Journal of Sustainable Agricultural and Environmental Sciences
https://jsaes.journals.ekb.eg/
JSAES, 2022, 1(1): 80 - 89

ISSN-Print: 2735-4377
ISSN-Online: 2785-9878

Survey and Population Fluctuation of Certain Insect Pests and their Predators in Canola Fields at Kafr-El Sheikh Governorate

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J.Sust.Agri.Env.Sci. (JSAES)

Keywords:
Brassica napus L*; Myzus persicae; Thrips tabaci; Empoasca decipiens*.

ABSTRACT

The third most important crop in the world for the production of edible oils is canola (*Brassicae napus* L.). So, canola crop should receive a great care to enhance crop productively, hence increase the production of edible oils. In fields of canola, during 2016/2017 and 2018/2019 seasons, *Thrips tabaci* Lind was the most occurring (64.1% out of the total surveyed insects) followed by *Myzus persicae* (Sulzer) (24.2%). The least encountered insect pest species was *Empoasca decipiens* (Paoli) (7.1%) and *Liriomyza brassicae* (Riley) (4.5%). Two peaks of T. tabica were found in the first season, on 21st February and 4th April, while the peaks in the second season were recorded on 24th January and 21st March. In addition, four insect predator species were surveyed, belonging to four families and three orders, *Chrysoperla carnea* is the most prevalent insect predators and the population densities of *Chrysoperla carnea* peaked in March during the two seasons.

1. INTRODUCTION

Canola (*Brassica napus* L.) is the third major source of producing edible oils, in the world, proceeded by soybean and palm oil **(Kandil and Gia, 2012)**. The main producer countries are China, European Union, Canada, India and Japan **(Ghazani and Morangoni, 2016)**. Canola, modified from rapeseed in Canada in 1974, has very low levels of erucic acid and glucosinolates, which makes it safer and more favorable for human consumption. Canola seeds contain 33% proteins, 5% fats and 10% fiber **(Raymer, 2002)**. Edible oil supplies are highly insufficient for the domestic Egyptian consumption of oils imports exceeds recently 95% **(FAOSTAT, 2021)**.

Several insects attack canola plants throughout the growing season, resulting in damage and losses to this important crop **(Amer *et al.*, 2009)**. Aphids represent a major threat to canola plantations, if the conditions come are favorable for such insects **(Atta *et al.*, 2019)**. Aphids severely damage all canola plant organ, flowers, shoots, pods and stems, as they suck the saps and may transmit virus diseases **(Shafiand Farooq, 2021)**. Fortunately, canola fields

are rich in natural enemies that can help in the management of harmful insects **(Atta *et al.*, 2019 and Waleed, 2020)**.

The objective of this study was to survey pests and their natural enemies in canola plantations. The population fluctuations of the main insect pest species and predators were monitored.

2. MATERIALS AND METHODS

2.1 Experimental site

The present work was conducted at the experimental Farm of Saka Agricultural Research Station, Kafr El Sheikh Governorate, during 2016/2017 and 2018/2019 canola growing seasons.

2.2 Experimental design

Survey of the major insect pests and predatory insects in canola fields. Field experiments were carried out to survey and study the seasonal abundance of the main insect pests (*Myzus persicae* (Sulzer), *Thrips tabaci* Lind, *Empoasca decipiens* (Paoli) and *Liriomyza brassicae* (Riley) and their associated insect predators; hoverflies *Chrysoperla carnea* Steph. and *Aphidoletes aphidimyza*. An area about half feddan was divided into plots; each is about 10m x 30m. One canola variety (Pactol) was cultivated on November 15 during the two study canola seasons. The treatments were carried out in a complete randomized block design with three replicates. All recommended agricultural practices were followed during canola growing seasons without insecticide application. Weekly samples were initiated four weeks after planting and continued until harvest.

2.3 Sampling techniques

2.3.1 Sweep net

A normal sweep met (35cm in diameter and 70cm deep) with a wooden handle (120cm) was used for collecting flying and mobile insects on the plant parts. When finishing strokes, the captured insects were emptied into a glass jar and transferred to the laboratory for further investigations. Weekly sample of 20 double strokes were done by walking diagonally in the canola field.

