Menoufia J. Plant Prot., Vol. 5 February (2020): 1 - 15

SEASONAL FLUCTUATIONS AND GENERATIONS NUMBRER OF TORTOISE BEETLE, *CASSIDA VITTATA* (Vill.) INFESTING SUGAR BEET PLANTS AND THE SOME ASSOCIATED PREDATORS, EGYPT

Aml Z. N. Al – Habshy, A. A. Abd – Elsamed and S. A. M. Amer
Plant Prot. Res. Inst., Agric. Res. Cent., Dokii, Giza, Egypt

Received: Nov. 2 , 2019 Accepted: Nov. 20 , 2019

ABSTRACT: ***Seasonal fluctuations and number of generations of Cassida vittata (Vill) (eggs, larvae and adults) and seasonal fluctuation of the some associated predators, Coccinella undecimpunctata (L.), Paederus alfierii (Koch.), Chrysoperla Carnea (Stephens), Scymnus sp. and true spiders were studied at Diarb- Nigm district, Sharkia Governorate, during the two sugar beet plants seasons 2015/2016 and 2016/2017. The seasonal fluctuation of C. vittata (adults, eggs and larvae) on sugar beet plants recorded two peaks during each seasons. Peaks of eggs were recorded in 7th of March and 4th of April in the first season, while in the second season, these peaks were noticed in 6th of March and 17th of April. Peaks of larvae were recorded in 21th of March and 2nd of May in the first season, while in the second season, these peaks were noticed in 20th of March and 1st of May. Peaks of adults were recorded in 11th of April and 2nd of May in the first season, while in the second season, these peaks were noticed in 3rd of April and 1st of May. C. vittata eggs, larvae and adults were recorded were recorded three generations for the two seasons. The peak of C. undecimpunctat and P. alfierii was occurred in 21th of March and 20th of March for the first and second seasons. The peak of C. Carnea was recorded in 14th of March and 13th of March for the two seasons. The peak of true spiders was recorded in 11th of April and 17th of April for the two seasons. The numbers of Scymnus sp was decreased for the two seasons. The relation ship between (adults, eggs and larvae) numbers and mean maximum, minimum temperature and RH%.***

Key words: ***Sugar beet plants, seasonal fluctuations, generations, Cassida vittata, predators.***

INTRODUCTION

Sugar beet, *Beta vulgaris* L., growing for sugar production and it is considered as one of the two important sugar beet crops in the world and Egypt. The Egyptian government encourages sugar beet growers to increase the cultivated area with sugar beet for decreasing the gap between sugar production by sugar cane and consumption. Sugar beet quality is of great economic importance. Several numbers of insects attack this crop caused considerable damage in its yield. *C. vittata* considered among the economic pests of sugar beet plants at present

Guirguis (1985) the highest larval population of *C. vittata* took place from mid-March to mid-April with minimum occurrence by late June. The maximum number of the adult beetle and highest infestation occurred in May, and the insect numbers were lowest by late June till harvest. Ali *et al.,* (1993) stated that sever infestation of *C. vittata* was concentrated in October and November plantations and recorded the common predators on sugar beet plants which *C. undecimpunctata, P. alfierii* and *C. carnea*. Predator numbers recorded two peaks, the first one occurred in December, while the other was in June.

Awadalla (1993) the *C. vittata* recorded two peaks of eggs, larvae, pupae and adults on sugar beet plants at Mansoura region. Bassyouny (1993) showed that *C. vittata* appeared in December and its population gradually increased in all plantations as the sugar-beet plants become older reaching the peak in April and May. Shalaby (2001) the *C. vittata* adults were surveyed from sugar-beet plants for the first time in December, and reached maximum as a complex of larvae and adults during March in September plantation. The maximum populations of October and November plantations were recorded in April. El-Khouly (2006) observed that the initial appearance of *C. vittata* survivors occurred in January reached a peak in April. The changes in the population densities of the predacious insects; *C. undecimpunctata, P. alfierii* and *C. carnea* coincided with the population densities of the tested pests *P. mixta* and *C. vittata*. Amin *et al.,* (2008) indicated that the infestation by *C. vittata* appeared in the last week of March and extended until the second week of May. The population density of this insect recorded three peaks during the activity period, in last week of March, mid April and mid May. Abo El-Ftooh *et al.,* (2013) showed that The population fluctuations of *C.vittata* (larvae and adults) numbers were increasing whenever plants became bigger. Khalifa, Amany (2017) Showed that sugar beet plants of August and September plantations suffered very low infestation with *C. vittata* larvae and adults. However, the highest insect population density was detected in October plantation; with values of larvae and adults in the first and second seasons. It was obvious that *C. vittata* population density was very high during March, April and May in sugar beet plants of October plantation.

The present study aimed to investigate seasonal fluctuations and generations number of *C. vittata* and seasonal fluctuation of the some associated predators *C. undecimpunctata*, *P. alfierii, C. Carnea, Scymnus* sp. and true spiders. Effect of maximum,minimum temperature and relative humidity on the number of *C. vittata* .

MATERIAL AND METHODS

Experimental Design:

The experiment was carried out at Diarb- Nigm district, Sharkia Governorate, during two growing sugar beet seasons of 2015/2016 and 2016/2017 to study seasonal population fluctuations and generations number of *C. vittata*. The experimental area 1050 m^2 was chosen and divided into three plots. The field was planted with sugar beet on the end of October during two seasons. The normal agricultural practical were followed and no pesticides treatments were applied during the whole experimental period.

Sample technique

Direct count, Sampling started when the age of sugar beet plants reached one month after sowing and continued weekly throughout the growing seasons from 14^{th} and 12^{th} of December until 16^{th} and 22^{nd} of May in 2015/2016 and 2016/2017 seasons. The following procedures of sampling were adopted. 25 plants were taken randomly and the total number of existing of *C. vittata* (adults, eggs and larvae) and predators on plants were recorded. For clearing the effect of certain weather factors such as temperature and relative humidity on the seasonal fluctuations of *C. vittata,* the daily mean of the two factors were provided by the Meteorological central Laboratory for Agricultural Climate-Agricultural Research Center during the whole period of the two seasons (2015/2016 and 2016/2017).

