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Some ecological studies on sugar beet crop insects in Kafr El-Sheikh and Nubaria regions

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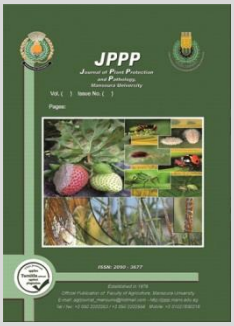

ABSTRACT

The present studies were conducted at the experimental farms in Agricultural Research Stations of Kafr El-Sheikh and Nubaria regions during two seasons (2019/2020 and 2020/2021) to survey the insect pests and predators that inhibiting sugar beet crop, and to study the seasonal abundance of main insect pests in such crop, and to evaluate the impact of some climatic factors in both regions on the seasonal abundance of some serious insects. Survey studies revealed that sugar beet plants attacked by 45 insect species: 15 of them were accidently visitors. In addition, ten predator species were recorded during the period extended from October until April in both regions during the two seasons. *Spodoptera littoralis* larvae gave the highest monthly average in December, while *Pegomyia mixta* larvae recorded the highest monthly average numbers in February and March in Kafr El-Sheikh and Nubaria regions in both seasons. On the other hand, the highest monthly average numbers of *Cassida vittata* adults were recorded in April in Kafr El-Sheikh region but in February-March in Nubaria region, during both seasons. *Scrobipalpa ocellatella* appeared with the highest monthly average only in April of both seasons in Kafr El-Sheikh. Whereas, it doesn't exist in Nubaria region. Results revealed that effects of the three weather factors (temperature, relative humidity and wind speed) were non-significant during the two seasons in both regions. I could be concluded that sugar beet plants that cultivated Nubaria region received less numbers of insect species than that cultivated in Kafr El-Sheikh region, and given that the sugar beet crop is considered a reclamation crop for new lands, so it must be reassurance in its cultivation due to the lack of insect infestation as well.

Keywords: Survey, insect pests, predators, sugar-beet crop, Population fluctuation, Weather factors.

INTRODUCTION

Sugar beet is subjected to be attacked by numerous insect pests during its different growth stages. Many authors are interested to study the impact of insect pests on growers and crop yield (Boraei *et al*., 1993; El-khouly, 2006; Amin *et al.*, 2008; Fouad, 2011; El-Dessouki, 2019; Hawila, 2021). They concluded that pests' infestation is the main limiting factor affects the crop yield, both quantitatively and qualitatively. Sugar beet plants are attacked by more than 150 insect species and mites (Zarif, 1985; El-Dessouki, 2014). These insects are classified into four groups: harmful insects, visiting insects, parasitoids, and predators (Solouma, 1989). Among these insect species, there are three insect species (*Cassida vittata* Vill; *Pegomyia mixta* Vill and *Scrobipalpa ocellatella* Boyd) were found associated with sugar beet plants and the main predator species that recorded associated with these insect pests were *Coccinella undecimpunctata* L.; *Scymnus sp*., *Paederus alfierii* Koch. and *Chrysoperla carnea* (Steph.).

The sugar beet fly, *P. mixta* (Diptera: Anthomyiidae) decreases seriously the quantity and quality of sugar (Ebieda, 1997 b; Zarif and Hegazi, 1990; Al-Habashy, 2018). The tortoise beetle, *C. vittata* (Coleoptera: Chrysomelidae) is one of the most serious and destructive insect pests of sugar beet in Egypt where the tortoise beetle larvae and adults feed on the lower side of the large sugar beet leaves, where they eat the lower epidermis and the inner tissue, but the upper epidermis remains intact looking like a transparent glass causing serious damage, adults feed on leaves tissue, causing regular circular holes (Abo El-Ftooh, 1995 and Ebieda, 1997 a; Hawila 2021). In recent years, the sugar beet moth, *S. ocellatella* has become serious pest of the sugar beet plants. Its larvae may be found in a single tunnel, in the mid rib, leaf stalk or roots and may cause death to the infested plants and pest damage was occurred in the central buds and the root of the sugar beet plant (Amin *et al*., 2008; Al-Keridis, 2016; Ahmadi *et al.*, 2017).

