



Suitability of Egyptian Clover and Alfalfa as Safe Habitats Tonatural Enemies in The Egyptian Agrosystem

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ABSTRACT: In Egypt, clover is the main forage crop, particularly in winter. It plays a vital role in the sustainability of agricultural ecosystem, as it enriches the soil by fixation of atmospheric nitrogen. Clover is an environmentally friendly crop because no pesticides are used. The present study was carried out at the experiment farm of Sakha Agricultural Research Station during 2020/2021 and 2021/ 2022 seasons from November to June to survey arthropods using the seep net at Egyptian clover, *Trifolium alexandrinum* and alfalfa, *Medicago sativa* fields.

The relative abundances of nine insect pest species were monitored. The specific insect pest of clover, *Hypera brunneipennis* (Boheman) was collected in small portions (5.16 and 4.83% out of total collected insect pests) from Egyptian clover and alfalfa plots, respectively. *Sitona lividipes* exhibited the highest relative abundance with values of 57.15 and 30.92% on Egyptian clover and alfalfa, respectively. On the other hand, 17 insect predator species were collected. Orius spp. were the most occurring predators, with relative abundances of 24.64 and 25.96%, and coccinellids exhibited considerable portions with values of 45.07 and 53.51% out of total collected predators on both crops, respectively. Parasitism of *Hypera brunneipennis* eggs by *Anaphes fusceipennis* was monitored from March 23rd till the end of the season, and was assessed as 21.72 and 17.92% in the first and second seasons, respectively.

Keywords: Egyptian clover, alfalfa *Hypera brunneipennis*, natural enemies

INTRODUCTION

Clover, *Trifolium alexandrinum* L. is a crucial fodder crop belonging to Leguminosae, and suitable to be grown at moderate and semi-arid climates of Mediterranean areas. Clover is very popular among dairy people, particularly as it is a high nutritional crop, with a surplus of yield throughout its growth stages.

Unfortunately, this important fodder crops are liable to attacks of several insect pests. **Abdel Fattah and EL-Saadany (1978)** surveyed 64 arthropod species, from clover fields, that were classified into Diptera (36%), Hymenoptera (27%), Coleoptera (18%) and Hemiptera (8%), as well as some other orders. **Tawfik et al (1980)** collected, from clover fields, 93 arthropod species, belonging to 50 families and seven orders. **Wagan et al (2015)** surveyed aphids, lead miners, thrips, whitefly and cutworms, as harmful insects inhabiting this crop. *Spodoptera littoralis*, *S. exigua* and *Aphis gossypii* were surveyed from clover fields as harmful insect pests, while *Coccinella undecimpunctata*, *Apis mellifera* and *Vespa orientalis* were categorized as beneficial insects (**Mohammad and Hafez**

2023, at Kafr El- Sheikh region). Boraie et al (1993) surveyed the insect pests inhabiting clover fields, and indicated that one of important damaging insects is *Hypera brunneipennis* (Boheman). The latter insect pest was found present in clover fields all over the season, beginning from December up to May (**Rakha 2008, and Awadalla et al 2014**). *H. brunneipennis* was considered, by **El- Hussein (2019)**, as a damaging insect pest to both Egyptian clover and alfalfa.

Because clover fields are rarely treated with pesticides, this gives a good opportunity to flourishing of natural enemies. On the other hand, the intensive growth of Egyptian clover and alfalfa serves as a good shelter to the natural enemies complex to manage the harmful insects particularly that both crops are used as fodder to animals.

The objectives of this investigation were to compare between clover and alfalfa as habitats for insect pests and as shelters for natural enemies. In addition, correlation coefficients were computed to find out the relationship

between populations of some natural enemies and insect pests

MATERIALS AND METHODS

1. Cultural Practices

The present work was carried out at the experimental farm of Forage Research Department, Sakha Agricultural Research Station, for two successive seasons; 2020/2021 and 2021/2022. The Egyptian clover, *Trifolium alexandrinum* L. (Helaly cultivar) and alfalfa, *Medicago sativa* L. (Nubaria 1 cultivar) were sown in areas of 2000 and 200 m², respectively. Both crops were sown in the last week of October in both seasons.

Normal cultural practices, as recommended by Egypt's Ministry of Agriculture, were followed throughout the season, without any pesticide applications.

2. Insect Sampling

About one month after sowing, weekly insect samples were collected using 50 double strokes by the sweep net. The catch was introduced into 2-liter glass jars and transferred to the laboratory for sorting and counting. Specimens of collected insects were sent to Survey and Classification Department, and Biological Control Department, Plant Protection Research Institute, Agricultural Research Center, Dokki, Cairo for identification.

3. Meteorological Records

Records of meteorological factors were obtained from Sakha Meteorological Research Station to find out the effect of these factors on the populations of the considered insects.