Number of generation

The approximated number and duration of the annual field generation of *C. vittata* (adults, eggs and larvae) were calculated according Audemard and Milaire (1975) and by Jacob (1977). The data were plotted on semigaussion (Scale Gauss) and a regression line represented each generation.

RESULTS AND DISCUSSIONS

1. Seasonal fluctuations of *C. vittata* on sugar beet plants.

1) Adults

Results in Tables (1 and 2) indicated that adults of tortoise beetle began to appear in 21th and 19th of December with few numbers 6 and 4 adults / 25 plants during first and second seasons on sugar beet plants, respectively. The number of the adults had two peaks during the two seasons. These peaks were recorded in 11th of April and 2nd of May represented by 87 and 93 adults/25 plants, respectively, in the first season. In the second season, these peaks were noticed in 3rd of April and 1st of May represented by 100 and 85 adults /25 plants, respectively.

Table (1): Weekly number of tortoise beetle, *C. vittata* (adults, eggs and larvae) infested sugar beet plants and accumulated during 2015/2016 season.

Date	Accumulated days	No. of adults	Accumulated		No. of eggs	Accumulated		No. of larvae	Accumulated		Temp.		R.H%
			No.	%		No.	%		No.	%	. Min	. Max	
14\12	7	0	0	0.00	0	0	0.00	0	0	0.00	11.29	19.71	68.14
21\12	14	6	6	0.66	0	0	0.00	0	0	0.00	11.57	20.86	64.57
28\12	21	9	15	1.64	0	0	0.00	0	0	0.00	11.00	20.00	68.14
4\1	28	13	28	3.06	8	8	1.17	1	1	0.06	10.29	18.00	61.68
11\1	35	15	43	4.70	11	19	2.77	2	3	0.19	12.43	20.14	45.14
18\1	42	15	58	6.35	14	33	4.82	28	31	1.97	10.43	20.29	64.14
25\1	49	17	75	8.21	20	53	7.74	13	44	2.80	9.29	16.43	54.29
1\2	56	22	97	10.61	25	78	11.39	17	61	3.89	7.00	15.29	69.86
8\2	63	23	120	13.13	30	108	15.77	24	85	5.41	10.57	20.29	59.71
15\2	70	27	147	16.08	29	137	20.00	33	118	7.52	11.14	20.86	50.43
22\2	77	31	178	19.47	34	171	24.96	54	172	10.96	16.43	27.57	48.57
29/2	84	39	217	23.74	36	207	30.22	64	236	15.03	14.71	24.71	50.86
7/3	91	37	254	27.79	81	288	42.04	62	298	18.98	17.86	30.71	58.28
14/3	98	47	301	32.93	54	342	49.93	119	417	26.56	16.86	28.42	39.57
21/3	105	45	346	37.86	40	382	55.77	257	674	42.93	15.14	24.29	50.00
28/3	112	58	404	44.20	47	429	62.63	190	864	55.03	17.00	27.43	40.86
4/4	119	61	465	50.88	60	489	71.39	115	979	62.36	14.71	26.81	54.86
11/4	126	87	552	60.39	49	538	78.54	95	1074	68.41	20.57	34.00	36.71
18/4	133	72	624	68.27	27	565	82.48	79	1153	73.44	18.86	30.14	45.43
25/4	140	64	688	75.27	25	590	86.13	107	1260	80.25	20.14	35.57	41.29
2/5	147	93	781	85.45	26	616	89.93	145	1405	89.49	19.00	33.14	43.29
9/5	154	70	851	93.11	33	649	94.74	113	1518	96.69	20.14	31.14	43.29
16/5	161	63	914	100	36	685	100	52	1570	100	23.71	37.14	35.43

Table (2): Weekly number of tortoise beetle, *C. vittata* (adults, eggs and larvae) infested sugar beet plants and accumulated during 2016/2017 season.

Date	Accumulated days	No. of adults	Accumulated		No. of eggs	Accumulated		No. of larvae	Accumulated		Temp.		R.H%
			No.	%		No.	%		No.	%	. Min	. Max	
12/12	7	0	0	0.00	0	0	0.00	0	0	0.00	12.21	21.43	57.31
19/12	14	4	4	0.31	0	0	0.00	0	0	0.00	11.36	20.17	55.67
26\12	21	8	12	0.92	0	0	0.00	0	0	0.00	10.43	18.29	56.17
2\1	28	13	25	1.91	11	11	1.56	1	1	0.08	10.07	19.00	60.5
9\1	35	18	43	3.28	10	21	2.97	5	6	0.46	9.14	18.00	52.86
16\1	42	37	80	6.10	12	33	4.67	10	16	1.23	10.43	17.57	49.57
23\1	49	43	123	9.38	16	49	6.93	14	30	2.31	9.71	19.43	72.43
30\1	56	51	174	13.27	20	69	9.76	15	45	3.47	11.57	18.71	53.40
6\2	63	53	227	17.32	22	91	12.87	26	71	5.47	6.00	17.71	60.86
13\2	70	64	291	22.19	27	118	16.69	44	115	8.87	11.71	21.71	55.43
20\2	77	65	356	27.15	28	146	20.65	53	168	12.95	11.71	16.43	60.71
27\2	84	68	424	32.34	34	180	25.46	61	229	17.66	10.86	21.00	62.57
6\3	91	61	485	36.99	65	245	34.65	79	308	23.75	13.29	23.86	63.14
13\3	98	67	552	42.11	41	286	40.45	81	389	29.99	15.14	23.57	44.00
20\3	105	73	625	47.67	33	319	45.12	98	487	37.55	13.71	21.86	52.57
27\3	112	91	716	54.61	48	367	51.91	61	548	42.25	15.14	24.00	59.40
3\4	119	100	816	62.24	51	418	59.12	53	601	46.34	16.43	27.00	47.14
10\4	126	85	901	68.73	43	461	65.21	46	647	49.88	15.71	26.71	55.86
17\4	133	71	972	74.14	61	522	73.83	79	726	55.98	16.57	26.29	55.86
24\4	140	53	1025	78.18	48	570	80.62	113	839	64.69	18.43	31.43	36.71
1\5	147	85	1110	84.67	41	611	86.42	170	1009	77.79	17.00	28.43	44.14
8\5	154	73	1183	90.24	39	650	91.94	140	1149	88.59	19.43	29.86	52.17
15\5	161	75	1258	95.96	36	686	97.03	93	1242	95.76	21.00	36.00	37.71
22\5	168	53	1311	100	21	707	100	55	1297	100	21.19	32.29	46.43

2) Eggs

Results in Tables (1 and 2) indicated that eggs of tortoise beetle began to appear in the first of week January with few numbers 8 and 11 eggs / 25 plants during first and second seasons on sugar beet plants. The number of eggs had two peaks during the two seasons. These peaks were recorded in 7th of March and 4th of April represented by 81 and 60 eggs/ 25 plants, respectively, in the first season. In the second season, these peaks were noticed in 6th of March and 17th of April represented by 65 and 61 eggs/ 25 plants, respectively.

