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Influence of Certain Ecological Factors on Seasonal Abundance of Key Insect Species existing on Sugar Beet Plants

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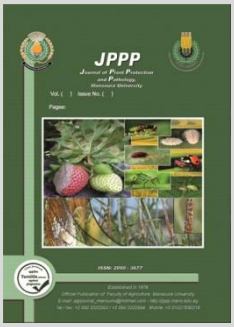

ABSTRACT

The current investigation aimed to assess the incidence and the population fluctuations of the main insect pests and associated predators on sugar beet plants and as well to determine their relation with temperature, relative humidity, precipitation, and mean numbers of leaves per plant at El-Hosinia district, Sharkia Governorate,Egypt during the two successive seasons of 2021/22 and 2022/23. The results revealed that *Empoasca decipiens* (Paoli) was the most dominant insect pest species constituting 51.72% of the general total numbers of pests. Moreover, it followed by *Cicadulina chinai* (Gauri), *Pegomyia mixta* (Vill.), and *Myzus persicae* (Sulzer), recording 34.61, 11.57, and 2.10%. The major predaceous species were *Chrysoperla carnea* (Steph.) (61.45%), and *Coccinella undecimpunctata* L. (38.55%). Statistical analysis proved that the combined effect of the tested ecological factors on the population activity of insect species was ranged from 36.47 to 64.14% in the first season and 56.76 and 92.62% in the second one. These findings would provide valuable knowledge for the researchers, farmers, and breeders of sugar beet in Egypt.

***Keywords*:** Sugar beet, insect pests, predators, weather factors.

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is one of the main sugar crops in the world. It is cultivated in about 40 countries worldwide (Wu *et al*. 2013). It is representing 40-45% of the total world's sugar production (OECD/FAO 2015; Jolayemi 2019). Recently in Egypt, sugar beet became an important source of sugar because it contains 30% more sucrose than sugarcane and requires less fertilizer (Ali *et al*.2014; Khalifa 2017). It provides not only sugar but also green fodder and molaces for cattle and poultry production (Khan 1985). Under field conditions, sugar beet is prone to infestation with numerous insect pests such as the leafhoppers (*Empoasca decipiens* (Paoli)& *Cicadulina chinai* (Ghauri)), the green peach aphid (*Myzus persicae* (Sulzer)) and the beet fly (*Pegomyia mixta* (Vill)) (Sherif *et al*.2013; Hegab *et al*.2018).The yield is severely impacted by the attack of these insects (Bassyouny 1993). Leafhoppers feed by puncturing phloem vessels of the leaves and this may reduce an obstruction of the vessels, a reddening and necrosis of leaves, thus reduced photosynthesis, resulting in delayed maturity or a reduced sugar content of the harvest (Backus *et al*. 2005). The green peach aphid damages the crop directly by feeding on the vascular bundle of the plants and indirectly through the transmission of numerous viral diseases (Yingqin *et al*. 2022). The beet fly is considered one of the most harmful insects to sugar beet plants, as it causes a decrease in their sucrose percentage by 12.65 to 14.70% (Fouad 2011). Under the Egyptian field conditions, insect predators like chrysopids and coccinellids were often observed on sugar beet fields (El-Agamy *et al*.1996; Shalaby 2001) Climatic conditions are important factors affecting the population densities of insect pests (Bylund 1999). Temperature is probably the main environmental factor that affects insect behavior, distribution, survival, development, and reproduction (Kuo *et al*.2006; Zhao *et al*. 2013). Variable rates of rainfall may have a significant impact on insect populations (Staiey *et al*. 2007). Small-bodied pests like aphids, leafhoppers, whiteflies, mites *etc*. may be washed away during heavy rainfall (Pathak *et al*. 2012).

Hence, the study aimed to assess the incidence and the seasonal abundance of the main insect pests and their associated predatory species on sugar beet plants and their relationship with the prevailing weather factors.