2.3.2 Pitfall trap

Twelve cylindrical plastic containers (9cm in diameter and 12cm deep) were fixed in an area of about one feddan and provided with water till a height of 8cm, each container was provided with few drops of formaldehyde for preserving the insects from decomposition, in addition to few drops of liquid soap as a surfactant. Traps were placed every week and the trapped insects were sieved through a fine textile, collected and counted.

2.4 Population density of certain insect pests and their associated predatory insects in canola fields

The same area assigned for surveying insect pests and predatory insects in canola fields was used for monitoring the population fluctuations of the certain insect pests (*Myzus persicae* (Sulzer), *Thrips tabaci* Lind., *Empoasca decipiens* (Paoli) and *Liriomyza brassicae* (Riley) and the certain predatory insects throughout the two canola growing seasons.

2.5 Weather factors

Date of weather factors were obtained from the meteorological station, located at Rice Research and Training Center Sakha Agriculture Research Center. Daily maximum and minimum of temperature and relative humidity values were recorded.

2.6 Statistical analysis

Analysis of variance was performed to compare the tested parameters by using SPSS program.

3. RESULTS AND DISCUSSION

3.1 Survey of certain insect pests in canola fields during 2016/2017 and 2018/2019 seasons

Data presented in Table 1 revealed the occurrence of species of certain insect pests belonging to 4 families in 3 orders. Homopterahad two species (*Myzus persicae* and *Empoasca decepiens*). While each of Thysanoptera and Diptera contained one

species; *Thrips tabaci* and *Liriomyza brassicae*, respectively. Based on the total number of each species, data in Table 1 total surveyed insects, followed by *Myzaus persicae* representing 24.2%. The rest insects exhibited low numbers varied from 4.5% (*Liriomyza brassicae*) to 7.1% (*Empoasca decipiens*). The obtained results indicated that *Thrips tabaci* was the most dominant insect representing 64.13% of the

agree with the findings of **Khan and Begum (2005), Ataa *et al.* (2019) and Abdel-Rahman *et al.* (2020)** who considered aphids as the most damaging insects on canola plants.

Table 1: Number of the certain insect pest species surveyed from canola fields, during 2016/2017 and 2018/2019 seasons at Sakha, Kafr El Sheikh Governorate

Order	Family	Scintific name	Season		Total	Abundance %
			2016/2017	2018/2019		
Diptera	Agromyzidae	*Liriomyza brassicae* Riley	211.32	97.97	309.29	4.5
Hemiptera	Cicadellidae	*Empoasca decipiens* Paoli.	272.95	209.63	482.58	7.1
	Aphididae	*Myzus persicae* Sulzer	952.64	692.31	1644.95	24.2
Thysanoptera	Thripidae	*Thrips tabaci* Lind	2270.97	2085.64	4356.61	64.1
Total			3707.7	3085.4	6793.2	

3.2 Survey of the certain insect predatorsin canola fields during 2016/2017 and 2018/2019 seasons

With regard to the predaceous insects, it is obvious from results in Table 2 that 6 species belonging to 3 families and 2 orders were counted. The surveyed predators were *Episyrphus balteatus* (De Geer), *Eupeodes corolla*, *Scavaalboma culata* (Macquar), *Sphaerophoria scripta* (Linnaeus), *Aphidoletes aphidimyza* (Rondani) and *Chrysoperla carnea* (Stephens). Based on the total number of each species of insect predators. Data in Table 2 indicated that *Chrysoperla carnea* had the highest dominance. (65.65%) followed by hoverflies (18.02%). While *Aphidoletes aphidimyza* was the least dominant species (16.31%), these results agree with those of **Kismir (1992)** in Turkey and **Sarwar (2013)** in Pakistan who reported that both of *Chrysoperla carnea* and syrphids are major insect predators.