3) Larvae

The larvae of tortoise beetle began to appear in the first of week of January with few numbers 1 larvae / 25 plants during the first and second seasons on sugar beet plants. The larvae had two peaks during the two seasons. These peaks were recorded in 21th and 2nd of May represented by 257 and 145 larvae/25 plants, respectively, in the first season while in the second season, it were noticed in 20th of March and 1st of May represented by 98 and 170 larvae /25 plants, respectively Tables (1 and 2).

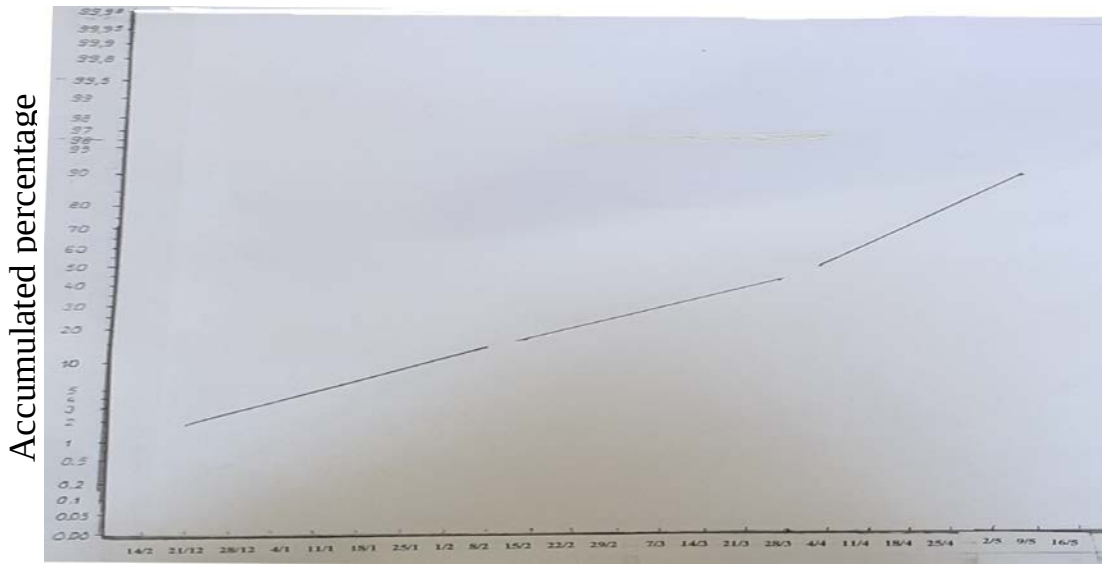
2. Number of generations of *C. vittata* on sugar beet plants.

1) Adults

Data given in Figs. (1 and 2) and Table (3) showed three generations of *C. vittata* adults for 2015/2016 and 2016/2017 seasons on sugar beet plants. The first generation was started at 21th and 19th of December in the first and second seasons and continued to 8 weeks until 8th and 6th of February, respectively. The second generation was appeared at 15th and 13th of February in the first and second seasons and continued to 7 and 8 weeks until 28th and 3rd of March, respectively. The third generation was appeared at 4th and 10th of April in the first and second seasons and continued to 6 weeks until the 9th and 15th of May, respectively.

Table (3): The annual generation of *C. vittata* (adults) in Sharkia Governorate during 2015/2016 and 2016 /2017 seasons.

Generation number	2015/2016					2016/2017				
	Duration		Duration in weeks	Total adults		Duration		Duration in weeks	Total adults	
	From	To		Number	%	From	To		Number	%
1st	21th of December	8th of February	8 weeks	120	13.13	19th of December	6th of February	8 weeks	227	17.32
2nd	15th of February	28th of March	7 weeks	284	31.07	13th of February	3rd of April	8 weeks	589	44.93
3rd	4th of April	9th of May	6 weeks	447	48.91	10th of April	15th of May	6 weeks	449	33.71



Date

Fig. (1): Annual generation of *C. vittata* (adults) in Sharkia Governorate during 2015/2016 season.