MATERIALS AND METHODS

The present investigation was performed throughout the two winter seasons of 2021/22 and 2022/23 at El-Hosinia district, Sharkia Governorate, Egypt (latitude: 30.94 ° N and longitude: 31.91° E).

Experimental design.

Sugar beet seeds (Oscar poly variety) were sown on September 15th, 2021 and September 13rd, 2022. The investigation was conducted at an area of (336 m^2) on a Randomized Complete Block Design (RCBD) with four replicates (84 m^2). Each replicate contained ten rows of 10 m long and 60 cm wide. The space between plants were 20 cm, and 50 cm were left as a buffer area between replicates. Standard agricultural practices were followed up without any pesticide's applications.

Sampling techniques.

Sampling procedures were began from the second week of November till harvesting time in both seasons of the study. To evaluate the seasonal abundance of the key insect pests on sugar beet plants, biweekly samples were taken randomly. Each sample consisted of 20 leaves (5 leaves/replicate) to determine numbers of green peach aphids.

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These leaves were kept in paper bags and transferred to laboratory for inspection, whereas numbers of leafhoppers, beet flies and their associated predators were estimated by using four yellow sticky board traps (one trap/replicate). These boards were hanged on wooden poles of different heights to make the traps approximately 20 cm above the plants throughout their developmental period. The captured individuals of these insect species were counted and recorded. Twenty plants were chosen randomly to calculate the mean numbers of leaves per plant.

Weather factors.

The data pertaining to maximum and minimum temperature (°C); relative humidity (%) and rainfall (mm) were provided by the Central Meteorological Laboratory of Agricultural Climate, Agricultural Research Center through the investigation period.

Statistical analysis.

=To clarify the relationship between the population densities of the tested insect's species and these climatic factors, the values of simple correlation coefficient (r), partial regression coefficient (b) and the total explained of variance (E.V%) were determined by using (SPSS 2006).

RESULTS AND DISCUSSION

The incidence of the major insect pests and their associated predators on sugar beet plants.

The incidence of the main insect species on sugar beet at El-Hosinia district, Sharkia Governorate, Egypt during the two consecutive seasons 2021/22 and 2022/23 is listed in Table (1). By divesting the insect species existing on sugar beet plants, four species were recorded as insect pests and they were accompanied by two predatory species. These insect pests were *Empoasca decipiens* (Paoli), *Cicadulina chinai* (Gauri), *Pegomyia mixta* (Vill.), and *Myzus persicae* (Sulzer), with relative densities of (46.85&56.14%), (38.32&31.24%), (12.46&10.77%), and (2.38&1.85%), respectively. In addition, the most common predaceous species were *Chrysoperla carnea* (Steph.) (58.29&64.35%), and *Coccinella undecimpunctata* L. (41.71&35.65%) throughout the first and the second season, respectively. Such findings are consistent with those of (Fouad 2011; El-Dessouki *et al*. 2014; Hegab *et al*. 2018). According to them, sugar beet plants were infested mainly with *E. decipiens*, *C. chinai*, *P. mixta*, and *M. persicae* under Egyptian field conditions. Our results are also in accordance with the results of (El-Dessouki *et al*. 2014; Askar 2016; Mansour *et al*. 2021) who stated that *C. carnea*, and *C. undecimpunctata* were the key predatory species on sugar beet fields.

Table 1. Total numbers and percentages of insect species counted on sugar beet plants at El - Hosinia district, Sharkia Governorate, Egypt in 2021/22 and 2022/23 seasons.

Insect species		2021/22		2022/23		General	
		Total no.	%	Total no.	%	Total no.	%
Insect pests	*Empoasca decpiens* (Paoli)	13520	46.85	17838	56.14	31358	51.72
	Cicadulina chinai (Ghauri)	11059	38.32	9924	31.24	20983	34.61
	Pigomyia mixta (Vill.)	3595	12.38	3421	10.77	7016	11.57
	Myzus persicae (Sulzer)	687	2.38	589	1.85	1276	2.10
	General total	28861	100.00	31772	100.00	60633	100.00
Insect predators:	*Chrysoperla carnea* (Steph.)	123	58.29	148	64.35	271	61.45
	Coccinella undecimpunctata L.	88	41.71	82	35.65	170	38.55
	General total	211	100.00	230	100.00	441	100.00

Seasonal abundance of the insect species on sugar beet plants.