4. Parasitism of *Hypera brunneipennis*

Parasitism of *Hypera brunneipennis* eggs was monitored through a lab-field experiment. Plastic pots, 30 cm diameter, and 30 cm depth filled with proper soil were confined in screen cages (45x45x60 cm). Egyptian clover plants, at the vegetative stage (about 45 cm height), were pulled out from clover fields, and transplanted into the pots. Using the sweep net, adults of *H. brunneipennis* were collected from clover fields and released inside the cages onto clover plants, where *H. brunneipennis* adults lay their eggs. The following day, the pots were taken out from the cages and moved to the field and fixed among the clover plants to allow parasitoids lay their eggs (if any on *H. brunneipennis* eggs). Twenty-four hours later, clover plants, in the pots, were examined, and the *H. brunneipennis* eggs were collected and incubated at the room temperature. These procedures were weekly practiced, beginning from December 1st up to May 4th in both seasons; 2020/2021 and 2021/2022. The incubated eggs

were monitored to record the number of emerging parasitoids, or *H. brunneipennis* hatching larvae. Thus, the parasitism percentage was calculated

RESULTS AND DISCUSSION

1. Insect Pest Species

The relative abundances of nine insect pest species are presented in Table (1) on Egyptian clover, *Trifolium alexandrinum* L. versus alfalfa, *Medicago sativa* L. in 2020/2021 and 2021/2022 seasons. As averages of both seasons, *Sitona lividipes* and leafhoppers exhibited the highest relative abundance on Egyptian clover, with values of 57.15 and 19.14%, and on alfalfa with values of 30.92 and 34.65%, respectively. Aphids occupied the third rank of occurrence (12.40%) on Egyptian clover but constituted a higher portion (25.25%) on alfalfa. The remaining five insect pest species were found in low relative abundance. However, the specific insect pest of clover, *Hypera brunneipennis* was collected in small portions; 5.16 and 4.83% on Egyptian clover and on alfalfa, respectively.

2. Insect Predator Species

Seventeen insect predator species were collected from each of Egyptian clover and alfalfa fields (Table 2). *Orius* spp were the most occurring in Egyptian clover and alfalfa fields, with relative abundances of 24.64 and 25.96%, respectively. Also, *Coccinella undecimpunctata* constituted considerable portions on both crops with values of 8.93 and 12.63%, respectively. Despite *Oxytelus nitidulus* was represented by 12.33% out of total catch of Egyptian clover, it represented only 2.80% in case of alfalfa. The situation was found reversed with *Hippodamia convergens*, *H. tredecimpunctata* and *H. variegata* which constituted only 3.20, 1.58 and 1.42% out of total predator populations in Egyptian clover compared to 13.20, 9.64 and 9.23% in alfalfa, respectively. In addition, *Paederus alfieri* was represented by 5.52 and 7.19% in Egyptian clover and alfalfa, respectively.

3. Parasitism of *Hypera brunneipennis* eggs by *Anaphes fusceipennis*

Eggs of *H. brunneipennis* were almost free from parasitoids (Table 3) from December 1st up to January 26th, the parasitoid activity gradually increased to exhibit the first peak (33.33%) on February 16th, and then relatively decreased, but later, the parasitoid demonstrated the highest peak (38.24%) on March 16th. Then, the parasitism decreased and was completely absent from April 20th till the end of the season.

Table (1): Relative abundance of insect pests attacking Egyptian clover and alfalfa at the experimental farm of Sakha Agricultural Research Station

insect pest	Stage	Total numbers of insect pests/1500 double strokes									
		Egyptian clover					Alfala				
		2020-2021		2021-2022		Overall average	2020-2021		2021-2022		Overall average
		NO	%	NO	%		NO	%	NO	%	
<i>Hypera brunnipennis</i>	A	238	6.12	128	4.19	5.16	112	3.45	134	6.21	4.83
<i>Sitona lividepis</i>	A	2244	57.75	1728	56.54	57.15	1195	36.85	539	24.99	30.92
<i>Nezara viridula</i>	A,N	92	2.37	222	7.26	4.82	124	3.82	36	1.67	2.75
Aphids	A,N	498	12.81	366	11.98	12.4	892	27.51	496	22.99	25.25
Leafhoppers	A,N	768	19.76	566	18.52	19.14	912	28.12	888	41.17	34.65
<i>Autographa spp</i>	L	26	0.67	16	0.52	0.6	0.00	0.00	24	1.11	0.056
<i>Spodoptera exigua</i>	L	2	0.05	0.00	0.00	0.03	6	0.19	0.00	0.00	0.1
<i>Spodoptera littoralis</i>	L	6	0.15	12	0.39	0.27	0.00	0.00	2	0.09	0.05
<i>Eupropocnemis plorans</i>	A,N	12	0.31	18	0.59	0.45	2	0.06	38	1.76	0.91
Total		3886	0.00	3056	0.00	0.00	3243	0.00	2157	0.00	0.00