In addition to the three main insect species, the cotton leafworm, *Spodoptera littoralis* Boisd is a destructive insect pest of sugar beet plantations, particularly to the early plantations as the larvae seriously attack the young plants and causing significant defoliation with small roots which cause a shortage of sugar crop (Bazazo and Ibrahim, 2020).

The integrated management of insect pests should consider all factors that may have adverse effect on insect population growth. The climatic conditions are of the most important factors effect on the population dynamics of

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insects (Godfrey and Rosenheim, (1996) and Godfrey and Leser, (1999), therefore, the effect of weather factors such as; temperature, relative humidity and wind speed were investigated on the population density of the considered piercing-sucking insects in sugar beet fields during two successive seasons; 2016 and 2017.

The present study aims to survey the insect pests and their predators that inhibiting sugar beet crop, to study the seasonal abundance of the main (harmful) insect species that attacking sugar beet plants, and to evaluate the impact of some climatic factors on the seasonal abundance of these harmful insects in sugar beet plantations inr Kafr El-Sheikh and Nubaria regions.

MATERIALS AND METHODS

Experimental design

Field experimental studies were conducted at the experimental farms of Agricultural Research Stations in Kafr El-Sheikh and Nubaria regions, Egypt during two successive winter seasons of 2019/2020 and 2020/2021. The experimental area was two feddens which divided into four plots; each plot was half feddan and the experimental design was a randomized complete block design (RCBD) with four replicates. Weekly samples consisted of 100 plants were taken randomly from the four replicates. The experimental area was cultivated with Karam cultivar in 20th of September in 2019 and 2020 seasons in both regions, to monitor the insect pests of sugar beet crop and their associated predators in Kafr El-Sheikh and Nubaria regions. Prior to initiating the experiments, soil samples were collected from (0-30 cm depth) of the experimental site in both regions and samples were analyzed according to procedures described by Page *et al.* (1982). The results of analysis for the two experimental sites in Kafr El-Sheikh and Nubaria regions during both seasons are listed in Table (1).

Table 1. Soil physical and chemical properties of experimental sites in Kafr El-Sheikh and Nubaria regions in the first (2019/2020) and second (2020/2021) seasons.

Soil properties	Region			
	Kafr El-Sheikh		Nubaria	
	1st season (2019/2020)	2nd season (2020/2021)	1st season (2019/2020)	2nd season (2020/2021)
Soil texture	Clay		Sandy loam	
Sand %	38.20	38.48	51.48	54.97
Silt %	13.10	13.42	32.10	33.63
Clay %	48.70	48.10	12.53	11.40
pH (1: 2.5 water suspension)	8.13	8.27	8.28	8.35
EC (dSm^{-1})	3.64	3.49	2.72	2.47
Cations (meq/L.)				
Ca^{++}	7.63	9.18	5.89	5.39
Mg^{++}	4.21	3.82	3.81	2.99
Na^{+}	19.42	17.74	13.68	12.79
K^{+}	5.14	4.16	3.82	3.52
Anions (meq/L.)				
HCO_3^{-}	5.33	5.43	3.27	2.77
Cl^{-}	22.13	21.62	16.36	15.32
$SO4^{--}$	8.94	7.85	3.67	3.21
O.M. (%)	0.34	0.41	0.35	0.32
$CaCO_3$ (%)	2.21	1.98	23.47	22.71
Available N(ppm)	61.43	59.42	35.22	37.81
Available P (ppm)	5.21	4.96	3.34	3.74
Available K (ppm)	123.70	125.93	98.63	107.20

Insect survey

Survey of insect pests that inhibiting sugar beet crop was taken in account from the beginning of plantation up to the harvest time in Kafr El-Sheikh and Nubaria regions during the two successive seasons (2019/2020 and 2020/2021). Plants were examined visually in the field and the observed insects and predators were recorded and counted. Counts were recorded weekly. Then, some specimens were kept in muslin bags and transferred to the laboratory of Field Crop Pests Research Department, Plant Protection Research Institute for identification. The conventional agricultural practices were carried out as commonly recommended by the Egyptian Ministry of Agriculture under natural infestation conditions without using of insecticides application.