Table 2: Number of the certain insect predators surveyed from canola fields, during 2019/2017 and 2018/2019 seasons, at Sakha, Kafr El Sheikh Governorate

Order	Family	Scientific name	Season		Total	Abundance %
			2016/2017	2018/2019		
Diptera	Syrphidae (Hoverflies)	*Episyrphus balteatus* (De Geer)	13.32	10.32	66.61	18.02
		Eupeodes corolla	20.32	11.65		
		Scava albomaculata(Macquart)	2	1		
		Sphaerophoria scripta (Linnaeus)	5	3		
	Cecidomyiidae	*Aphidoletes aphidimyza* (Rondani)	37.98	22.32	60.3	16.31
Neuroptera	Chrysopidae	*Chrysoperla carnea*	136.31	106.29	242.6	65.65
Total			214.93	154.85	369.51	

3.3 Population fluctuation of certain insect pests in canola fields during 2019/2017 and 2018/2019 seasons

3.3.1 Liriomyza brassicae

Adults of *Liriomyza brassicae* appeared with two peaks in 2016/2017 season (Fig. 1) on Feb 7th (28.66) and April 4th (30.00). In the second season (Fig. 1), two peaks were found with 20.00 and 18.33 adults on February 7th and March 7th, respectively. No significant correlations were found between *L. brassicae* populations and both temperature and RH%.

3.3.2 Empoasca decipiens

Data presented in Fig. 2 show that *Empoasca decipiens* nymphs and adults were captured by the sweep net in all samples beginning from December to April, throughout the two canola seasons. In the first season, 2016/2017, two peaks of this green leafhopper were detected; on 24th of January and 7th of March, with population densities of 35.66 and 37.99 nymphs and adults/20 double strokes, respectively. Also, in the second season, 2018/19, two peaks of the leafhopper activity were attained; on 7th of February and 21st of March, with population densities of 34.33 and 31.33 nymphs and adults/20 double strokes, respectively. Seasonal mean of the first season (27.29 nymphs and adults) was higher than that of the second season (20.96).