Results given in Tables (2&3) show the biweekly counts of the most dominant insect pests and their associated predators on sugar beet during two seasons of 2021/22 and 2022/23.

The leafhoppers species.

Insect pests.

The potato leafhopper, *Empoasca decipiens*.

It was obvious that the population of *E. decipiens* fluctuated and showed two peaks of activity in both seasons of the study. In the first season, the two peaks (490.25 &901.75 individuals/sample) occurred in mid of the two months of December (2021) and February (2022), subsequently. However in the second season, these two peaks (1220.25&287.25 individuals/sample) were noted during late December (2022) and January (2023), respectively.

***Cicadulina chinai*.**

In (2021/22) growing season, the population of *C. chinai* recorded two distinct activity peaks (579.75&643.75 individuals/sample) in mid-December (2021) and January (2022), successively. Whereas in the season of (2022/23), the population peaked three times at the end of November, December (2022), and February (2023) by 401.50, 404.00 and 230.25 individuals/sample, consecutively.

These results partially agree with those of Hegab *et al*. 2018, who assessed the population fluctuations of the most dominant piercing-sucking insects including *E. decipiens* and *C. chinai* on sugar beet plants during 2015/16 and 2016/17 seasons and stated that the maximum numbers of leafhopper species were recorded in the second week of November and February in both experimental seasons. Al-Habashy *et al*. 2014 mentioned that leafhoppers species had two main peaks on sugar beet; in the second week of November and in the first week of February.

The green peach aphid, *Myzus persicae*.

The population density of aphids reached its maximum number twice throughout the two studied seasons. These peaks (22.50 &50.75 individuals/sample) took place at the end of December (2021) and February (2022) in the first season, respectively. While in the second season the two peaks were recorded in the middle of December (2022) by 19.25 individuals/sample and in late January (2023) by 36.25 individuals/sample. Our results agree in great parts with those obtained by Al-Habashy *et al*. 2014, they reported that *M. persicae* recorded two peaks on sugar beet in the second week of December and in the fourth week of January during 2010/11 and 2011/12 growing seasons. On the contrary, (Fouad 2011) mentioned that *M. persicae* had one peak of abundance on sugar beet plants during the two seasons of 2008/09 and 2009/10. Additionally, (Hegab *et al*. 2018) recorded one peak of activity for *M. persicae* in the first week of February in 2015/16 and 2016/17.

The sugar beet fly, *Pegomyia mixta*.

In both study seasons, the population density of *P. mixta* achieved two peaks of abundance in mid-December (2021&2022) and mid-February (2022&2023) with average numbers of (113.67&233.17 individuals/sample) and (194.17&185.00 individuals/sample), respectively. Such findings are in harmony with those of Mohisen 2012; Abdel-Moniem *et al*.2014; Zaghlol *et al*. 2015; Mansour *et al*. 2021 who reported that *P. mixta* infested sugar beet leaves from November and its population fluctuated giving two main peaks throughout the experimental period. On the other hand, El-Khouly 2006 mentioned that the sugar beet fly had three activity peaks and the highest one was in April during 2005 and 2006 growing seasons.