Table (2): Relative abundance of insect predators associated with insect pests in Egyptian clover and alfalfa at the experimental farm of Sakha Agricultural Research Station

insect predatory species	Stage	Total numbers of insect pests/1500 double strokes									
		Egyptian clover					Alfala				
		2020-2021		2021-2022		Overall average	2020-2021		2021-2022		Overall average
		NO	%	NO	%		NO	%	NO	%	
<i>Coccinella novemmtata</i>	A	4	0.37	12	2.69	1.63	0.00	0.00	0.00	0.00	0.00
<i>C.septempunctata</i>	A	8	0.74	136	30.49	15.62	0.00	0.00	30	8.29	4.15
<i>C.undecimpunctata</i>	A	188	17.41	2	0.45	8.93	146	25.26	0.00	0.00	12.63
<i>Cydonia vicina isis</i>	A	2	0.19	0.00	0.00	0.1	0.00	0.00	0.00	0.00	0.00
<i>Hippodomia convergens</i>	A	40	3.7	12	2.69	3.2	60	10.38	58	16.02	13.2
<i>Hippodomiatredecimpunct</i>	A	34	3.15	0.00	0.00	1.58	22	3.81	56	15.47	9.64
<i>Hippodomia variegata</i>	A	16	1.48	6	1.35	1.42	30	5.19	48	13.26	9.23
<i>Rhizobius lihura</i>	A	6	0.56	0.00	0.00	0.28	22	3.86	8	2.21	3.04
<i>Scymnus interruptus</i>	A	20	1.85	30	6.73	4.29	0.00	0.00	4	1.1	0.55
<i>Scymnus syriacus</i>	A	10	0.93	42	9.42	5.18	0.00	0.00	4	1.1	0.55
<i>Scymnus ailvifroms</i>	A	2	0.19	8	1.79	0.99	6	1.04	0.00	0.00	0.52
<i>Scymnus spp</i>	A	6	0.56	14	3.14	1.85	0.00	0.00	0.00	0.00	0.00
<i>Oxytelus nitidulus</i>	A	150	13.89	48	10.76	12.33	10	1.73	14	3.87	2.8
<i>Paederus alfieri</i>	A	32	2.96	36	8.07	5.52	32	5.54	32	8.84	7.19
<i>Orius spp</i>	A, N	508	47.03	100	2.24	24.64	134	23.18	104	28.73	25.96
<i>Chrysoperla carnea</i>	L	40	3.7	0.00	0.00	1.85	108	18.69	4	1.1	99
<i>Ischnura senegalensis</i>	A	14	1.3	0.00	0.00	0.65	8	1.38	0.00	0.00	0.69
total		1080		446			578		362		

Table (3): Parasitism of eggs of *Hypera brunniipennis* inhabiting Egyptian clover fields by *Anaphes fuscipennis* at the experimental farm of Sakha Agricultural Research Station

Date	2020-2021			2021-2022		
	Eggs	parasitoid	%	Eggs	parasitoid	%
Dec.1	0	0	0.00	0	0	0.0
8	0	0	0.00	8	1	12.50
15	0	0	0.00	6	1	16.67
22	8	1	12.50	10	2	20.00
29	8	1	12.50	28	4	14.29
Jan.5	0	0	0.00	40	9	22.50
12	0	0	0.00	8	1	12.50
19	0	0	0.00	0	0	0.00
26	8	0	0.00	0	0	0.00
Feb.2	18	3	16.67	0	0	0.00
9	26	5	19.23	16	4	25.00
16	36	12	33.33	40	11	27.50
23	28	6	21.43	6	1	16.67
Mar.2	38	7	18.42	12	2	16.67
9	20	4	20.00	6	1	16.67
16	68	26	38.24	18	1	5.56
23	44	12	27.27	6	0	0.00
30	16	2	12.50	8	0	0.00
Apr.6	18	3	16.67	0	0	0.00
13	48	4	8.33	0	0	0.00
20	12	0	0.00	0	0	0.00
27	0	0	0.00	0	0	0.00
May.4	0	0	0.00	0	0	0.00
Total	396	86	21.72	212	38	17.92

The parasitism status of *H. brunniipennis* eggs in 2021/ 2022 season (Table 3) was different from that of the first season. The parasitoid was active throughout December up to January 12th, with a parasitism ranging between 12.50 and 22.50%. Specimens of host eggs were free from parasitism from January 19th up to February and then, the parasitoid recovered its activity, beginning from February 9th (25.00% parasitism), and recorded the highest peak (27.50%) on February 16th. Then, the parasitism gradually decreased to reach minimum (5.56%) on March 16th. However, the monitoring revealed the absence of the parasitoid from March 23rd. till the end of the season, on May 4th. Seasonal averages of parasitism were 21.72 and 17.92% in the first and second seasons, respectively.