Seasonal abundance

Four insect species were taken in account according to their occurrence and importance to monitor their populations. These insects were the cotton leafworm, *Spodoptera littoralis*, the sugar beet fly, *Pegomia mixta*, the tortoise beetle, *Cassida vittata*, and the sugar beet fly, *Scrobipalpa ocellatella* that found infest sugar beet crop in both region of study during the two successive seasons (2019/2020 and 2020/2021). In both regions, weekly samples (readings) of 25 plants / replicate were chosen randomly after one month from plantation until the harvest time to record numbers of living larvae of *S. littoralis*, *P. mixta*, and *Scrobipalpa ocellatella*, as well larvae and adults of *C. vittata* to study their populations.

Statistical analysis

Data obtained were analyzed using one-way ANOVA, and means separated using Duncan's Multiple Range Test. Correlation and regression coefficients were also determined, Statics were conducted using SPSS (2006).

RESULTS AND DISCUSSION

Insect Survey

Fifty-five insect pest species belonging to 32 families and seven orders were surveyed from sugar beet plants during a period extended from the beginning of plantation until the harvest time in both regions during the two successive sugar beet growing seasons (2019/2020 and 2020/2021). These insects could be classified as harmful pests (30 species), visitor insects (15 species), and predatory insects (10 species). Within each group of pests, the families and the orders are arranged alphabetically as shown in Tables (2 and 3).

Table 2. Survey of harmful insects that attacking sugar beet plants during the two successive winter seasons of 2019/2020 and 2020/2021.

Harmful insects			Region	
Order	**Family**	**Species**	**Kafr El-Sheikh**	**Nubaria**
Coleoptera	Chrysomelidae	*Cassida vittata* Vill.	√	√
		Chaetocnema tibialis Illi.	√	-
	Curculionidae	*Lixus junci* Boh.	√	-
		Temnorhinus brevirostris Gyull.	√	-
		Bothynoderes Punctiventris Germ.	√	-
	Cryptophagida	*Atomaria linearis* Steph.	√	-
	Anobiidae	*Gibbium psylloides* Czen	√	-
	Scarabaeidae	*Melolontha melolontha* L.	√	-
Diptera	Anthomyidae	*Pegomyia mixta* Vill.	√	√
		Pegomyia hyoscami Vill	√	√
	Gelechiidae	*Scrobipalpa ocellatella* Boyd.	√	-
	Crambidae	*Ostrinia nubilalis* Hub.	√	-
Lepidoptera	Noctuidae	*Agrotis ipsilon* Huf.	√	√
		Spodoptera littoralis Boisd.	√	√
		Spodoptera exigua Hub.	√	-
		Chrysodeixis gamma L.	√	-
		Chrysodeixis chalcites Esp.	√	-
	Geometridae	*Scopula coenosaria luridata* (Zeller)	√	-
		Scopula donovani Distant	√	-
	Pentatomidae	*Nezara viridula* L.	√	√
Hemiptera	Aleyrodidae	*Bemisia tabaci* Gann.	√	√
	Cicadellidae	*Empoasca lybica* Deb.	√	√
		Empoasca decipiens Paoli.	√	√
	Pseudococcida	*Phenacoccus solenopsis* Tinsley	√	-
Homoptera	Aphididae	*Aphis craccivora*.	√	√
		Aphis gossypii Glov.	√	√
		Nasomovia (Hyperoyzus) lactuca L.	√	-
		Myzus persicae Sulz.	√	-
Thysanoptera	Thripidae	*Thrips tabaci* L.	√	-
Orthoptera	Gryllotalpidae	*Gryllotalpa gryllotalpa L.*	√	√

In Kafr El-Sheikh region, 30 harmful insect pests were recorded, while only 12 species were recorded in Nubaria region (Table, 2). In Kafr El-Sheikh region, 15 visitor insects were recorded, while three insect species were recorded in Nubaria region (Table, 3). In the former region, 15 predatory insects were found, while in the latter one five species were observed (Table, 3).

The current results are in agreement with several authors. For example, Bazazo (2005) found 16 insect pest species causing a considerable damage in sugar beet fields; Shalaby (2001) surveyed 40 insect species attacking sugar beet plants in Egypt; El-Dessouki (2014) counted 35 insect pests on sugar beet fields which classified as serious insect pests (26 species) and visitor insects (9 species); and El-Dessouki (2019) recorded 42 insect species belonging to 27 families that attacking sugar beet plants in Kafr El–Sheikh region.