Table 2. Biweekly mean numbers of the main insect pests and their associated predators on sugar beet at El - Hosinia district, Sharkia Governorate, Egypt in 2021-22 season

Sampling Date	Minimum temperature (°C)	Maximum temperature (°C)	Relative humidity %	Precipitation (mm)	*E. decipiens*	*C. chainai*	*M. persicae*	*P. mixa*	*C. carnea*	*C. undecimpunctata*	Mean no. of leaves/ plant
15/Nov/2021	19.54	30.40	70.52	5.00	174.50	121.50	3.50	73.50	0.50	0.50	12.40
30/Nov/2021	16.24	26.46	73.69	25.40	197.50	167.50	1.75	52.33	0.75	1.00	16.55
15/Dec/2021	12.40	22.18	71.16	0.20	490.25	579.75	11.75	113.67	2.00	1.50	11.60
30/Dec/2021	10.04	18.95	71.59	13.40	194.50	95.75	22.50	47.33	2.00	0.75	17.85
15/Jan/2022	8.76	19.59	74.23	4.60	272.25	643.75	16.25	90.33	2.25	1.50	21.30
30/Jan/2022	6.53	15.46	70.16	47.10	245.50	396.50	19.75	88.33	5.00	3.75	22.35
15/Feb20/22	7.74	18.65	67.83	4.90	901.75	349.25	21.75	194.17	7.25	4.25	17.80
28/Feb/2022	9.34	20.35	70.31	9.70	752.75	267.50	50.75	150.67	4.25	3.75	19.85
15/Mar/2022	10.19	21.76	63.24	4.80	130.50	133.50	16.50	119.50	5.75	4.25	13.05
30/Mar/2022	8.33	19.67	66.53	25.30	19.00	10.00	7.25	53.67	1.00	0.75	15.20

Table 3. Biweekly mean numbers of the main insect pests and their associated predators on sugar beet at El - Hosinia district, Sharkia Governorate, Egypt in 2022-23 season

Sampling Date	Maximum temperature (°C)	Minimum temperature (°C)	Relative humidity %	Precipitation (mm)	*E.decipiens*	*C.chainai*	*M.persicae*	*P.mixa*	*C.carnea*	*C. undecimpunctata*	Mean no.of leaves/ plant
15/Nov/2022	27.79	17.62	67.05	0.60	585.25	362.25	0.00	53.50	1.25	1.00	13.55
30/Nov/2022	25.56	15.31	69.15	1.30	742.50	401.50	3.00	154.50	3.00	2.75	14.15
15/Dec/2022	24.81	14.12	72.42	0.80	775.50	144.50	19.25	233.17	4.00	3.00	15.30
30/Dec/2022	22.54	13.61	72.82	9.20	1220.25	404.00	17.00	98.50	3.75	1.50	20.85
14/Jan/2023	20.89	11.10	71.57	10.20	187.50	328.50	19.50	86.50	4.00	0.50	19.85
29/Jan/2023	22.28	10.35	70.44	0.30	287.25	265.25	36.25	54.67	4.50	3.75	18.45
13/Feb/2023	18.58	9.20	67.62	3.90	247.50	121.00	18.75	185.00	7.50	2.00	14.50
28/Feb/2023	20.14	9.70	67.55	0.90	187.25	230.25	12.50	72.50	5.00	3.75	13.60
15/Mar/2023	28.36	12.54	62.04	0.80	156.75	173.75	13.00	23.33	3.00	1.50	11.25
30/Mar/2023	25.55	13.13	67.92	7.60	69.50	49.75	8.00	23.17	1.00	0.75	12.95

Predatory insects.

The green lacewing, *Chrysoperla carnea*.

In the first season, the average numbers of *C.carnea* found on sugar beet plants associated with the aforementioned insect pests ranged between 0.5 to 7.25 individuals/sample giving its maximum number in the mid of February (2022). In the second season of the study, the average numbers of *C. carnea* ranged from 1.00 to 7.50 individuals/ sample and it peaked twice by 4.00 and 7.50 individuals/sample on the fifteenth day of December (2022) and February (2023).