4. Population fluctuations of dominant insect pests and associated predators in 2020/2021 season

4.1. Insect pests

Hypera brunniipennis had three peaks (Table 4) of insect adults with 32, 76 and 38 individuals/100 double strokes at Egyptian clover fields on January 18th, March 18th and on April 17th, respectively. Only one peak of 72

adults was attained in alfalfa field on March 18th. Total insect populations were 238 and 112 adults/1500 double strokes in Egyptian clover and alfalfa, respectively.

Sitona lividipes adults were attained in two peaks of 480 and 644 adults/100 double strokes on March 18th and April 17th, respectively, with a total count of 2244 adults/1600 double strokes throughout the season compared to 1195 adults in case of alfalfa.

Nezara viridula nymphs and adults were collected in few numbers throughout the season from both crops. However, the insect population was notably found during May and June, with totals of 92 and 124 nymphs and adults/1500 double strokes throughout the season on Egyptian clover and alfalfa, respectively.

Aphid nymphs and adults were more captured by the sweep net, from Egyptian clover on February 3rd and 18th, and on April 2nd and 17th. The same trend was found in alfalfa fields. Total seasonal counts revealed that alfalfa harbored more aphids than had Egyptian clover; with 892 and 498 nymphs and adults/1500 double strokes, respectively.

Leafhopper nymphs and adults mainly occurred on Egyptian clover on April 2nd and 17th and on June 2nd with densities of 202, 184 and 232 Individuals/100 double strokes, respectively. On alfalfa, the major insect densities were captured on April 2nd, May 3rd and 18th and June 2nd, with 106, 150, 292 and 130 nymphs and adults, respectively. Total seasonal counts were 768 individuals on Egyptian clover compared to 912 individuals on alfalfa/1500 strokes, respectively (Table 4)

Table (4): Biweekly numbers of the major insect pests and associated predators on Egyptian clover and alfalfa at Sakha Agricultural Research Station, during 2020/2021 season

Inception date	No. of insect pests and associated predators /100 double strokes																	
	Egyptian clover									Alfalfa								
	<i>Hypera brunneipennis</i>	<i>Sitona lividipes</i>	<i>Nezara viridula</i>	Aphids	Leafhoppers	Coccinellids	Staphylinids	<i>Chrysoperla carnea</i>	<i>Orius</i> spp	<i>Hypera brunneipennis</i>	<i>Sitona lividipes</i>	<i>Nezara viridula</i>	Aphids	Leafhoppers	Coccinellids	Staphylinids	<i>Chrysoperla carnea</i>	<i>Orius</i> spp
stage	A	A	A. N	A. N	A. N	L	L	L	A. N	A	A	A. N	A. N	A. N	L	L	L	A. N
Nov.24	0	88	0	0	20	2	0	0	0	0	18	0	2	6	0	4	0	0
Dec.8 22	0	140	0	0	14	0	2	2	0	0	136	6	10	20	0	0	0	4
	4	116	0	0	12	0	4	2	0	2	544	10	0	40	0	6		
Jan. 5 20	0	26	0	0	0	0	0	0	0	0	64	0	0	2	0	0	0	0
	2	56	0	4	0	0	0	0	0	0	32	0	8	2	0	0	0	0
Feb.318	22	94	0	26	8	0	38	0	0	0	42	0	48	8	0	2	2	0
	32	10	0	36	10	0	0	0	0	0	14	2	124	0	2	0	0	0
Ma318	26	80	0	8	24	4	14	0	0	8	10	0	20	42	0	16	0	0
	76	480	0	0	4	2	10	2	0	72	134	0	0	56	98	6	6	6
Apr.217	18	100	0	150	202	0	38	4	8	8	5	0	30	106	0	4	2	0
	38	644	0	274	184	16	50	14	22	10	34	4	404	34	2	10	54	2
May.318	18	310	12	0	28	146	28	6	12	4	58	8	216	150	24	0	26	0
	2	66	54	0	0	84	4	0	8	2	74	24	0	292	96	0	4	32
Jun.213	0	30	6	0	232	72	0	10	158	6	30	22	0	130	54	0	8	60
	0	4	20	0	30	18	0	0	300	0	0	48	0	24	12	0	0	30
Total	238	2244	92	498	768	342	188	40	490	112	1195	124	892	912	286	48	108	130

4.2. Insect Predators

Coccinellid larvae occurred intensively on both crops during the period from May 3rd up to June 2nd, with total populations, throughout the season, of

342 and 286 larvae/1500 double strokes on Egyptian clover and alfalfa, respectively.

Staphylinid larvae were collected in relatively high numbers, from Egyptian clover as well as from alfalfa during March, April and May. Total seasonal counts were higher (188 larvae /1500 double strokes) on Egyptian clover than on alfalfa (48 larvae) (Table4).