Seasonal abundance of the main insect pests

The cotton leaf worm, *Spodoptera littoralis*

Data presented in Table (4) showed the monthly average number of *S. littoralis* in the two regions (Kafr El-Sheikh and Nubaria) during 2019/ 2020 and 2020 /2021 seasons. During the first season, it can be noticed that, the highest monthly average number of *S. littoralis* were recorded in December with an average number of 261.0 and 96.25 larvae/25 plants in the first season and 296.50 and 124.75 larvae/25 plants in second season in Kafr El-Sheikh and Nubaria regions, respectively. Generally, the infestation by *S. littoralis* had the highest average number of *S. littoralis* larvae in December in the

two regions of both seasons and the population decreased in during the harvest time. In general, there was significant difference in numbers of larvae between both regions with the higher numbers of larvae in were in Kafr El-Sheikh region during the two seasons. These results in agreement with those of El-Dessouki (2019) who found that the highest infestation densities of *S. littoralis* larvae were recorded at the fourth week of November in the first season (2015/2016), while in the second season (2016/2017) the highest infestation density of larvae was recorded at the fourth week of February. Hawila (2021) who mentioned that, population of *S. littoralis* was the highest during the last week of November during 2018/2019. While in 2019/2020, the highest infestation density of larvae was recorded at the second week of December.

Table 3. Survey of predators and visitor insects in sugar beet fields during the two successive winter seasons of 2019/2020 and 2020/2021.

Order	Family	Species	Region	
			Kafr El-Sheikh	Nubaria
Predatory insects				
Coleoptera	Coccinellidae	*Coccinella undecimpunctata*	√	√
		Cydonia vicina isis	√	-
		Scymnus sp.		
	Carabidae	*Bembidion sp.*	√	-
		Calosoma chlorostictum	√	-
		Pterostichus pharaoh	√	-
	Staphylinidae	*Paederus alferii*	√	√
Hemiptera	Anthocoridae	*Orius sp.*	√	√
Neuroptera	*Chrysopidae*	*Chrysoperla carnea*	√	√
Diptera	Syrphidae	*Mitsyrphus corollea*	√	√
Visitor insects				
Hemiptera	Lygaeidae	*Spilostethus pandurus* (Scop)	√	-
		Oxycarenus hyalinipennis Cast.	√	-
Coleoptera	Curculionidae	*Sitona lepidus* Gyll.	√	-
	Mordellidae	*Mordellistena bruneipennis* (Mcleay)	√	-
	Anthicidae	*Anthicus crinitus* (Laferte)	√	-
	Pyraustidae	*Hymeni recuvalis* (FAB)	√	-
Lepidoptera	Crambidae	*Pyrausta aurata* Scop.	√	-
		Noctuelia floralis Hub.	√	-
	Nymphalidae	*Vanessa cardui* L.	√	-
	Lycaenidae	*Lampides baeticus* L.	√	√
	Pieridae	*Pieris rapae* L.	√	√
Diptera	Agromyzidae	*Liriomyza congesta* (Becker)	√	√
		Melanagromyza cunctans (Meigen)	√	-
	Phoridae	*Megaselia scalaris* (loew)	√	-
	Ephydridae	*Hecamede albicans* (Meigen)	√	-

Table 4. Seasonal number of *Spodoptera littoralis* larvae that infesting sugar beet plants during the two successive winter seasons of 2019/2020 and 2020/2021 in Kafr El-Sheikh (A) and Nubaria (B) regions.

Sampling date	2019/2020		Sampling date	2020/2021	
	A	B		A	B
November, 2019	111.80	8.60	November, 2020	128.40	49.00
December, 2019	261.00	96.25	December, 2020	296.50	124.75
January, 2020	141.60	56	January, 2021	184.20	15.2
February, 2020	40.25	15.75	February, 2021	51.50	0.00
March, 2020	21.5	1.00	March, 2021	8.50	0.00
April, 2020	1.25	0.00	April, 2021	2.75	0.00
Mean ± SE	96.9 ± 39.7 a	35.5 ± 17.9b b	Mean ± SE	112.0 ± 46.8a a	63.0 ±32.4b b