The eleven-spotted ladybird beetle, *Coccinella undecimpunctata.*

The mean numbers of *C. undecimpunctata* were slightly low and ranged between 0.50 to 4.25 individuals/sample and recorded its highest number on the 15th day of February (2022) in the season of 2021/22. Whereas in 2022/23, the average numbers of *C. undecimpunctata* ranged from 1.00 to 3.75 individuals/ sample. The population density of *C. undecimpunctata* have three peaks of abundance (3.00, 3.75 &3.75 individuals/ sample) in mid of December (2022) and at the end of January and February (2023), alternatively. Similar results were obtained by Sherief *et al.* 2013 who reported that the most considerable peaks of these predaceous species were noted in February. The present research differed from those of Mesbah 1991; Shalaby 2001; El-Dessouki *et al*. 2014; Askar 2016 who stated that the main peaks of *C. carnea* and *C. undecimpunctata* were achieved in the months of March and April.

Influence of certain weather factors on the main insect species on sugar beet plants.

Data summarized in Tables (4&5) cleared the impact of the major ecological factors (minimum and maximum temperatures, relative humidity, precipitation (mm.), and mean numbers of leaves per plant) on the population density of the most dominant insect pests and their associated predators existing on sugar beet plants during the two growing seasons of 2021/22 and 2022/23.

Minimum temperature.

There were negative and insignificant correlation relationships between the biweekly mean numbers of *E. decipiens*, *C. chinai*, *M. persicae*, *P. mixta*, *C. carnea*, and *C. undecimpunctata* and the minimum temperature, whereas r1 valued -0.2598, -0.2631, -0.5170 -0.3562, -0.6264, and -0.5630, in the first season, respectively. In the second season, *E. decipiens* and *C. chinai* had a positive and insignificant correlation with r1 values of 0.1310 and 0.0563. While, *M. persicae*, *P. mixta*, and *C. undecimpunctata* had negative and insignificant correlations with minimum temperature (r1=-0.5214, -0.3239, and -0.2858), successively. As for *C. carnea* the correlation was highly significant negative (r1= -0.8275**).

Table 4. Simple correlation, partial regression and explained of variance between certain ecological factors and the biweekly mean numbers of the major insect species existing on sugar beet plants at El-Hosinia district, Sharkia Governorate, Egypt during 2021 /2022 growing season.

Insect species		r1	r2	r3	r4	r5	b1	b2	b3	b4	b5	E.V%
Insect pests	*E. decipiense*	-0.2598	-0.2324	0.0549	-0.3526	0.2203	0.4685	0.5183	0.8804	0.3177	0.5408	36.47
	C. chinai	-0.2631	-0.2975	0.4566	-0.2059	0.3176	0.4626	0.4029	0.1847	0.5681	0.3712	54.43
	P. mixa	-0.3562	-0.2642	-0.3284	-0.4102	0.0903	0.3123	0.4607	0.3543	0.2391	0.804	51.63
	M. percicae	-0.517	-0.4933	-0.0626	-0.0986	0.4996	0.126	0.1474	0.8635	0.8764	0.1414	56.3
Insect predators	*C .carnea*	-0.6264	-0.5725	-0.5138	-0.0245	0.311	0.0527	0.0837	0.1288	0.9464	0.3818	73.73
	C. undecimpunctata	-0.563	-0.4974	-0.5086	0.0456	0.3138	0.0905	0.1435	0.1349	0.9005	0.3773	64.14

- r1, r2, r3, r4, r5 = Simple correlation between minimum temperature, maximum temperature, relative humidity, precipitation, mean number of leaves/ plant and biweekly mean numbers of insect species.

-b1, b2, b3, b4, b5 = Partial regression between minimum temperature, maximum temperature, relative humidity, precipitation, mean numbers of leaves/ plant and biweekly mean numbers of insect species.

Table 5. Simple correlation, partial regression and explained of variance between certain ecological factors and the biweekly mean numbers of the major insect species existing on sugar beet plants at El-Hosinia district, Sharkia Governorate, Egypt during 2022 /2023 growing season.