Chrysoperla cranea larvae were rarely collected throughout the season on both crops. The densities were relatively high on Egyptian clover by mid-April and early June; 14 and 10 larvae/100 double strokes, respectively. On alfalfa, high numbers were found on April 17th and on May 3rd, with densities of 54 and 26 larvae /100 double strokes, respectively. Thus, this chrysopid was more collected from alfalfa than from Egyptian clover.

Orius spp nymphs and adults were captured from Egyptian clover by the sweep net mainly on June 2nd (158) and on June 13th (300), compared to 60 and 30 nymphs and adults/100 double strokes from alfalfa fields. Total counts were 490 and 130 nymphs and adults/1500 double strokes, from Egyptian clover and alfalfa, respectively.

5. Population fluctuations of dominant insect pests and associated predators in 2020/2021 season

5.1. Insect pests

***Hypera brunneipennis* adults**

Adults of *H. brunneipennis* appeared in Egyptian clover fields in three peaks; 24, 18 and 12 individuals/100 double strokes on January 5th, February 18th and on May 3rd, respectively with a total number of 128 adults/1500 double strokes, throughout the season. In alfalfa fields, two peaks were attained; with 26 and 18 adults /100 double strokes on January 20th and April 2nd, with a total of 134 adults/1500 double strokes throughout the season.

Table (5): Biweekly numbers of the major insect pests and associated predators on Egyptian clover and alfalfa on at kafr El-Sheikh Region, during 2021/2022 season

Investigation date	No. of insect pests and associated predators /100 double strocks																	
	Egyptian clover									Alfalfa clover								
	<i>Hypera brunneipennis</i>	<i>Sitona lividipes</i>	<i>Nezara viridula</i>	Aphids	Leafhoppers	Coccinellids	Staphylinds	<i>Chrysoperla carnea</i>	<i>Orius</i> spp	<i>Hypera brunneipennis</i>	<i>Sitona lividipes</i>	<i>Nezara viridula</i>	Aphids	Leafhoppers	Coccinellids	Staphylinds	<i>Chrysoperla carnea</i>	<i>Orius</i> spp
stage	A	A	A. N	A. N	A. N	L	L	L	A. N	A	A	A. N	A. N	A. N	L	L	L	A. N
Nov.24	2	88	0	0	2	0	0	0	0	0	20	0	0	0	0	0	0	0
Dec.8	10	480	0	0	0	8	6	0	0	0	34	2	4	6	0	2	0	0
22	14	348	4	0	12	4	0	0	0	0	82	8	0	40	0	0	0	6
Jan. 5	24	110	0	0	6	0	8	0	0	0	10	10	50	0	0	0	0	0
20	4	28	0	0	4	0	2	0	0	26	41	0	0	56	0	0	0	0
Feb.3	4	52	0	0	22	0	6	0	0	24	42	0	0	472	8	4	0	0
18	18	66	0	4	10	0	0	0	0	22	10	0	30	40	0	10	0	0
Mar.3	12	78	0	0	110	12	10	0	0	16	68	0	0	14	42	10	0	0
18	10	68	0	22	12	0	22	0	0	18	54	0	0	20	0	6	0	0
Apr.2	8	50	0	154	104	0	4	2	2	18	46	0	24	44	0	0	0	0
17	10	130	0	186	264	36	6	0	0	6	42	2	136	24	0	0	0	0
May.3	12	200	0	0	18	114	16	0	0	4	34	4	130	66	18	2	0	0
18	0	28	36	0	2	40	2	0	0	0	56	8	90	36	22	0	4	18
Jun.2	0	2	148	0	0	26	0	0	20	0	20	2	32	62	36	0	0	0
13	0	0	34	0	0	24	2	0	80	0	3	0	0	44	126	18	0	80
Total	128	1728	222	366	566	262	84	2	102	134	539	36	496	888	252	52	4	106

Sitona lividipes

Adults of *S. lividipes* were collected from the Egyptian clover fields by the sweepnet in three peaks: 480, 78 and 200 individuals/100 double strokes on December 8th, March 3rd and May 3rd, respectively. In alfalfa fields, also, three peaks were found with 82, 68 and 56 adults/100 double strokes on December 22nd, March 3rd and May 18th, respectively. The total catch, throughout the season, was too much less (539 adults/1500 strokes) than that of Egyptian clover fields (1728).

***Nezara viridula* nymphs and adults**

In general, the population densities of *N. viridula* nymphs and adults were quite low throughout 2021/2022 season. In case of Egyptian clover, the insect was only collected late in the season, ranging between 34 and 148 nymphs and adults/100 double strokes, during the period from May 18th to June 13th with a total of 222 individuals/1500 double strokes. In alfalfa fields, very few numbers were collected with 36 nymphs and adults/1500 double strokes throughout the season.