The sugar beet fly, *Pegomia mixta*

Data in Table (5) show the numbers of *P. mixta* larvae in the two regions (Kafr El-Sheikh and Nubira) during 2019/2020 and 2020/2021 seasons. During the first season, it can be noticed that, the highest monthly average numbers of *P. mixta* were recorded in March 2020 and February 2020 with an average number of 241.50 and 83.25 larvae in Kafr El-Sheikh and Nubira, respectively. In the second season, the highest monthly average numbers of *P. mixta* were recorded in March 2021 and February 2021 with an average number of 326.25 and 89.00 larvae in Kafr El-Sheikh and Nubaria regions, respectively. In general, there was significant difference in numbers of larvae between both regions with the higher numbers of larvae in were in Kafr El-Sheikh region during the two seasons. The obtained findings of the present study are in harmony different at 0.05 probability level with those of Youssef (1994) and Ebida (1997b) who stated that *P. mixta* was commonly found in sugar beet more than other crops, causing a

considerable reduction in yield. El-Khouly (2006) showed that the abundance of *P. mixta* showed three seasonal peaks with the highest one was occurred in April 2005 and 2006. Mohisen (2012) mentioned that *P. mixta* larvae attack early the sugar beet leaves from November until late February and reached its maximum abundance during March and April in Kafr El-Sheikh. El- Zaghloul *et al.* (2015) reported a negative relationship between the sugar beet yield and population of *P. mixta*. Desouki *et al.* (2014) stated that *P. mixta* occurred throughout the period from late December until late April on sugar beet plants in both seasons of 2011 and 2012 in Kafr El-Sheikh.

Table 5. Seasonal average number of *Pegomia mixta* larvae that infesting sugar beet plants during the two successive winter seasons of 2019/2020 and 2020/2021 in Kafr El-Sheikh (A) and Nubaria (B) regions.

Sampling date	2019/2020		Sampling date	2020/2021	
	A	B		A	B
November, 2019	114.20	0.00	November, 2020	171.20	0.00
December, 2019	116.00	15.75	December, 2020	254.00	14.00
January, 2020	125.60	67.40	January, 2021	300.40	84.20
February, 2020	144.00	83.25	February, 2021	312.00	89.00
March, 2020	241.50	39.25	March, 2021	326.25	34.75
April, 2020	132.25	0.00	April, 2021	150.00	0.00
Mean ± SE	145.6 ± 19.7 a	51.4 ± 14.3 b	Mean ± SE	252.3 ± 30.8 a	55.5 ± 18.5b

Means with the same letters are not significantly

The sugar beet beetle, Cassida vittate

Results illustrated in Table (6) showed the monthly average number of *C. vittata* individuals in the two regions (Kafr El-Sheikh and Nubaria) during 2019/2020 and 2020/2021 seasons. During the first season, it can be noticed that, the highest monthly average number of *C. vittata* individuals were recorded in April 2020 and February 2020 with an average number of 332 and 129.75 larvae in Kafr El-Sheikh and Nubaria regions, respectively. In the second season, the highest monthly average numbers of *C. vittata* individuals were recorded in April 2021 and March 2021 with an average number of 374.75 and 123.50 larvae in Kafr El-Sheikh and Nubaria region, respectively. During the whole season, there was significant difference in numbers of larvae and adults between both regions with the higher numbers of larvae in were in Kafr El-Sheikh region during the two seasons.

Table 6. Seasonal average number of *Cassida vittata* individuals *(*larvae and adults) that infesting sugar beet plants during the two successive winter seasons (2019/2020 and2020/2021) in Kafr El-Sheikh (A) and Nubaria (B) regions.

Sampling date	2019/2020		Sampling date	2020/2021	
	A	B		A	B
November, 2019	0.00	0.00	November, 2020	0.00	0.00
December, 2019	0.00	0.00	December, 2020	31.75	0.00
January, 2020	0.00	6.60	January, 2021	67.00	9.00
February, 2020	0.00	129.75	February, 2021	116.00	98.50
March, 2020	140.75	85.25	March, 2021	186.50	123.50
April, 2020	332.00	3.00	April, 2021	374.75	19.25
Mean ± SE	78.8 ± 55.6a	37.4 ± 22.9b	Mean ± SE	129.3 ± 55.9a	41.7± 22.3b

Means with the same letters are not significantly different at 0.05 probability level