Insect species		r1	r2	r3	r4	r5	b1	b2	b3	b4	b5	E.V%
Insect pests	*E .decipiense*	0.131	0.5386	0.5644	0.0818	0.4416	0.7184	0.1082	0.0892	0.8222	0.2013	67.09
	C. chinai	0.0563	0.4075	0.336	0.0832	0.507	0.8772	0.2424	0.3425	0.8193	0.1348	79.44
	P. mixa	-0.3239	-0.0041	0.4847	-0.1202	0.1377	0.3612	0.991	0.1557	0.7409	0.7045	56.79
	M. percicae	-0.5214	*-0.6685	0.3791	0.0467	0.5645	0.1222	0.0346	0.28	0.8981	0.0891	92.62
Insect predators	*C. carnea*	**0.8275	**-0.7646	0.1579	-0.0526	0.2473	0.0033	0.01	0.6631	0.8852	0.491	81.91
	C. undecimpunctata	-0.2858	-0.3278	0.133	*-0.662	0.0374	0.4234	0.3551	0.7141	0.0355	0.9183	87.62

- r1, r2, r3, r4, r5 = Simple correlation between minimum temperature, maximum temperature, relative humidity, precipitation, mean number of leaves/ plant and biweekly mean numbers of insect species.

-b1, b2, b3, b4, b5 = Partial regression between minimum temperature, maximum temperature, relative humidity, precipitation, mean numbers of leaves/ plant and biweekly mean numbers of insect species.

Maximum temperature.

Statistical analysis of simple correlation showed a negative insignificant relation between the population fluctuations of *E. decipiens*, C. *chinai*, *M. persicae*, *P. mixta*, *C. carnea*, and *C. undecimpunctata* and the maximum temperatures.Their correlation coefficient values in the first season (r2) were -0.2324, -0.2975, -, -0.4933, -0.2642, -0.5725, and -0.4974, respectively. However, in the second season, the simple correlation coefficient analysis showed a positive insignificant relationship between the population of the two leafhoppers species *E. decipiens* and *C. chinai* (r2 = 0.5386 and 0.4075). This relationship was negative being insignificant in case of *P. mixta* (r2 =-0.0041) and *C. undecimpunctata* (r2 = -0.3278), significant in *M. persicae* (r2=-0.6685*) and highly significant in *C. carnea* (-r2 =-0.7646**).

Relative humidity.

The obtained results demonstrated that the mean numbers of *E. decipiens* and *C. chinai* were positively and insignificantly affected by the changing in relative humidity with (r3) values of 0.0549 and 0.4566. Relative humidity impacted the population densities of *M. persicae*, *P. mixta*, *C. carnea*, and *C. undecimpunctata* negatively and insignificantly with (r3) values of -0.0626, -0.3284, -0.5138, and-0.5086 during the first season, alternatively. While in the second season, relative humidity had a positive insignificant influence on *E. decipiens*, *C. chinai*, *M. persicae*, *P. mixta*, *C. carnea*, and *C. undecimpunctata* (r3 values = 0.5644, 0.3360, 0.3791, 0.4847, 0.1579, and 0.1330), subsequently.

Precipitation (mm).

The influence of precipitation on the population activity of *E. decipiens*, *C. chinai*, *M. persicae*, *P. mixta*, and *C. carnea* in the first season was negative and insignificant showing r4 values of -0.3526, -0.2059, -0.0986, -0.4102, and -0.0245, respectively. However, this influence was positive and insignificant in case of *C. undecimpunctata* (r4 = 0.0456). In the second season of the study, precipitation had a positive insignificant impact on both of *E. decipiens*, *C. chinai*, and *M. persicae* (r4 = 0.0818, 0.0832, and 0.0467), subsequently. This impact was negative being insignificant in case of *P. mixta* and *C. carnea* (r4 = -0.1202 & -0.0526) and significant in case of *C. undecimpunctata* (r4 = -0.6620*).

Mean numbers of leaves per plant.

