	0.00±0.00
25-Apr	0.00±0.00	0.67±0.33	0.67±0.33	1.33±0.33	1.33±0.33	25-Apr	0.67±0.33	0.00±0.00	0.00±0.00	0.67±0.33	0.67±0.33
02-May	----	----	0.00±0.00	0.00±0.00	0.00±0.00	02-May	----	----	----	----	----
Mean ±SE	0.64±0.03	1.03±0.03	1.21±0.07	2.36±0.05	0.50±0.06	Mean ±SE	0.94±0.03	0.58±0.05	0.39±0.03	0.86±0.03	0.56±0.06
L.S.D. at 0.05%			0.16*			L.S.D. at 0.05%			0.13*		

The last occurrence of the insect was recorded on April 25 and April 18 with average number of 0.67±0.33 and 0.33±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. However, at the third planting date, *Ch. carnea* recorded the first appearance on February 28 and March 7 for 2022/2023 and 2023/2024 seasons, respectively, with average number of 1.00±0.00. The highest population peaks were recorded on April 4 with average numbers of 4.00±0.00 and 1.67±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. The last appearance of the insect was recorded on April 25 and April 11 with average numbers of 0.67±0.33 and 1.00±0.00 individuals for 2022/2023 and 2023/2024 seasons, respectively.

On the other hand, at the fourth planting date the insect recorded the first appearance on February 8 and March 7 with average numbers of 0.33±0.33 and 1.33±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. The highest population peaks were recorded on April 4 with average numbers of 15.33±0.33 and 3.00±0.58 individuals for 2022/2023 and 2023/2024 seasons, respectively. The last appearance of the insect was recorded on April 25 with average numbers of 1.33±0.33and 0.67±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. Finally, at the fifth planting date, the first appearance of the insect was recorded on March 7 with average numbers of 0.33±0.33 and 1.00±0.00 individuals for 2022/2023 and 2023/2024 seasons, respectively. The highest population peaks were recorded on

April 11 and April 4 with average numbers of 2.67±0.33 and 1.67±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively. The last appearance of the insect was recorded on April 25 for both seasons with average numbers of 1.33±0.33 and 0.67±0.33 individuals for 2022/2023 and 2023/2024 seasons, respectively.

There were a significant differences between the five planting dates on mean number of insects. The highest mean number of insect (2.36±0.05 individuals) was recorded at the fourth planting date at the first season. However, at the second season, the highest mean number of insect was recorded at the first planting date with average number of 0.94±0.03 individuals.

Data illustrated in Table (5) indicated that there is a high significant positive correlation in 2022/2023 season between *C. undecimpunctata* and alfalfa weevil at the first and the second planting date. However, a significant positive correlation was recorded at the third planting date. There is insignificant differences at the fourth and fifth planting date. The correlation between *S. corolla* and *H. brunneipennis* in 2022/2023 season was insignificant at the five planting dates, negative in the first three planting dates and positive in the other two planting dates. The simple correlation between *Ch. carnea* and *H. brunneipennis* in 2022/2023 season was highly significant positive at the first and the second planting dates and insignificant positive at the three other planting dates. The simple correlation between the maximum temperature and *H. brunneipennis* in 2022/2023 season was insignificant positive at the five planting dates.

Table 5. Simple correlation (r) between the populations of *H. brunneipennis* on the one hand and three predators and three weather factors on the other hand in clover field, 2022/2023 season.

	2022/2023 season				
	H. brunneipennis				
	R				
	15-Nov	01-Dec	15-Dec	01-Jan	15-Jan
C. undecimpunctata	0.84**	0.72**	0.76*	0.39	0.03
S. corolla	-0.14	-0.18	-0.13	0.01	0.57
Ch. carnea	0.87**	0.60**	0.33	0.22	0.57
Max. T.	-0.33	-0.38	-0.28	-0.08	-0.08
Min. T.	-0.14	-0.20	-0.14	0.02	-0.15
R.H.	0.10	0.16	0.23	0.13	-0.12

The simple correlation between the minimum temperature and *H. brunneipennis* in 2022/2023 season was insignificant negative at all the five planting dates except the fourth planting which was insignificant positive. The simple correlation between the relative humidity and *H. brunneipennis* in 2022/2023 season was insignificant positive at all the five planting dates except the fifth planting, which was insignificant negative.

Data illustrated in Table (6) indicated that there is insignificant negative correlation in 2023/2024 season between *C. undecimpunctata* and alfalfa weevil at all the five planting dates. The same results were recorded between *S. corolla* and *H. brunneipennis* in the second season. The simple correlation between *Ch. carnea* and *H. brunneipennis* in 2023/2024 season was insignificant positive at all the five planting dates except the fifth planting which was insignificant negative. The simple correlation between the maximum temperature and *H. brunneipennis* in 2023/2024 season was insignificant positive at all the five planting dates except the fifth planting which was insignificant negative. The simple correlation between both minimum temperature and relative humidity from on hand and *H. brunneipennis* on the other hand in 2023/2024 season was insignificant positive at all the five planting dates.

Table 6. Simple correlation (r) between the populations of *H. brunneipennis* on the one hand and three predators and three weather factors on the other hand in Clover field, 2023/2024 season.