Aphid nymphs and adults

In the Egyptian clover, nymphs and adults of aphids constituted two peaks of occurrence; 154 and 186 individuals/100 double strokes on April 2nd and April 17th, respectively. In alfalfa, also, two peaks were attained with 30 and 136 nymphs and adults on February 18th and April 17th, respectively. Over the whole season, 366 and 496 nymphs and adults were collected/ 1500 double strokes from Egyptian clover and alfalfa, respectively.

leafhopper nymphs and adults

In Egyptian clover fields, leafhoppers exhibited two peaks of occurrence with 110 and 264 nymphs and adults/100 double strokes on March 3rd and April 17th, respectively. However, three peaks were recorded in alfalfa fields with 472, 44 and 66 nymphs and adults/100 double strokes on February 3rd, April 2nd and May 3rd, respectively. Total numbers, over the season, were 566 and 888 nymphs and adults/1500 double strokes in the Egyptian clover and alfalfa fields, respectively.

5.2. Insect predators***Coccinella undecimpunctata* adults**

Adults of *C. undecimpunctata* were mainly collected from Egyptian clover fields late in the season, by April 17th up to June 13th, ranging between 24 and 114 adults/100 double strokes. This predator appeared in similar numbers in alfalfa fields, with a range of 18-126 adults/100 double strokes. Over the whole

period of the season, the predator populations were 262 and 252 adults/1500 double strokes in the Egyptian clover and alfalfa fields, respectively.

Staphylinid larvae

Staphylinid larvae appeared in the Egyptian clover fields with very low numbers exhibiting two small peaks on March 18th and May 3rd with 22 and 16 larvae/100 double strokes, respectively. The corresponding peaks in alfalfa fields were 10 and 18 larvae/100 double strokes on March 3rd and January 13th, respectively. The total numbers for the whole season were 84 and 52 larvae/ 1500 double strokes in clover and alfalfa fields, respectively.

***Chrysoperla carnea* larvae**

This predator was rarely detected with only two and four larvae, from clover and alfalfa, respectively for the whole experimental period.

***Orius* spp nymphs and adults**

This predator was only collected in May from clover fields (102 individuals / 1500 double strokes), compared to 106 individuals/100 double strokes in alfalfa fields, where it exhibited two moderate peaks by mid-May and mid- June.

6. Correlation coefficient values**6.1. In clover fields**

Data presented in Table (6) show that numbers of *H. brunnipennis* adults correlated insignificantly with each of coccinellids and *Orius* spp in both seasons of study. The same result was found between numbers of aphids and the two abovementioned predators. *Sitona lividipes* adults exhibited significant correlations with each of staphylinids and *Chrysoperla carnea* in the first season (2020/2021), and the same result was calculated between both predators and numbers of aphids. In the second season (2021 /2022), nymphs and adults of leafhoppers correlated insignificantly with each of coccinellids and *Orius* spp.

6.2. In alfalfa fields.

Hypera brunnipennis correlated significantly with staphylinid population in (2020/2021) season, but correlations between *S. lividipes* and all considered predators were not significant, with positive values, except staphylinids in 2021/2022 season. Aphids had highly significant positive correlation with *Chrysoperla carnea* in the first season. As for leafhoppers, the correlations were highly significant positive with coccinellids, and significant positive with *Orius* spp, both in the first season.

Table (6): Correlations between certain insect pests and associated predators in clover fields, at Sakha Agricultural Research Station.

Insect pest	Year	Predator			
		Coccinellids	Staphylinids	<i>Chrysoperla carnea</i>	<i>Orius</i> spp
<i>Hypera brunnipennis</i> (adults)	2020/21	-0.124	0.328	0.234	-0.175
	2021/22	-0.118	0.322	0.024	-0.317
<i>Sitona lividipes</i> (adults)	2020/21	0.117	0.445*	0.501**	0.191
	2021/22	0.068	0.016	-0.138	-0.358
Aphids (nymphs & adults)	2020/21	-0.193	0.559**	0.487	-0.030
	2021/22	-0.083	0.269	0.386	-0.093
Leafhoppers (nymphs & adults)	2020/21	0.153	0.346	0.468*	0.139
	2021/22	-0.043	0.558**	0.065	-0.212

Table (7): Correlations between certain insect pests and associated predators in alfalfa fields, at Sakha Agricultural Research Station.