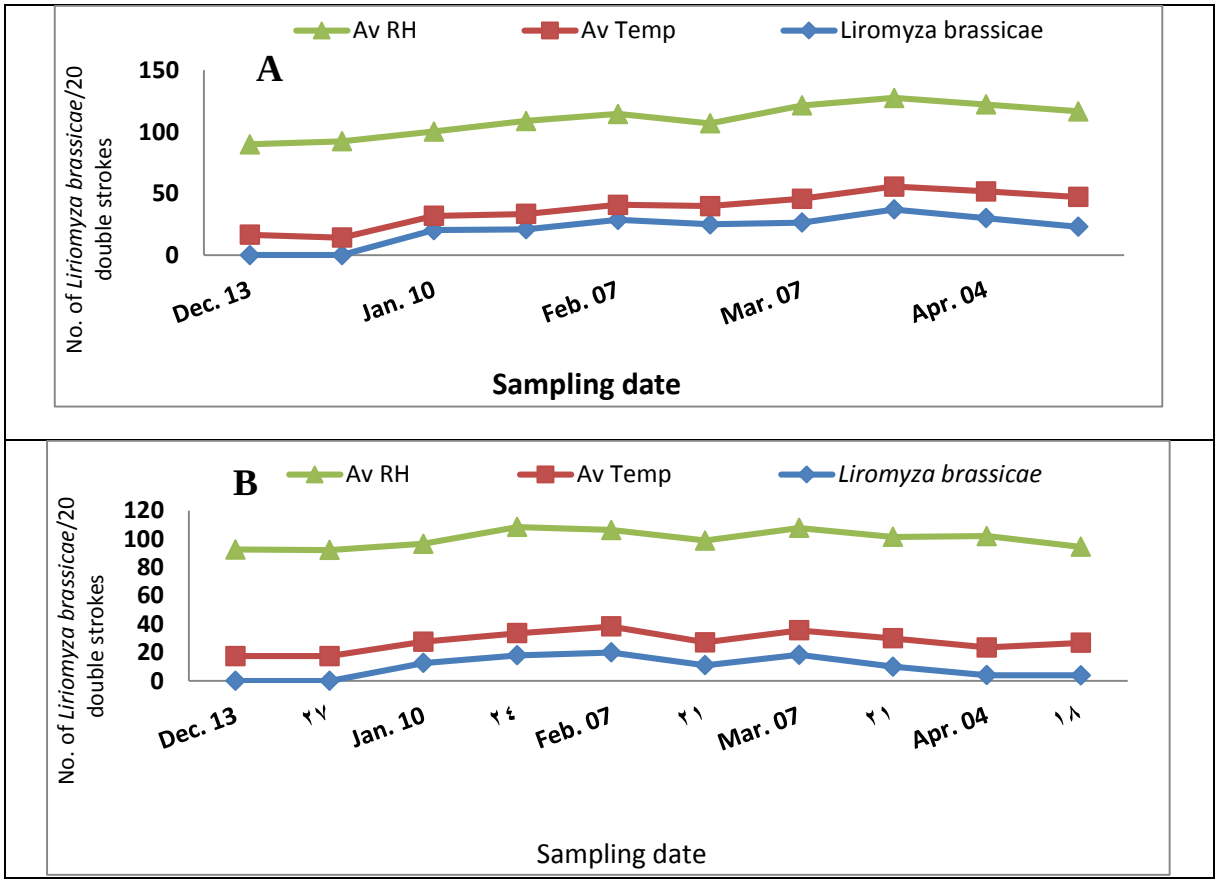


Fig. 1: Population fluctuations of *Liriomyza brassicae* adults at the experimental farm of Sakha Agricultural Research Station, 2016/17 (A) and 2018/2019 (B)