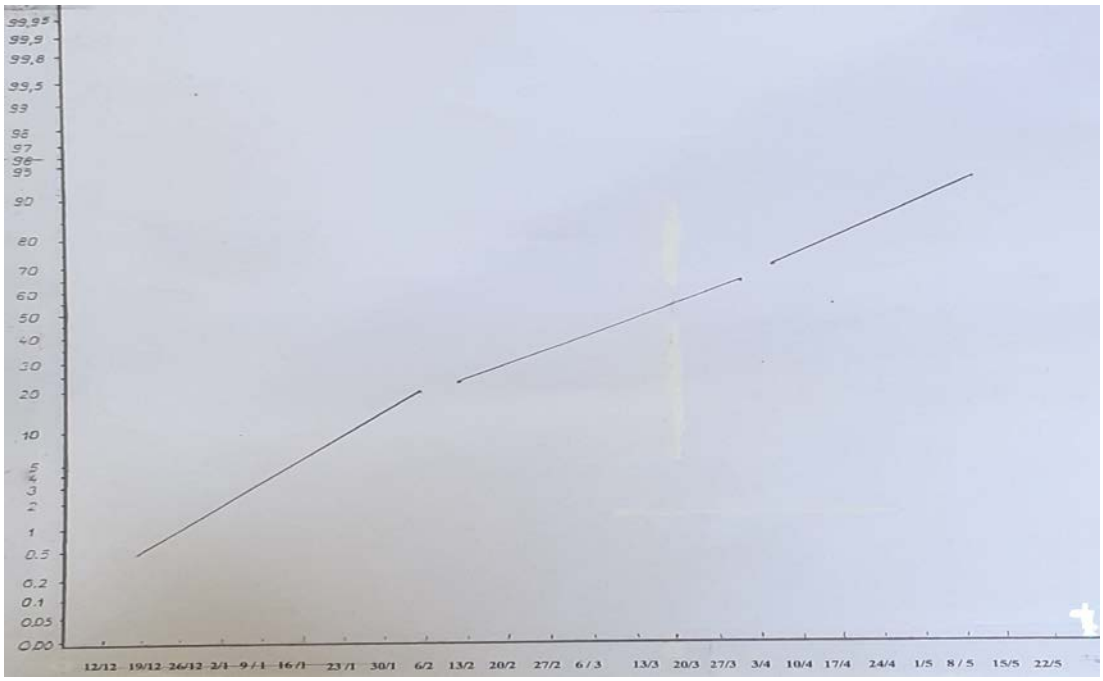


Fig. (2): Annual generation of *C. vittata* (adults) in Sharkia Governorate during 2016/2017 season

2) Eggs

The data in Figs. (3 and 4) and Table (4) showed that the *C. vittata* eggs had three generations for 2015/2016 and 2016/2017 seasons on sugar beet plants. The first generation was started at 4th and 2nd of January in the first and second seasons and continued to 7 and 8 weeks until 15th and 20th of February during first and second seasons, respectively. The second generation was appeared at 22th and 27th of February in both experimental seasons and continued to 6 and 7 weeks until 28th of March and 10th of April during first and second seasons, respectively. The third generation was appeared at 4th and 17th of April in both experimental seasons and continued to 6 and 5 weeks until 9th and 15th of May during first and second seasons, respectively.

3) Larvae

Data given in Figs. (5 and 6) and Table (5) showed three generations of *C. vittata* larvae for 2015/2016 and 2016/2017 seasons on sugar beet plants. The first generation was started at 4th and 2nd of January in both seasons and continued to 8 weeks until 22th and 20th of February during first and second seasons, respectively. The second generation was appeared at 29th and 27th of February in both seasons and continued to 6 and 7 weeks until 4th and 10th of April during first and second seasons, respectively. The third generation was appeared at 11th and 17th of April in both seasons and continued to 5 weeks until 9th and 15th of May during first and second seasons, respectively.

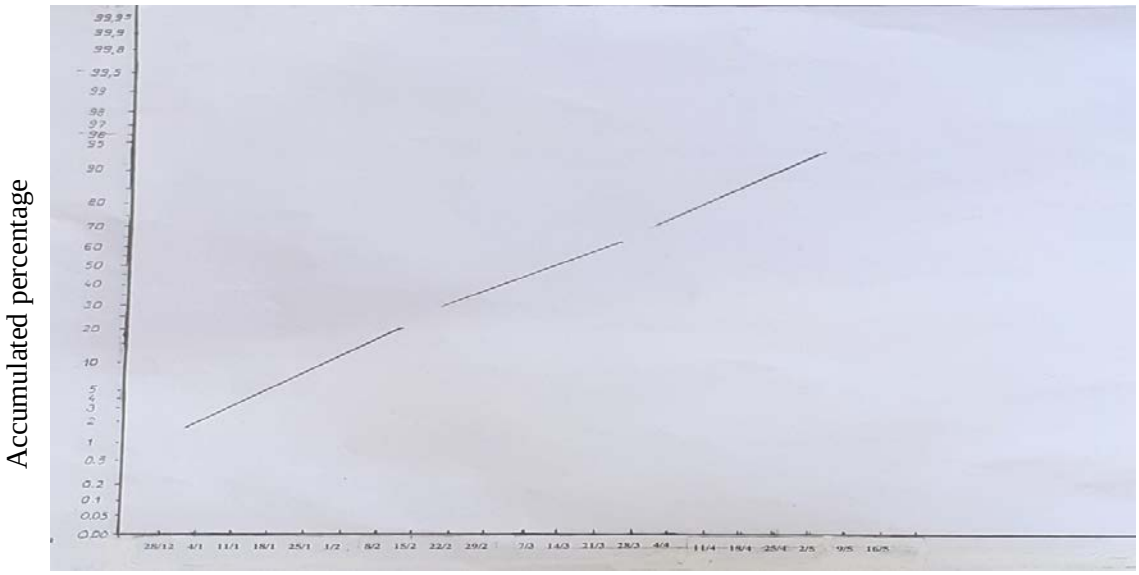


Fig. (3): Annual generation of *C. vittata* (eggs) in Sharkia Governorate during 2015/2016 season. Accumulated percentage.