Insect pest	Year	Predator			
		Coccinellids	Staphylinids	<i>Chrysoperla carnea</i>	<i>Orius</i> spp
<i>Hypera brunnipennis</i>	2020/21	0.214	0.406*	0.162	-0.175
	2021/22	-0.273	0.100	-0.249	0.289
<i>Sitona lividipes</i>	2020/2021	0.137	0.079	0.102	0.144
	2021/2022	0.081	-0.020	0.164	0.260
Aphids	2020/2021	-0.194	0.058	0.715**	-0.262
	2021/2022	0.009	-0.240	0.133	0.040
Leafhoppers	2020/2021	0.654**	-0.019	0.288	0.422*
	2021/2022	0.130	0.417*	0.188	0.096

Data in Table (8) show the correlations between weather factors and insect pests and their associated predators in clover fields. In the second season (2021/2022), there were significant positive correlations between maximum temperature and populations of each of *H. brunnipennis*, coccinellids and *Orius* spp.

Minimum temperature correlated in the second season with significant positive values with coccinellids and *Orius* spp. However, maximum relative humidity exhibited negative correlations with the majority of insects and predators.

Table (8): Correlations between weather factors and populations of insect pests and their associated predators in clover fields, at Sakha Agricultural Research Station

Insect pest	Year	Weather factor			
		Temp max	Temp min	RH% max	RH% min
<i>Hypera brunnipennis</i>	2020/21	-0.119	-0.063	-0.177	0.303
	2021/22	-0.389*	-0.348	0.194	0.338
<i>Sitona lividipes</i>	2020/2021	0.258	0.275	-0.408*	0.212
	2021/2022	0.019	0.057	-0.180	0.463
Aphids	2020/2021	0.019	0.057	-0.308	0.188
	2021/2022	0.053	0.108	-0.097	-0.247
Leafhoppers	2020/2021	0.418*	0.397*	-0.327	0.271
	2021/2022	0.042	0.009	-0.069	-0.205
Coccinellids	2020/2021	0.852**	0.859**	-0.619** 0.615	0.639**
	2021/2022	0.527**	0.711**		-0.401*
Staphylinids	2020/2021	0.219	0.109	-0.318	0.141
	2021/2022	-0.146	-0.214	0.031	0.014
<i>Chrysoperla carnea</i>	2020/2021	0.486**	0.477**	-0.608** 0.019	0.529**
	2021/2022	-0.167	-0.090		-0.028
<i>Orius</i> spp	2020/2021	0.413*	0.502**	-0.307	0.502**
	2021/2022	0.534*	0.537**	-0.098	-0.187

7. Comparison between Egyptian clover and alfalfa as hosts for insects and predators

7.1. predators in 2020/2021 season

Data in Table (9) show the difference between Egyptian clover and alfalfa as habitats for some insect pests and their associated predators in 2020/2021 season. Populations of *H. brunnipennis*, *S. lividipes* and *Nezara viridula* were collected in significant higher values in Egyptian clover than in alfalfa fields. The

remaining insect pests and all considered predators did not differ significantly between the two habitats in 2020/2021 season.

Data in Table 10) show that populations of *S. lividipes* and *coccinellids*, were significantly higher in clover fields, than in alfalfa ones. The remaining insects and associated predators exhibited no significant differences between the two habitats.

Table (9): Values of "t" test for comparing the population of insects and associated predators between Egyptian clover and alfalfa at Sakha Agricultural Research Station, 2020/ 2021 Season.

Insect pest	Clover	Alfalfa	Mann- Whitney U test	z	sig
	Mean rank	Mean rank			
<i>Hypera brunnipennis</i>	33.78	25.224	286.5	2.052	0.04*
<i>Sitona lividipes</i>	34.62	24.379	272	2.312	0.021*
<i>Nezara viridula</i>	25.81	33.190	313.5	1.996	0.46*
Aphids	27.10	31.897	351	1.197	0.231
Leafhoppers	25.72	33.276	311	1.72	0.085
Coccinellids	30.55	28.448	390	0.560	0.576
Staphylinds	31.83	27.172	353	1.221	0.222
<i>Orius spp</i>	28.09	30.914	379.5	0.725	0.468
Significant at the 0.05 level	29.55	29.448	419	0.031	0.975

Table (10): Values of "t" test for comparing the population, of insect and associated predators between Egyptian clover and alfalfa, Sakha Agricultural Research Station, 2020/ 2022 Season.

Insect pest	Clover	Alfalfa	Mann- Whitney Utest	z	sig
	Mean rank	Mean rank			
<i>Hypera brunnipennis</i>	30.03	28.970	405	0.249	0.803
<i>Sitona lividipes</i>	33.97	25.030	291	2.017	0.44*
<i>Nezara viridula</i>	28.17	30.030	382	0.732	0.464
Aphids	26.90	32.100	345	1.432	0.152
Leafhoppers	25.60	33.400	307.5	1.778	0.075
Coccinellids	31.12	27.880	373.5	0.838	0.402
Staphylinds	33.19	25.810	313.5	1.968	0.049*
<i>Orius spp</i>	28.48	30.520	391	1.04	0.296
Significant at the 0.05	29.48	29.520	420	0.013	0.990