Our results revealed that the correlation coefficient between the mean numbers of all studied insect species and the mean numbers of leaves per plant was positive and insignificant in the two successive seasons. The (r5) values of *E. decipiens*, *C. chinai*, *M. persicae*, *P. mixta*, *C. carnea*, and *C. undecimpunctata* were 0.2203, 0.3176, 0.4996, 0.0903, 0.3110, and 0.3138 in 2021/22 season, respectively. Moreover, they were 0.4416, 0.5070, 0.5645, 0.1377, 0.2473, and 0.0374 in 2022/23 season, alternatively.

The total explained variance percentages due to all studied ecological factors (E. V%) influenced *E. decipiens*, *C. chinai*, *M. persicae*, *P. mixta*, *C. carnea*, and *C. undecimpunctata* by 36.47, 54.43, 56.30, 51.63, 73.73, and 64.14% in the first season and by 67.09, 79.44, 92.62, 56.79, 81.91, and 87.62% in the second one, consecutively.

The present results of *E. decipiens* and *C. chinai* are supported by those of Hegab *et al*. 2018 who reported that the effect of both minimum and maximum temperatures, as well as relative humidity on the population densities of leafhopper species was in most cases insignificant whether positive or negative.

The results of *M. persicae*, differ from those of Hegab *et al*.; Fouad 2011, who mentioned that the correlation coefficient between the mean numbers of green peach aphid and both mean temperature and relative humidity was highly significant, negative and positive. The results of *P. mixta* are similar with the results of Al-Habashy 2018, who stated that temperature had a positive insignificant impact but relative humidity had a negative insignificant impact on the population activity of the sugar beet fly. Shalaby 2001 mentioned that the correlation among the mean numbers of *C. carnea* and temperature was negative while in case of relative humidity it was positive. Additionally, Askar 2016 found that both temperature and relative humidity had highly significant and positive influence on the population fluctuations of *C. undecimpunctata* in the first season, but in the second season it was negative insignificant and Staley *et al*. 2007 indicated that rain precipitation had a significant effect on the population activity of tiny insects. Bale *et al*. 2002 mentioned that the meteorological parameters (temperature and relative humidity) are contributing factors in the population variations of insects and their predators.

CONCLUSION

Empoasca decipiens, *Cicadulina chinai*, *Myzus persicae*, and *Pegomyia mixta* were recorded as major insect pests on sugar beet plants throughout the investigation period and they were accompanied with two predatory species; *Chrysoperla carnea* and *Coccinella undecimpunctata*. The meteorological factors influenced the population density of these insect species differently according to each species and furthermore from one season to other.

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تأثير بعض العوامل الإيكولوجيه على الوفره الموسميه لأنواع الحشرات الرئيسيه المتواجده على نباتات بنجر السكر

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الملخص

يهدف البحث الحالي إلى دراسة مدى التواجد وتقلبات التعداد للآفات الحشريه الرئيسيه والمفترسات المصاحبه لها على نباتات بنجر السكر وكذلك لتقييم علاقتها بدرجات الحراره والرطوبه النسبيه وكمية هطول الأمطار ومتوسط عدد الأوراق لكل نبات في منطقة الحسينيه، محافظة الشرقيه بمصر خلال الموسمين المتتاليين 22/2021 و 23/ 2022 . وقد أوضحت النتائج أن النوع *E.decipiens* كان أكثر الأنواع الحشريه إنتشاراً حيث شكل 51.72% من العدد الإجمالي العام للآفات، يليه *C.chinai*، *P. mixta* و*M. persicae* مسجلاً 34.61، 11.57 و 2.10%. كانت المفترسات الرئيسيه *C. carnea*(61.45%) و *C. undecimpunctata*(38.55%). و قد أثبت التحليل الإحصائي أن التأثير المشترك للعوامل البيئيه المختبره على تقلبات التعداد للانواع الحشريه محل الدراسه يتراوح ما بين 36.47 إلى 64.14% في الموسم الأول و ما بين 56.76 إلى 92.62% في الموسم الثاني. ومن شأن هذه النتائج أن تقدم معلومات مهمه للباحثين والمزارعين ومربي بنجر السكر في مصر.

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