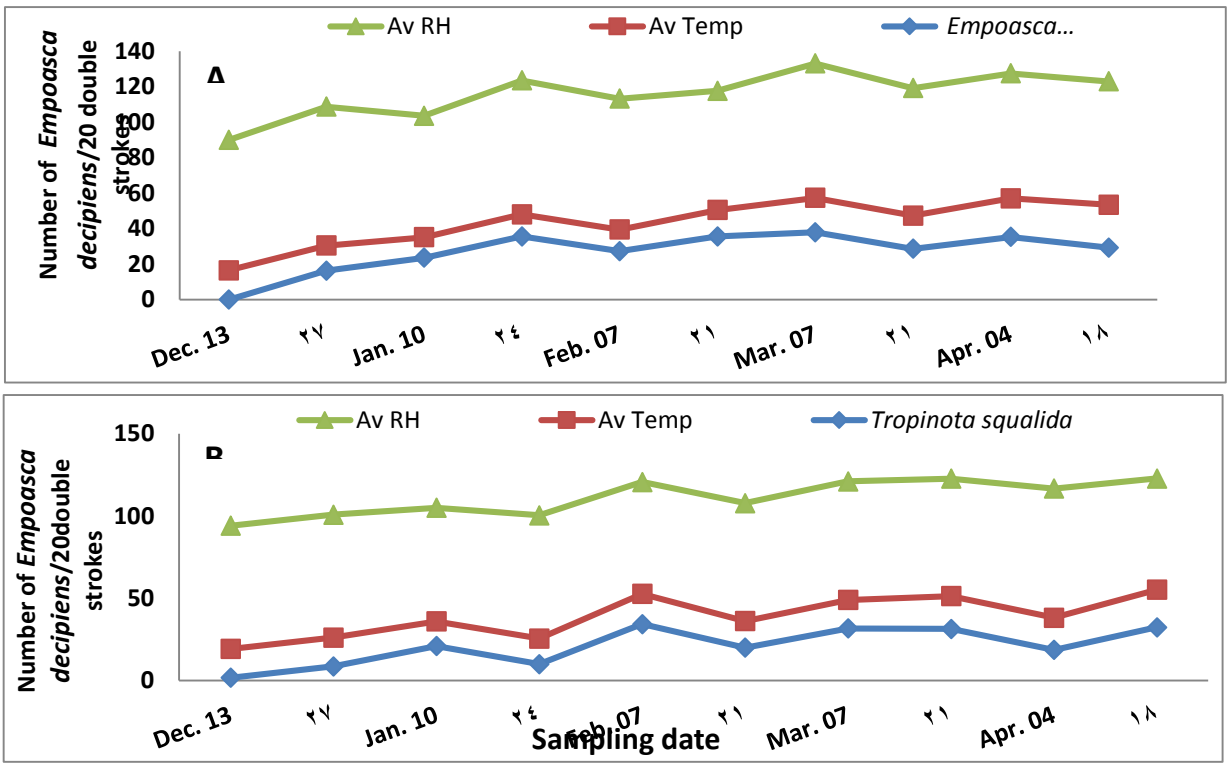


Fig. 2: Population fluctuation of *Empoasca decipiens* nymphs and adults at the experimental farm of Sakha Agricultural Research Station, 2016/2017 (A) and 2018/2019 (B)