The above demonstrated results are in agreement with those of Al-Habashy (2014) who sated that the tortoise beetle, *C. vittata* was first appeared on sugar beet plants in late February and continued until mid-March in 2011 season, with two peaks corresponding to February and late March of 10 and 230 larvae / 25 plants, respectively in Diarb – Nigm district, Sharkia Governorate. But, in the second season of 2012, the two peaks were occurred during early- and mid-April, denoting 29 and 35 larvae / 25 plants, respectively. El-Desouki *et al.* (2014) and Kandil (2016) found that *C. vittata* (larvae and adults) individuals registered three seasonal peaks of abundance that occurred in February, March and April in both seasons of study. The first peak was 116 individuals / 15 samples on the 1st March followed by the second peak 108 individuals / 15 samples on the 4th March, but the third one was the lowest peak (98 individuals / 15 samples) on the 3rd April during the first season. However, in the second season, the first peak

Table 7. Seasonal average number of *Scrobipalpa ocellatella* larvae that infesting sugar beet plants during the two successive winter seasons (2019/2020 and 2020/2021) in Kafr El-Sheikh (A) and Nubaria (B) regions.

Sampling date	1st Season (2019/2020)		Sampling date	2nd season (2020/2021)	
	A	B		A	B
November, 2019	0.00	0.00	November, 2020	0.00	0.00
December 2019	0.00	0.00	December 2020	27.25	0.00
January 2020	54.00	0.00	January 2021	89.60	0.00
February 2020	84.50	0.00	February 2021	235.25	0.00
March 2020	98.75	0.00	March 2021	332.25	0.00
April 2020	208.75	0.00	April 2021	360.00	0.00
Mean ± SE	111.5 ± 33.7	-	Mean ± SE	208.9 ± 65.6	-

was 62 individuals / 15 samples on the 3rd February followed by the second peak 92 individuals / 15 samples on the 4th March, but the third peak was 98 individuals / 15 samples on the 3rd April.

The sugar beet moth, *Scrobipalpa ocellatella*

Data in Table (7) show the monthly average number of *S. ocellatella* in Kafr El-Sheikh region during 2019/ 2020 and 2020/2021 seasons. During the first season, it can be noticed that, the highest monthly average number of *S. ocellatella* was recorded in April 2019/2020 with an average number of 208.75 larvae while the highest monthly average number of *S. ocellatella* during the second season was recorded in April 2021 with an average number of 360 larvae.

Mahmoudi *et al*. (2013) mentioned that the infestation by *S. ocellatella* appeared in end of December in a few numbers and increased gradually to reach the highest peak in May which recorded 175 and 187 larvae/50 plants. The same trend was in the second season at Kafr El-Sheikh region. Al-Keridis (2016) found that the infestation by *S. ocellatella* observed in the fourth week of November 2014 and third week of November 2015. Its population increased gradually from November to May.

Effect of certain weather factors on insect populations

Results presented in Table (8) revealed that the weather factors (temperature, relative humidity and wind speed) affected the population of examined insects. This effect differed from factor to factor, season to season, and from site to site.

Table 8. Correlation (r) and regression (b) coefficients between number of insect pests in sugar beet field and each of three weather factors during the two successive winter seasons of 2019/2020 and 2020/2021 in two different regions.

Insect pests	Factors	2019/2020						2020/2021					
		Kafr El-Sheikh region			Nubaria Region			Kafr El-Sheikh region			Nubaria region		
		r	b	EV%	r	b	EV %	R	b	EV%	R	b	EV%
Spodoptera littoralis	Temp(c˚)	-0.019	-0.175	13.3	- 0.271	- 1.074	11.9	0.164	1.416	40.4	0.220	0.974	23.9
	R.H (%)	- 0.322	- 2.402		-0.292	-0.895		0.517**	2.264**		0.312	0.626	
	W.S(km/h)	0.125	1.038		0.110	0.378		0.324	12.899		0.325	6.571	
Pegomia mixta	Temp (c˚)	-0.419*	-2.52*	27.5	- 0.858	- 6.546	76.9	-0.672**	-2.25**	57.7	-0.706	-2.898	53.3
	R.H (%)	- 0.039	- 0.161		-0.133	-0.233		0.066	0.127		-0.098	-0.126	
	W.S (km/h)	-0.418*	-2.23*		0.147	2.575		0.074	0.164		-0.039*	-0.501*	
Cassida vittata	Temp (c˚)	0.041	0.548	41.1	- 0.252	- 1.305	33.1	-0.032	-0.309	44.8	-0.65**	-3.241**	48.5
	R.H (%)	0.185	1.949		-0.375	1.559		-0.589*	-3.086*		-0.505*	-0.968*	
	W.S (km/h)	0.031	0.376		0.009	0.039		-0.158	-6.784		0.266	-4.583	
Scrobipalpa ocellatella	Temp (c˚)	-0.169	-1.291	19.3	-	-	-	-0.376	-4.721	39.8	-	-	-
	R.H (%)	0.279	1.681			-		-0.564*	-3.502*		-	-	
	W.S (km/h)	0.002	0.013		-	-		-0.224	11.835		-	-	