DISCUSSION

In the current study, nine insect pest species were surveyed from both Egyptian clover and alfalfa. Only two species; *Hypera brunnipennis* and *Sitona lividipes* could be reported as specific to clover and alfalfa hosts. **El. Kifl et al (1974)** indicated that *Sitona lividipes* life cycle was affected by leguminous host plant as well as the soil type. In our study, *S. lividipes* constituted 57.54 and 30.92% out of the total population of surveyed insect pests from Egyptian clover and alfalfa, respectively. **El-Dessouki and Al- Awady (1978)** reported only one peak of *S. lividipes* per year on Egyptian Clover. The insect population in our study was very high in December and early May. *Hypera*

brunnipennis exhibited, in the current investigation, relatively higher population densities in late March up to early May. **El-Mezyyen (2003)** encountered two peaks for *H. brunnipennis* in Egypt (in January and April) and in Libya (in March and May). In a biology study on *H. brunnipennis*, **Awadalla et al (214)** concluded that the life cycle of the pest was shorter when reared on clover, but longer when reared on Kidney bean.

In the current investigation, we surveyed, in addition to *H. brunnipennis* and *S. lividipes*, *Nezara viridula*, aphids, leafhoppers, *Autographa spp*, *Spodoptera littoralis*, *S. exigua* and *Euprepucnemis plorans*. Similar results were obtained by **Wagan et al (2015)**, in China, who

recorded aphids, leafminers, thrips, whiteflies and cutworm as insect pests inhabiting Egyptian clover. In the same context, **Mabrouk and Mahbob (2017)** surveyed 46 arthropod species from clover and faba bean fields, at Dakhla Oasis, classified into 33 families and nine orders. These species included insect pests, natural enemies and pollinators.

Despite *H. brunneipennis* constituted 4.83-5.16% out of total insect pests recorded in our study, **El-Sheikh (2019)** indicated that this insect pest was a very important pest at El-Farafra Oasis, New valley.

It is important to understand the role of natural enemies in keeping the natural balance in the agricultural ecosystem (**El-Husseini et al 2018**). In this investigation, we recorded 17 insect predatory species inhabiting both Egyptian clover and alfalfa fields. **Summers et al (1981)** found large aestivated aggregations of *H. brunneipennis* inhabiting the same shelters of the insect predators; *Hippodamia Convergens* Guerin and *Coccinella* spp which means

that the insect and its predators share similar needs for this stage of their life cycle. **EL Mezayyen et al (2003)** found predators similar to those reported herein; *Coccinella* spp, *Chrysoperla carnea*, *Scymnus* spp, *Paederus alfieri* and *Orites* spp.

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الملخص العربي

مدى ملائمة البرسيم المصري والبرسيم الحجازي كعوائل آمنة للأعداء الطبيعية في
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البرسيم هو محصول العلف الرئيسي في مصر ، خاصة في فصل الشتاء. ويلعب دورا حيويا في استدامة النظام البيئي الزراعي، لأنه يزيد من خصوبة التربة عن طريق تثبيت النيتروجين الذى تحصل عليه البكتريا من الغلاف الجوي لتقوم بتثبيته في العقد البكتيرية في الجذور. ومن مميزات البرسيم أنه محصول صديق للبيئة لأنه لا يتعرض لأي مبيدات حشرية في معظم الأحيان. أجريت الدراسة الحالية بالمزرعة التجريبية بمحطة البحوث الزراعية بسخا خلال موسمي 2021/2020 و 2022/2021 خلال الفترة من نوفمبر إلى يونيو لحصر مفصليات الأرجل باستخدام شبكة جمع الحشرات على كل من البرسيم المصري والبرسيم الحجازي. وتم حصر الوفرة النسبية لتسعة أنواع من الآفات الحشرية في البرسيم. تم جمع سوسة ورق البرسيم بأعداد صغيرة (5.16 و 4.83%) من المجموع الكلى من إجمالي الآفات على البرسيم المصري والحجازي على التوالي. بينما سجلت سوسة جذور البرسيم بأعداد مرتفعة نسبيا بقيم 57.15 و 30.92% من إجمالي مجموع الحشرات الموجودة على البرسيم المصري والبرسيم الحجازي على التوالي. ومن ناحية أخرى، تم جمع 17 نوعا من الحشرات المفترسة. حيث سجلت بقعة الأوريس تواجدا بنسبة 24.64 و 25.96 بينما سجلت مجموعة مفترسات ابي العيد 45.07 و 53.51% من المجموع الكلى للمفترسات على نوعى البرسيم على التوالي. تمت مراقبة التطفل على التوالي على بيض سوسة ورق البرسيم بواسطة طفيل *Anaphes fusceipennis* في الفترة من 23 مارس وحتى نهاية الموسم، حيث بلغت نسبة التطفل 21.72 و 17.92% في الموسمين الأول والثاني على التوالي.