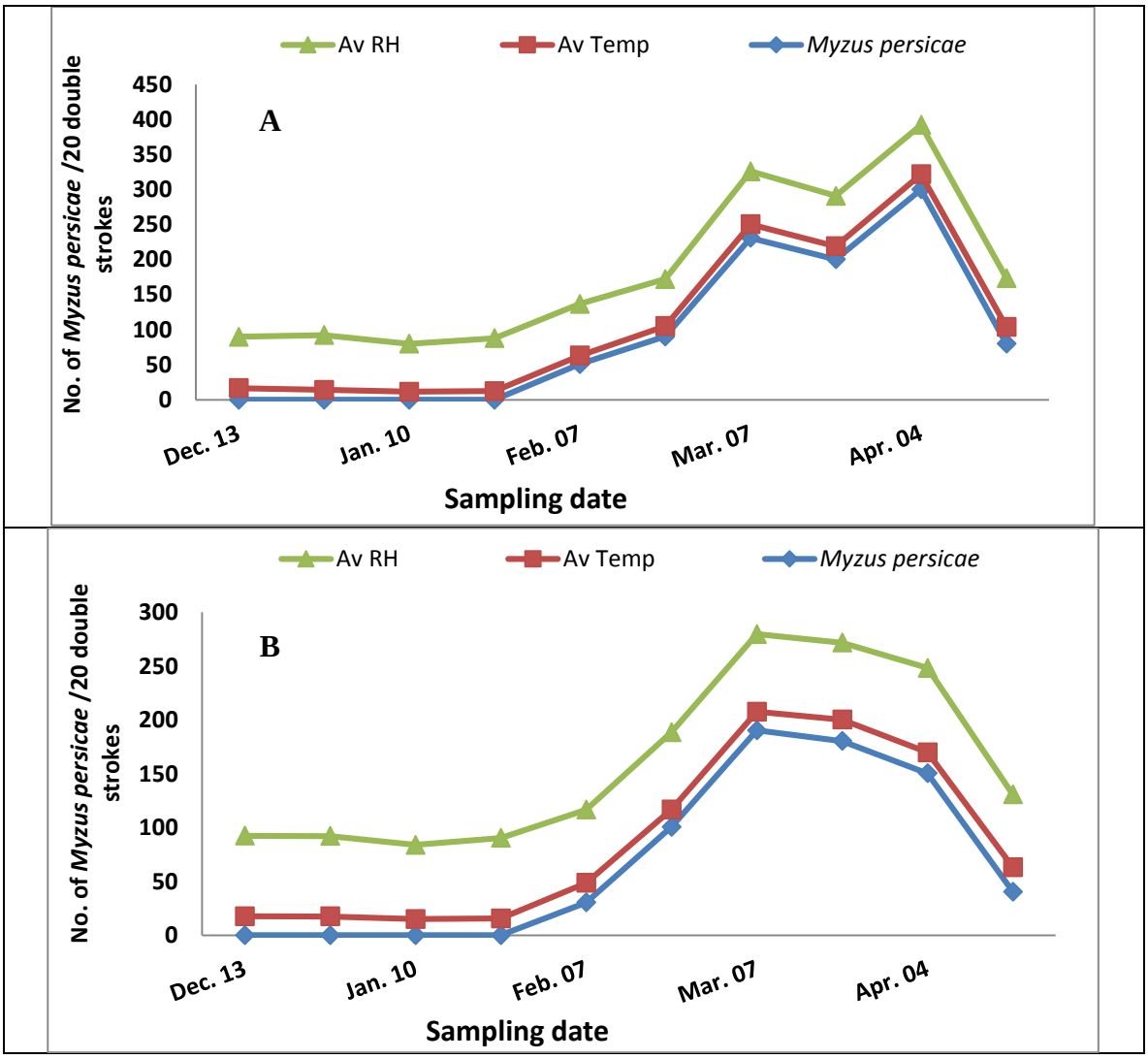
3.3.3 Myzus persicae

In 2016/2017 season (Fig. 3), *Myzus persicae* nymphs and adults were not found on canola plants up to late January. The numbers increased gradually to form the first aphid peak on 7th of March and the second one was recorded on the 4th of April, with population densities of 230.99 and 300.00 nymphs and adults per 20 branches, respectively. In 2018/2019 season (Fig. 3), one peak of *M. persicae* nymphs and adults (190.33) was recorded on 6th March. Seasonal mean of 2016/2017 was 95.26 while that of 2018/2019 was 69.23 nymphs and adults/20 branches. In the first season, highly significant positive correlation was found between *M. persicae* and temperature. However, this correlation was insignificant positive in the second season.

3.3.4 Thrips tabaci

Collections of double strokes revealed that *Thrips tabaci* infested canola plants throughout both seasons of study. In the first season (Fig. 4), two insect peaks were obtained on 21st February and 4th of April with densities of 300.00 and 500.00 larvae and adults/20 double strokes, respectively. In 2018/2019 season (Fig. 4), the peaks were recorded on 24th of January and 21th of March, with densities of 129.33 and 506.33 larva and adults/20 double strokes, respectively.

Seasonal mean of the first season was higher than that of the second season, with densities of 277.30 and 208.56 larva and adults /20 double strokes, respectively. *T. tabaci* populations correlated with a highly



positive significant value with temperature, and with positive significant value with RH%.

Fig. 3: Population fluctuation of *Myzus persicae* nymphs and adults the experimental at farm of Sakha Agricultural Research Station, 2016/2017 (A) and 2018/2019 (B)

3.03 and 2.60 individuals in the first and second seasons, respectively.

3.4.2 Aphidoletes aphidimyza

In 2016/2017, *A. aphidimyza* adults were not captured up to 10th of January, and exhibited a little peak of 4.66 adults/20 double strokes, and a bigger one of 8.00 adults per 20 double strokes on 7th of February and 21st of March, respectively, with an average of 3.80 adults for the whole season (Table 3). In 2018/2019 season (Table 4), *A. aphidimyza* adults were not detected during December and January. However, two peaks (each of 6.33 individuals) were attained on 7th February and 21st March) with an average of 2.23 adults per 20 double strokes for the whole season.

3.4.3 Chrysoperla carnea

In the first season (Table 3), *Ch. carnea* eggs, larvae and adults were collected very low up to 10th January, to exhibit only on peak (28.66/20 double strokes) on 7th March, with a seasonal average of 10.63. In the second season (Table 4), the seasonal average was 10.63 eggs, larvae and adults/20 double strokes with one peak (25.33/20 double strokes) on 20st March. Both *Chrysoperla carnea* and syrphids were found, in the current study, as of major insect pests. Similar results were obtained by **Waleed (2020)** in Egypt.