r = Correlation coefficient b = Regression coefficient E V = Explained variance *Significant ** high Significant

In the first season, the three weather factors did not affect the population of *S. littoralis* in both regions, whereas in the second season, relative humidity significantly affected only on populations of *S. littoralis*, in positive way, in Kafr El-Sheikh. The combined effect (expressed as percentage of explained variance) of the three weather factors on the insect population was weak and ranged from 11.9 to 40.4% in both seasons and regions. The same effect of the three weather factors on populations of *S. littoralis* was determined for *C. vittata* in the first year, but in the second year relative humidity significantly affected on populations of C. vittata in both regions in negative way. Only, temperature had significantly inverse effect on populations of C. vittata during the second season in Nubaria region. The combined effect (expressed as percentage of explained variance) of the three weather factors on the insect population was relatively high and ranged from 33.1 to

48.5% in both seasons and regions. Regarding *P. mixta*, only temperature had significantly inverse effect on its populations during both seasons in both regions. The combined effect of the three weather factors on the insect population was relatively high and ranged from 27.5 to 76.9% in both seasons and regions. In respect to *S. ocellatella*, only relative humidity had significantly inverse effect on its populations in the second season in Kafr El-Sheikh. The combined effect of the three weather factors on the insect population was 19.3 and 39.8% in the first and second season in Kafr El-Sheikh region, respectively.

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بعض الدراسات الايكولوجية على حشرات محصول بنجر السكر في منطقتي كفر الشيخ والنوبارية

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أجريت الدراسات الحالية بالمزارع البحثية بمحطات البحوث الزراعية بمنطقتي كفر الشيخ والنوبارية خلال الموسمين 2020/2019 و2021/2020 لحصر الآفات الحشرية لمحصول بنجر السكر والمفترسات المصاحبة لها بالإضافة إلى دراسة الوفرة الموسمية للآفات الحشرية الرئيسية على هذا المحصول، ولتقييم تأثير بعض العوامل المناخية على الكثافة العددية لهذه الحشرات. وكشفت الدارسات الحصرية أن نباتات بنجر السكر تعرضت لهجوم 45 نوع من الحشرات، منها 15 نوع من الحشرات الزائرة. وكما تم تسجيل عشرة أنواع من المفترسات خلال الفترة الممتدة من أكتوبر حتى ابريل في كلا المنطقتين خلال الموسمين. أعطت يرقات دودة ورق أعلى متوسط شهري في ديسمبر بينما سجلت يرقات ذبابة أوراق البنجر أعلى متوسط شهري خلال فبراير ومارس فى منطقتي النوبارية وكفرالشيخ في كلا الموسمين. على الوجه الاخر سجلت الاطوار الضارة لخنفساء البنجر السحائية أعلى متوسط شهري في أبريل في منطقة كفرالشيخ ولكن فبراير ومارس في منطقة النوبارية خلال الموسمين. وأخيرا ظهرت يرقات فراشة البنجر في منطقة كفرالشيخ فقط بأعلى متوسط في شهر أبريل. أظهرت النتائج أن العوامل المناخية الثلاثة (درجة الحرارة - الرطوبة- الرياح) كانت غير معنوي خلال الموسمين في المنطقتين. ويمكن أن نستنتج أن نباتات بنجر السكر التي كانت منزرعه في منطقة النوبارية استقبلت اعدادا أقل من أنواع الحشرات عن تلك المنزرعة في منطقة كفرالشيخ. ونظرا لأن محصول بنجر السكر يعتبر محصول استصلاح للأراضي الجديدة لذلك يجب تشجيع زراعته فيها لقلة الإصابة الحشرية أيضا.