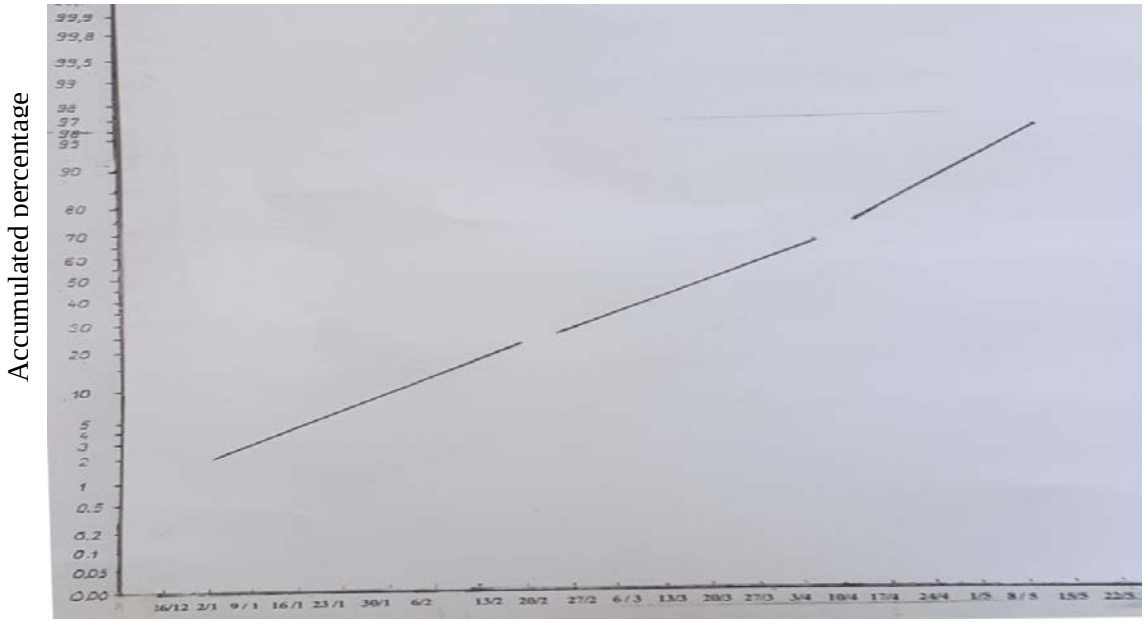


Fig. (4): Annual generation of *C. vittata* (eggs) in Sharkia Governorate during 2016/2017 season. during January. The population density of eggs, larvae and adults markedly

Table (4): The annual generation of *C. vittata* (eggs) in Sharkia Governorate during 2015/2016 and 2016 /2017 seasons.

Generation number	2015/2016					2016/2017				
	Duration		Duration in weeks	Total Eggs		Duration		Duration in weeks	Total Eggs	
	From	To		Number	%	From	To		Number	%
1st	4th of January	15th of February	7 weeks	137	20	2nd of January	20th of February	8 weeks	146	20.65
2nd	22th of February	28th of March	6 weeks	292	42.63	27th of February	10th of April	7 weeks	315	44.55
3rd	4th of April	9th of May	6 weeks	220	32.12	17th of April	15th of May	5 weeks	225	31.82

Generaly, the *C. vittata* adults, eggs and larvae were recorded three generations, second generation was highest one.

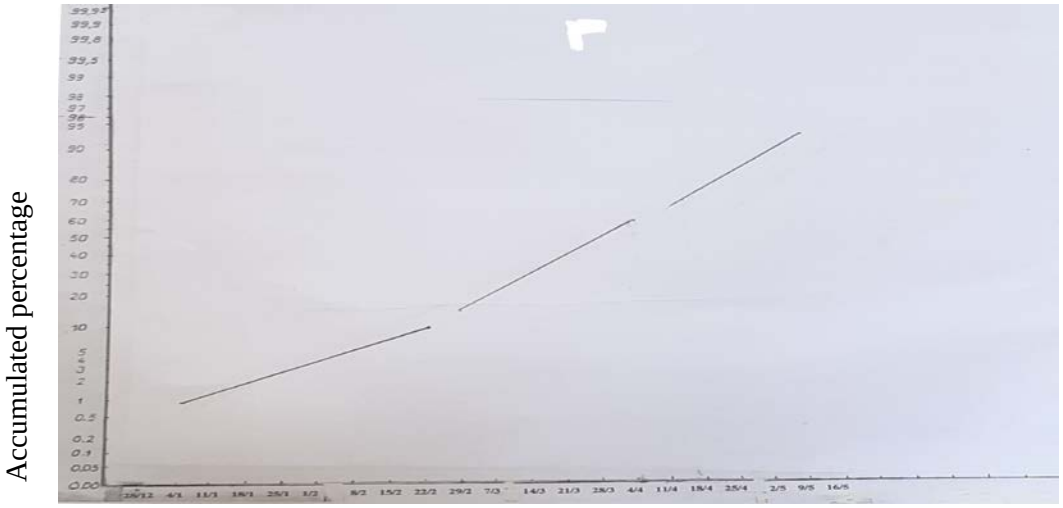


Fig. (5): Annual generation of *C. vittata* (larvae) in Sharkia Governorate during 2015/2016 season.

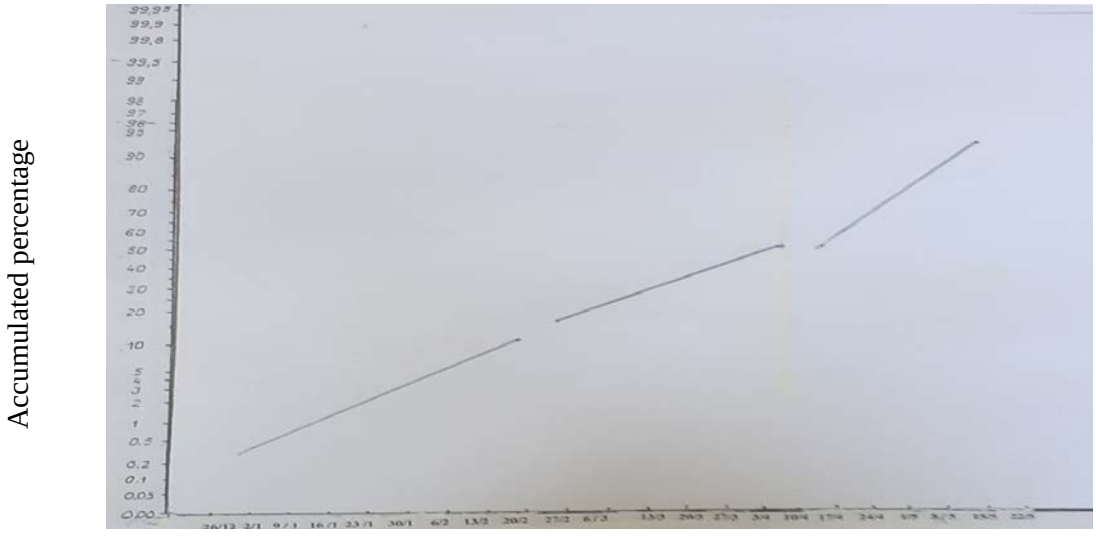


Fig. (6): Annual generation of *C. vittata* (larvae) in Sharkia Governorate during 2016/2017 season.

Table (5): The annual generation of *C. vittata* (larvae) in Sharkia Governorate during 2015/2016 and 2016 /2017 seasons.