The obtained results are in agreement with those obtained by **(*Atta et al.*, 2019)** in Pakistan who mentioned, *Myzus persicae Scava albomaculata* and *Sphaerophoria scripta*. In 2016/2017 (Table 3), these

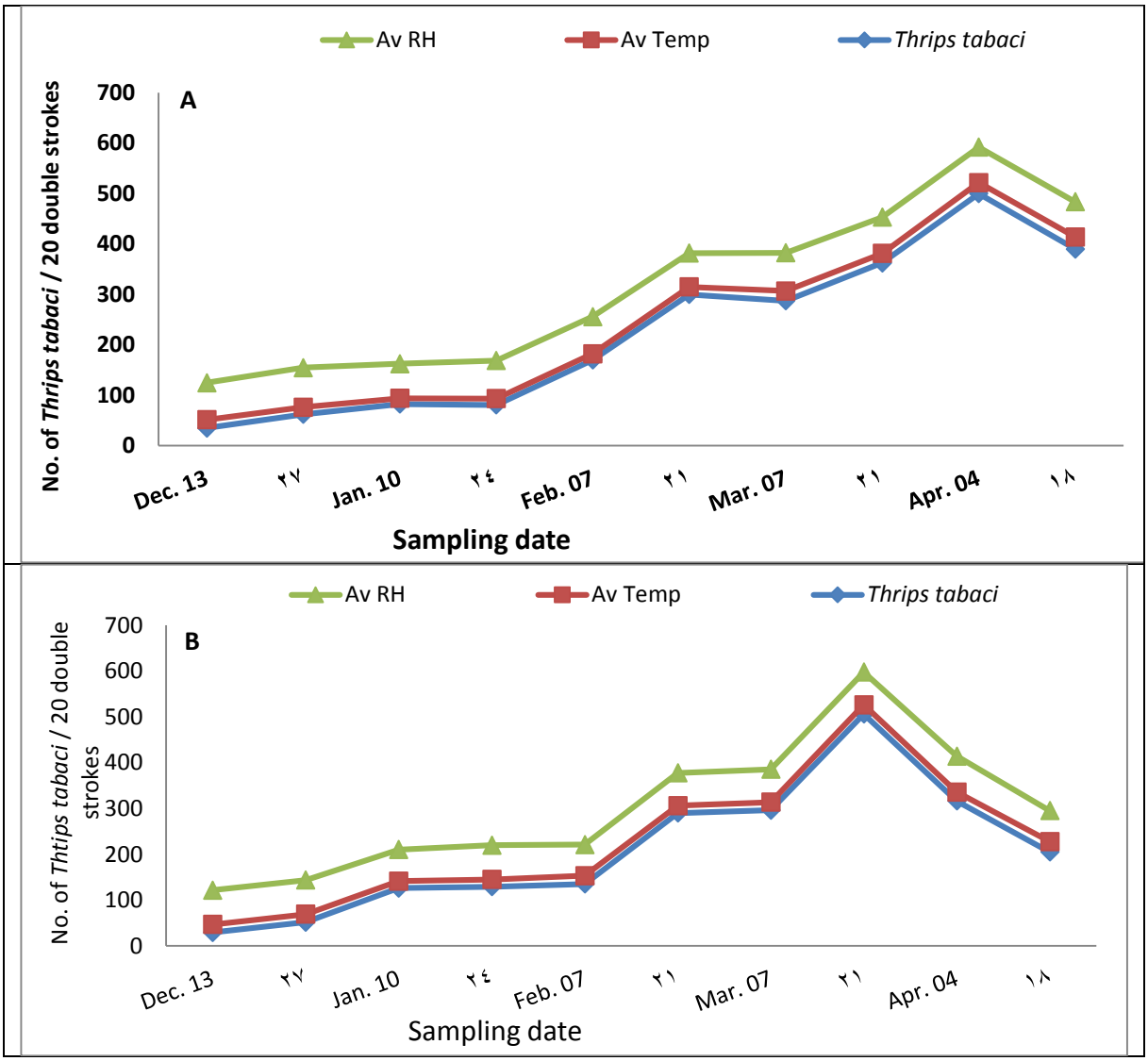


Fig. 4: Population fluctuation of *Thrips tabaci* adults at the experimental farm of Sakha Agricultural Research Station, 2016/2017 (A) and 2018/2019 (B)

Population fluctuation of predators in canola fields during 2016/2017 and 2018/2019 seasons.