	2023/2024 season				
	H. brunneipennis				
	R				
	15-Nov	01-Dec	15-Dec	01-Jan	15-Jan
C. undecimpunctata	-0.06	-0.09	-0.05	-0.12	-0.01
S. corolla	-0.12	-0.12	-0.16	-0.17	-0.23
Ch. carnea	0.19	0.29	0.16	0.14	-0.17
Max	0.06	0.11	0.18	0.17	-0.04
Min	0.04	0.09	0.20	0.24	0.06
R.H.	0.16	0.10	0.14	0.25	0.29

Discussion

Several researchers studied the effect of planting dates on the population density of the insect pests and their predators. Dowdy *et al*., (1986) studied the effect of alfalfa planting dates on alfalfa weevil. They illustrated that April and August plantations presented oviposition locations for alfalfa weevil which increased the larvae numbers in spring. Awadalla *et al.* (2014b), Kalyan and Ameta (2017) & Abdou, *et al.* (2019) showed that planting dates had a various effects on the population density of the insect pests infesting Legume crops. Abdallah, *et al.* (2019) observed that the corn planting in delayed planting dates, harbored more predators than the early plantations. Many studies have been conducted on the population density of *H. brunneipennis* and associated predators, one of these studies have been conducted by El-Mezayyen (2003) illustrated that *H. brunneipennis* recorded two peaks during March and May at Sebha. However, the occurrence was recorded in January and April at Kafr El-Sheikh. Also, he mentioned that *Coccinella* spp. reached its peak in November, February and March at Sebha. While, it had only one peak at Kafr El-Sheikh. *Chr. carnea* had two peaks at Kafr El-Sheikh. Boraei, *et al.* (2005) showed that *Ch. carnea* and *C. undecimpunctata* peaked twice a year, the second peak synchronized with alfalfa weevil. Awadalla, *et al.* (2014a) they illustrated that the insect adults had two peaks and the larvae peaked once. El-Sheikh (2019) studied the population density of *H. brunneipennis* in New Valley Governorate, Egypt. He mentioned that the adult populations reached their maximum by the third of March. Nikolova (2019) stated that the determination of the population dynamics of some insect pests of *Madicago sativa* L. help to determine the best time to control insect pests. Shenishen *et al.* (2023) recorded 3-4 peaks for *H.*

brunneipennis annually. In addition, they observed two predators associated with alfalfa weevil in clover field. Also, the correlation between *H. brunneipennis* on one hand and predators and weather factors on the other hand was studied. Many authors studied the relations between the pest and biotic and abiotic factors, El-Mezayyen (2003) illustrated that there are a significant positive correlation between *H. brunneipennis* and each of *Coccinella* spp., *Paederus alfierii* and true spiders at Kafr El-Sheikh. Boraei *et al.* (2005) recorded high positive correlation between alfalfa weevil and associated predators, *Ch. carnea* and *C. undecimpunctata*. El-Sheikh (2019) discussed the effect of weather factors on the population density of *H. brunneipennis.* He showed that a positive correlation between the adult density and each of daily mean temperature and relative humidity was found during the first period of activity. Shenishen *et al.* (2023) recorded highly significant positive correlations between *H. brunnipennis* larvae and its predators. The difference in the results of the correlation between the insect pest and its associated predators may be due to the biological diversity present in Egyptian clover fields, as well as the diversity of abiotic factors affecting the pest and its biological enemies. The insect may be affected by factors other than those studied, for example parasitoids. Shenishen, *et al.* (2023) illustrated that the correlations between the number of *H. brunnipennis* and number of parasitoids, *Microctonus* sp. and *Bathyplectes curculionis* were highly significant positive.

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تأثير مواعيد زراعة البرسيم المصري على الكثافة العددية لحشرة سوسة ورق البرسيم وبعض الأعداء الطبيعية بمحافظة سوهاج

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الملخص

يعتبر البرسيم المصري من أهم محاصيل العلف البقوليات الشتوية المنزرعة في مصر. سوسة البرسيم المصري (EAW) تعتبر من أهم الآفات الحشرية الاقتصادية التي تهاجم البرسيم في مصر. تمت دراسة تأثير مواعيد زراعة نبات البرسيم على الكثافة العددية لحشرة سوسة أوراق البرسيم وبعض المفترسات المرتبطة بها. وجدت فروق معنوية بين مواعيد الزراعة الخمسة ومتوسط أعداد حشرات سوسة أوراق البرسيم، حيث سجل موعد الزراعة الأول أعلى متوسط لعدد الحشرات خلال كلا الموسمين. سجل موعد الزراعة الخامس أعلى متوسط لعدد حشرة ابى العيد ذو الاحدى عشر نقطة 5.42 و14.18 فرداً للموسمين 2023/2022 و2024/2023 على التوالي. في الموسم الأول، سجل موعد الزراعة الخامس أعلى متوسط عدد لحشرة ذبابة السرفس. أما في الموسم الثاني فقد سجل موعد الزراعة الرابع أعلى متوسط لعدد الحشرات. تم تسجيل أعلى متوسط لعدد حشرة أسد المن في ميعاد الزراعة الرابع للموسم الأول. أما في الموسم الثاني فقد تم تسجيل أعلى متوسط لعدد الحشرات في ميعاد الزراعة الأول. وجد إرتباط موجب على المعنوية في الموسم 2023/2022 بين حشرة ابى العيد ذو الاحد عشر نقطة وسوسة أوراق البرسيم في ميعاد الزراعة الأول والثاني. الارتباط البسيط بين حشرة سوسة أوراق البرسيم وأسد المن في الموسم 2023/2022 كان موجب على المعنوية في موعدي الزراعة الأول والثاني.