Generation number	2015/2016					2016/2017				
	Duration		Duration in weeks	Total larvae		Duration		Duration in weeks	Total larvae	
	From	To		Number	%	From	To		Number	%
1st	4th of January	22th of February	8 weeks	172	10.96	2nd of January	20th of February	8 weeks	168	12.95
2nd	29th of February	4th of April	6 weeks	807	51.40	27th of February	10th of April	7 weeks	479	36.93
3rd	11th of April	9th of May	5 weeks	539	34.33	17th of April	15th of May	5 weeks	595	45.88

Abo-Saied Ahmed (1987) found that the adults of *C. vittata* appeared in sugar beet field in February and in December. The population densities of larvae and adults gradually increased as sugar beet becomes older and highest densities were recorded during April and May. Metwally *et al.,* (1987) mentioned that *C. vittata* was among the insect species, which were abundant on the sugar beet. The insect appeared in January and its population densities increased until reaching high levels during April, May and June. Abo-Aiana (1991) recorded that few numbers of *C. vittata* adults increased from March towards the end of sugar beet growing season.

Awadalla *et al.,* (1991) stated that *C. vittata* was recorded from mid-November until mid-April in 1989/90 and from early January until the end of the April (1990/91). Salama and Elnagar (1992) indicated that the insect had a single annual generation during March-May. Early plantings had the lowest population density and therefore planting during August. Youssef (1994) stated that in September plantation, the *C. vittata* appeared from January to April. While in December plantation the beetle appeared from February until June. The different stages had two peaks of abundance in the two seasons. Bassyouny and Bleih (1996) showed that *C. vittata* appeared in mid-January for all plantations during 1993/94 season, while it appeared earlier in December of 1994/95 season except in September plantation. Abd-El-Kareim and Awadalla (1998) indicated that all developmental stages of *C. vittata* gradually increased from March towards the end of sugar beet growing season. They recorded two peaks of immature stages, the first in March and the second in May, the highest peak of the adult stage was found in April and sharply declined in May and June. Bassyouny (1998) reported that the highest number of *C. vittata* was recorded on sugar beet plants of both mid-September and late-October plantations, while early plantation (August) received the lowest number especially at late season. Sherief *et al.,* (2013) showed that in the first and the second season, two peaks of both larvae and adult stages El-Dessouki *et al.,* (2014) showed *C. vittata* larvae had two peaks in both seasons during late February and late March in the first season and during early and mid-April in the second season. Khalifa, Amany (2017) Showed that sugar beet plants of August and September plantations suffered very low infestation with *C. vittata* larvae and adults. However, the highest insect population density was

detected in October plantation; with values of larvae and adults in the first and second seasons. It was obvious that *C. vittata* population density was very high during March, April and May in sugar beet plants of October plantation.

3. Seasonal fluctuations of some predators associated with *C. vittata*

Results in Tables (6 and 7) indicated that the number of predator insects (*C. carnea, C. undecimpunctata, P. alfierii* and true spiders) had one peak during the two seasons. The peak of *C. undecimpunctat* and *P. alfierii* (13 and 31 individual / 25 plants) was occurred in 21th of March for the first season and the total number (22 and 27 individual / 25 plants) was occurred in 20th of March for the second season, respectively. The peak of *C. carnea* was recorded in 14th and 13th of March with a total numbers of 24 and 29 individual / 25 plants for the two seasons, respectively. While The peak of true spiders was recorded in 11th and 17th of April with a total numbers of 28 and 34 individual / 25 plants for the two seasons, respectively. The numbers of *Scymnus* sp was decreased for the two seasons.

Table (6): Weekly number of the predators associated with tortoise beetle *C. vittata* infesting sugar beet plants at Sharkia Governorate during during 2015/2016 season.

Date	Number of predators/ 25 plants				
	C. undecimpunctata	*C. carnea*	*Scymnus sp.*	*P. alfierii*	True spiders
14\12	0	0	0	0	0
21\12	1	1	2	0	2
28\12	0	1	3	2	3
4\1	2	0	1	1	5
11\1	1	1	0	2	5
18\1	1	0	1	5	4
25\1	2	3	2	4	6
1\2	3	6	0	5	7
8\2	1	5	2	7	8
15\2	2	6	3	8	6
22\2	4	8	2	6	7
29/2	5	10	1	10	8
7/3	8	16	0	13	9
14/3	9	24	0	16	9
21/3	13	12	2	31	12
28/3	6	7	1	10	15
4/4	4	4	1	8	17
11/4	1	2	2	5	28
18/4	2	3	1	3	11
25/4	0	1	1	4	7
2/5	1	1	2	2	3
9/5	1	2	1	1	2
16/5	0	1	0	1	1

Table (7): Weekly number of the predacious insects associated with tortoise beetle *C. vittata* infesting sugar beet plants at Sharkia Governorate during during 2016/2017 seasons.

Date	Number of predators/ 25 plants				
	C. undecimpunctata	*C. carnea*	*Scymnus sp.*	*P. alfierii*	True spiders
12\12	0	0	0	0	0
19\12	1	2	0	0	2
26\12	2	1	1	0	3
2\1	0	0	1	2	3
9\1	2	3	0	1	5
16\1	1	4	2	3	4
23\1	1	5	1	2	3
30\1	2	6	0	4	6
6\2	3	6	3	6	6
13\2	5	9	1	7	5
20\2	7	8	2	9	7
27\2	6	15	4	9	6
6\3	8	20	3	13	5
13\3	11	29	2	16	7
20\3	22	10	1	27	8
27\3	9	8	0	15	9
3\4	6	7	1	9	13
10\4	3	5	2	7	15
17\4	2	6	2	5	34
24\4	2	3	4	3	12
1\5	3	4	2	4	7
8\5	1	1	1	1	4
15\5	1	0	1	2	1
22\5	0	1	0	1	2

Abo Saied Ahmed (1987) in Egypt recorded ten predators belonging to 5 orders and 6 families in sugar beet fields. He encountered *Coccinella* spp. form March to June while *Scymnus* sp. was encountered from November to June. Mesbah (1991) who found that the population of coccinellid predators started to increases in March and April. Youssef (1994) reported that three distinct peaks of *P. alfierii*, two peaks of coccinellid predators and two peaks of *C. carnea* were recorded in September. El-Agamy *et al* (1996) in Egypt found that the abundance of coccinellids, *P. alfierii* and *C. carnea* in sugar-beet fields reached their maximum populations during April in September plantation and throughout May-June in December plantation. Shalaby (2001) observed that the population density of coccinellids was high during March, April and may and the population density of *C. carnea* was the highest in September plantation. El-Khouly (2006) found that the changes in the population densities of the

predacious insects; *C. undecimpunctata*, *P. alfierii* and *C. carnea* coincided with the population densities of the tested pests *P. mixta* and *C. vittata*. Sherief *et al.,* (2013) showed that about natural enemies *C. undecimpunctata* and *C. carnea* appeared in November but *P. alfierii* was observed during January in both seasons The peaks of the studied predacious insects occurred in February. Khalifa, Amany (2017) reported the predatory coccinellids were more detected in the first plantation (3.44 – 7.08 adults/25 sugar beet plants) and the second plantation (2.00 – 3.21 adults/25 sugar beet plants). Other than coccinellid predators *P. alfierii*. and *Orius* sp., were surveyed.