3.4. Population fluctuation of predators in canola fields during 2016/2017 and 2018/2019 seasons

Four categories of insect predators were monitored during 2016/2017 and 2018/2019 seasons (Tables 3 and 4).

3.4.1 Hover flies

Four species of hoverflies were considered; *Episyrphus balteatus*, *Eupeodes corollae*, hoverflies were not detected during December and January and formed the first peak (6.99 individuals/20 double strokes) on 7th of February, and the second one (12.33 individuals) by late March. In 2018/2019 season (Table 4), the hoverflies were also absent during January and February, and formed the first peak on 6th February (4.66 individuals), and the second one on 20th of March (6.66 individuals/20 double strokes). Seasonal averages were

Table 3: Population fluctuation of predators at the experimental farm of Sakha Agricultural Research Station, 2016/2017 season

Sampling Date	Number per 20 double strokes		
	Hoverflies	*Aphidoletes aphidimyza*	*Chrysoperl acarnea*
Dec-13	0	0	0
27	0	0	0
Jan-10	0	0	3
24	0	2	4.66
Feb-07	6.99	4.66	9
21	4	4	15.66
Mar-07	3.33	6	28.66
21	12.33	8	23
Apr-04	7.33	5.66	25.33
18	6.66	7.66	27
Average	3.03	3.80	13.63
±SE	1.34	0.99	3.68

Table 4: Population fluctuation of aphid predators at the experimented farm of Sakha Agricultural Research Station, 2018/2019 season

Sampling Date	Number per 20 double strokes		
	Hoverflies	*Aphidoletes aphidimyza*	*Chrysoperla carnea*
Dec-13	0	0	0
27	0	0	1
Jan-10	0	0	2
24	0	0	4.99
Feb-07	4.66	6.33	10.33
21	4.33	1.33	15.66
Mar-07	2.33	0	20.33
21	6.66	6.33	25.33
Apr-04	5	5.33	15.66
18	2.99	3	10.99
Average	2.60	2.23	10.62
±SE	0.79	0.88	2.73

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ISSN-Online: 2785-9878

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Journal of Sustainable Agricultural and Environmental Sciences
https://jsaes.journals.ekb.eg/
JSAES, 2022, 1(1): 80 - 89

ISSN-Print: 2735-4377
ISSN-Online: 2785-9878

حصر وتقلبات تعداد بعض الآفات الحشرية ومفترساتها في حقول الكانولا بمحافظة كفرالشيخ

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مجلة العلوم الزراعية والبيئية المستدامة

الكلمات المفتاحية:

الملخص العربي

الكانولا (*Brassica napus* L.) هي ثالث أهم محصول في العالم لإنتاج زيوت الطعام لذا، يجب أن يحظى محصول الكانولا بعناية كبيرة لتحسين إنتاجيته، وبالتالي زيادة إنتاج زيوت الطعام في حقول الكانولا. في خلال موسمي 2016/2017 و 2018/2019، كان التربس يمثل 64.1٪ من إجمالي الأفراد التي تم حصرها يليه من الخوخ الاخضر 24.2٪ و كان أقل أنواع الآفات الحشرية التي تم حصرها هي الجاسيد 7.1٪ وصانعات أنفاق الأوراق 4.5٪.

تم تسجيل على قمتين من التربس في الموسم الأول، في 21 فبراير و4 أبريل، بينما تم تسجيل الذروة في الموسم الثاني في 24 يناير و21 مارس. بالإضافة إلى ذلك، تم حصرأربعة أنواع من الحشرات المفترسة، تنتمي إلى أربع عائلات وثلاث رتب.تعتبرحشرة أسد المن هي أكثر الحشرات المفترسة انتشارًا وبلغت الذروة العددية لأسد المن في شهر مارس خلال الموسمين.