4. Effect of maximum, minimum temperature and relative humidity on the number of *C. vittata* infesting sugar beet plants

1) Adults

The results in Table (8) showed that the correlation coefficient between adults and maximum temperature was positively high significant and significant (0.8545* and 0.5214*) in the two seasons, respectively. The correlation coefficient between larvae and minimum temperature was positively high significant (0.8363*** and 0.5432**) in the two seasons, respectively. While, relative humidity was negatively high significant and insignificant (- 0.7834*** and – 0.2227) in the two seasons, respectively.**

2) Eggs

The results in Table (8) obtained that the correlation coefficient between eggs and maximum temperature was positively high significant (0.5392 and 0.5511**) in the two seasons, respectively. The number of eggs was positively significant and high significant with minimum temperature (0.5118* and 0.5471**) in the two seasons, respectively. While, relative humidity was negatively significant and insignificant (-0.4573* and – 0.1931) in the two seasons, respectively.**

3) Larvae

The results in Table (8) obtained that the correlation coefficient between larvae and maximum temperature was positively high significant (0.5339 and 0.6919***) in the two seasons, respectively. The correlation coefficient between larvae and minimum temperature was positively high significant (0.5491** and 0.7006***) in the two seasons, respectively. While, relative humidity was negatively high significant and significant (- 0.5678** and -0.4839*) in the two seasons, respectively.**

Table (8): Simple correlation coefficients (r) between the means of (maximum, minimum temperature and relative humidity) and total numbers of *C. vittata* infesting sugar beet plants during 2015/2016 and 2016/2017seasons.

C. vittata	Simple correlation coefficients						Explained variance % R^2	
	2015/2016			2016/2017				
	Max. temp.	Min. temp.	R.H. %	Max. temp.	Min. temp.	R.H. %	2015/2016	2016/2017
Adults	0.8545***	0.8363***	-0.7834***	0.5214*	0.5432**	- 0.2227	77.78	33.43
Eggs	0.5392**	0.5118*	- 0.4573*	0.5511**	0.5471**	- 0.1931	31.27	37..31
Larvae	0.5339**	0.5491**	-0.5678**	0.6919***	0.7006***	- 0.4839*	31.27	49.99

5. Combined effects of meteorological factors on the numbers of *C. vittata* (eggs, larvae and adults).

The effect of (maximum and minimum) temperatures and mean relative humidity on *C. vittata* (adults, eggs and larvae) numbers were estimated by calculating the partial regression analysis. E.V. % values Table (8) demonstrated that the eggs, larvae and adults population of *C. vittata* in the two seasons E.V.% values of 77.78 % and 33.43 % (adults), E.V % values of 31.27 % and 37.31 % (eggs) and E.V.% values of 31.27 % and 49.99 % (larvae) for the two seasons, respectively.

REFERENCES

Abd El-Kareim, A. I. and S. S. Awadalla (1998). Mortality and life-budgets for immature stages of the tortoise beetle, *Cassida vittata* Vill. (Coleoptera: Chrysomelidae). J. Agric. Sci., Mansoura Univ., 23 (7): 3419 - 3430.

Abo-Aiana, R. A. D. (1991). Studies on pests of sugar beet in Kafr El-Sheikh. Ph. D. Thesis, Fac. of Agric, Tanta Univ., 171 pp.

Abo El-Ftooh, A.A., I.M.A Gohar, M. S. Saleh and Kh. El- Sh Mohamed (2013). Effect of some pesticides, sugar beet cultivars and their interaction on population density of tortoise beetle *Cassida Vittata* Vill and some characters of sugar beet cultivars at Nubaryia and Damanhour Region. Alex. Sci. Exch. J., 17 (3): 128 – 139.

Abo Saied Ahmed, A. M. B. (1987). Studies on the insects of sugar-beet in Kafr El-Sheikh Governorate Egypt. Ph. D. Thesis, Fac. of Agric. Tanta Univ., 152 pp.

Ali, F. A., M. A. Samy, F. E. El-Adl and S. M. Ibrahim (1993). Effect of planting dates on the infestation ration of the main insect in sugar-beet fields. J. Agric. Sci., Mansoura Univ., 18 (6): 1805- 1812.

Amin, A. H., A. Helmi and S. A. El-Serwy (2008). Ecological studies on sugar beet insects at Kafr El-Sheikh Governorate, Egypt. Egypt J. Agric. Res., 86 (6): 2129 -2139.

Audemard, H. and G. Millaire (1975). LE piegeage du carpocapce sexual de synthese: primiers results unitisables pour L. estimation des populations conduite de la lutte Ann. Zool. Ecol. Anim, 7 (1), 6180.

Awadalla, S. S. (1993). Abundance of the tortoise beetle, *Cassida vittata* Vill. and the role of parasitoids on their immature stages. J. Agric. Sci., Mansoura Univ., 18 (8): 2436 - 2440.

Awadalla, S. S., M. E. Ragab and H. M. Fathy (1991). Interaction between injurious and predatory insects inhabiting sugar beet plants Egypt. J. Biol. P. Cont., 1 (2): 25 - 32.

Bassyouny, A. M. (1993). Studies on prefer ability and injury level of some main insects to certain sugar beet varieties. Egypt. J. Appl. Sci., 8(1): 213-219.

Bassyouny, A. M. (1998). Economic injury level of the mains defoliator insects on sugar beet plants. J. Agric. Sci., Mansoura Univ., 23 (1): 405-418.

Bassyouny, A. M. and S. B. Bleih (1996). Sowing dates, seasonal fluctuations and chemical control against the main insects attacking sugar beet. Alex. Sci. Exch. J., 17 (3): 283 - 296.

El-Agamy, F. M., S. M. I. Metwally, R. El-Sufty and A. Youssef (1996). The relationship between population fluctuations of some important insect pests of sugar-beet and their insect predators at Kafr El-Sheikh Region. J. Agric. Res., Tanta Univ., 22(1): 69-76.

El-Dessouki, S.A., S.M. El-Awady, K.A.M.H. El-Khawass, A.H. Mesbah and W.A.A. El-Dessouki (2014).

Population fluctuation of some insect pests infesting sugar beet and the associated predatory insects at Kafr El-Sheikh Governorate. Ann. Agric. Sci., 59 (1): 119–123.

El-Khouly, M. I. I. (2006). Population Fluctuations of the beet fly, *Pegomyia mixta* Vill. and the tortoise beetle. *Cassida vittata* (Vill) in relation to certain associated natural enemies in sugar beet fields at Kafr El-Sheikh Governorate, Egypt. Egypt. J. Biol. P. Cont., 16 (1): 25-28.

Guirguis, G. Z. (1985). Studies on certain insects attacking sugar-beet in Western Desert, Egypt. Ph. D. Thesis, Fac. of Agric, Menoufiya Univ., 277 pp.

Jacob, N. (1977). Un model matimatic pentra stabilrea limitelor economic de talyrenta a atacalui molilor fructilor in lupte integrate, Analele I.C.P.P.: 15-17 Romania.

Khalifa, Amany A. (2017). Population dynamics of insect pests and their associated predators at different plantations of sugar beet. J. Plant Prot. and Path., Mansoura Univ., 8 (12): 651 – 656.

Mesbah, A. H. (1991). Ecological and biological studies on parasites and predators of some insects at Kafr El-Sheikh Region. M. Sc. Thesis, Fac. Agric. TantaUniv., 127 pp.

Metwally, S. M. I., R. El-Sufty, N. El-Dakhakhany and A. Bassouny (1987). Survey and seasonal abundance of insects associated with sugar-beet at Kafr El-Sheikh, Egypt. J. Agric, Tanta Univ., 13 (4): 1129 - 1139.

Salama, R. A. K. and S. El-Nagar (1992). The tortoise beetle, *Cassida vittata* Vill. (Col. Chrysomelidae), a possible pest of sugar beet plantation in Egypt. J. App. Ent., 113 (1): 88 -92.

Shalaby, G.A.M. (2001). Ecological studies on some important sugar-beet pests and natural enemies and their control. Ph. D. Thesis, Fac. of Agric, Kafr El-Sheikh, Tanta Univ., 141 pp.

Sherief, E. A. H, A. A. A. Said, F.A.H. Shaheen and H. A. M. Fouad (2013). Population fluctuatxion of certain pests and their associated predator insects on sugar beet in sharkia governorate, Egypt. Egypt. J. Agric. Res., 91 (1): 139-150.

Youssef, A. E. (1994). Studies on certain insects attacking sugar beet. Ph. D. Thesis, Fac. of Agric, Kafr El-Sheikh, Tanta Univ., 134 pp.

التقلبات الموسمية وعدد الاجيال لخنفساء البنجر السلحفائية التي تصيب نباتات البنجر وبعض المفترسات المصاحبة في محافظة الشرقية – مصر

أمل زكريا نور الدين الحبشى، عبدالله على عبدالصمد، سعيد عبدالفتاح محمود عامر

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – جيزة – مصر

الملخص العربى

التقلبات الموسمية وعدد الاجيال للحشرات الكاملة وبيض ويرقات خنفساء البنجر آلتي تصيب نباتات البنجر في منطقة ديرب نجم ، محافظة الشرقية والتقلبات الموسمية لبعض المفترسات المصاحبة (أبو العيد وأسد المن والحشرة الرواغة والاسكمنس والعناكب الحقيقية) وجد للحشرات الكاملة لخنفساء البنجر قمتين نشاط ،القمة الاولى فى يوم ١١ من شهر ابريل بينما القمة الثانية فى يوم ٢ من شهر مايو للموسم الاول وفى الموسم الثانى ظهرت القمة الاولى فى يوم ٣ من شهر ابريل بينما القمة الثانية فى يوم ١ من شهر مايو وجد ليرقات خنفساء البنجر قمتين نشاط ،القمة الاولى فى يوم ٢١ من شهر مارس بينما القمة الثانية فى يوم ٢ من شهر مايو للموسم الاول وفى الموسم الثانى ظهرت القمة الاولى فى يوم ٢٠ من شهر مارس بينما القمة الثانية فى يوم ١ من شهر مايو وكان لبيض خنفساء البنجر قمتين نشاط٢ القمة الاولى فى يوم ٧ من شهر مارس بينما القمة الثانية فى يوم ٤ من شهرابريل للموسم الاول وفى الموسم الثانى ظهرت القمة الاولى فى يوم ٦ من شهر مارس بينما القمة الثانية فى يوم ١٧ من شهرابريل . ولقد وجد ان للحشرات الكاملة وبيض ويرقات خنفساء البنجر ثلاث اجيال للموسمين . وججد قمة نشاط واحدة فى يوم ٢١ من مارس وفى ٢٠ من مارس لابو العيد و الرواغة خلال الموسمين وسجلت قمة نشاط واحدة لا سد المن فى يوم ١٤ من شهر مارس وفى يوم ١٣ من شهر مارس خلال الموسمين. وسجلت قمة نشاط واحدة للعناكب الحقيقية فى يوم ١١من شهر ابريل وفى يوم ١٧ من شهر ابريل خلال الموسمين وحشرات الاسكمنس كانت اقل تعداد خلال الموسمين. وتم دراسة العلاقة بين تعداد الحشرات الكاملة وبيض ويرقات خنفساء البنجر وكل من درجة الحرارة العظمى و الصغرى والرطوبة النسبية.

السادة المحكمين

أ.د/ على أحمد أحمـد مركز البحوث الزراعية – الجيزة

أ.د/ أحمد أحمد الدش كلية الزراعة – جامعة المنوفية