J. Agric. Sci. Mansoura Univ., 29(2): 911 - 923, 2004

ECOLOGICAL STUDIES ON THE MAIN INSECT PESTS OF SUGAR BEET PLANTS AND THE MOST COMMON PREDATORS AT KAFR EL-SHEIKH REGION

Helal, R.M.Y.

Economic Entomology Department, Faculty of Agriculture, Kafr El-Sheikh, Tanta University.

ABSTRACT

Field experiments were conducted at Kafr El-Sheikh Governorate during two successive seasons (1999/2000) and (2000/2001). Sugar beet was planted at three planting dates, during the first week of September, October and November, respectively. In each plantation, the relative abundance of *Spodoptera littoralis* (Boisd.), *Pegomyia mixta* (Vill.), *Cassida vittata* (Vill.) and three common predators *Paederus alfierii* (Stef.), *Coccinella* spp. and *Chrysoperla carnea* (Steph.) populations were estimated.

The seasonal abundance of either tested insect pest or predator was significantly varied among tested planting dates. Statistical analysis indicated that there are significantly positive correlation coefficients between the predators density and the main insect pests in the three planting dates. It was found out that September was the most suitable planting date in the tested area, to avoid high insect infestation at Kafr El-Sheikh Governorate is at early September.

Results also indicated a negative correlation between the weight of sugar beet root and sucrose percentage with regard of the artificial infestation of *Pegomyia mixta*.

INTRODUCTION

Sugar beet, *Beta vulgaris* L. provides about 40 percent of the world sugar production and represents the second source for sugar production in Egypt. The cultivated Area with sugar beet increased from 17.000 to 138.200 feddans in the period from 1982 to 2003 (cited from Delta sugar Company). Kafr El-Sheikh Governorate has the largest area of sugar beet cultivation. Under Egyptian conditions, sugar beet plants are considered as a very desirable host plant for many insect pests.

Many authors studied the population density of the major insects pests of sugar beet (Abo-Aiana, 1991; Aly *et al.*, 1993; Youssef, 1994; Ebieda, 1997; El-Khouly, 1998; Bassyouny and Abou-Attia, 1998; Abou-Attia, 1999 and Zawrah, 2000). The beet fly, *Pegomyia mixta* (Vill.) is considered as one of the most important insect pests of sugar beet in Egypt. (Awadalla *et al.*, 2001).

One of the most important measures recommend for the control of sugar beet insects, planting date which well coincide with the periods that the population levels of sugar beet insects are at the minimum level.

Therefore, the present work was outlined to study: the effect of three planting dates on the relative abundance of the main insect pests and their associated predators in sugar beet fields, the relation between insect population density and weather factors and predators, the effect of artificial in addition to infestation of sugar beet plants with *P. mixta* larvae on the weight and sucrose percentage root of sugar beet root.

MATERIAL AND METHODS

The present study was carried out at the experimental farm of the Faculty of Agriculture, Kafr El-Sheikh, Tanta University, during two successive seasons 1999/2000 and 2000/2001. Sugar beet was cultivated in half feddan. Sowing was done at three dates; during the first week of September, October and November, respectively. Recommended agricultural practices were adopted without any insecticidal applications. Sampling started after four weeks of sowing and continued every two weeks until harvest.

To evaluate the relative abundance of the main insect pests and the predators inhabiting sugar beet, twenty plants from each plantation were chosed randomly (five plants/ replicate), Every plant was covered with a polyethylene bag then it was pulled up and taken to the laboratory for examination. The number of larvae of *Spodoptera littoralis* (Boisd.) adult and larvae of *Pegomyia mixta* (Vill.), eggs, larvae, pupae and adults of *Cassida vittata* Vill., adults of *Paederus alfierii* (Stef.), adults and larvae of coccinallids group and larvae of *Chrysoperla carnea* (Steph.), were recorded.

At each sampling date, air temperature and relative humidity between the sugar beet field were recorded by the aid of electronic thermohygrometer to find out their relationships with the density of existing insect population. The obtained data was statistically analyzed according to Fisher and Yates (1957).

To determine the impact of artificial infestation levels of sugar-beet plants with certain numbers of *P. mixta* larvae on root yield and sucrose percentage. An experiment was conducted under field conditions in 2000/2001 season. The experimental area (64 m^2) was divided into 16 small plots (4 m^2 each) representing four levels of artificial infestation in four replicates were adopted in a randomized complete block design. The artifical infestation levels were 0 (control), 30, 60 and 90 larvae/plant.

Sugar-beet plots were cultivated in the first week of October and plants were thinned one month later. Normal cultural practices were followed until harvesting. For preventing natural infestation of insect pests and mites attacking sugar-beet plants, insecticides and fungicides were applied when ever necessary to perform a complete protection.

When sugar-beet plants reached the desired age that corresponded with the high peak (G^3, at the beginning of April) *Pegomyia mixta* in sugar-beet fields (**Youssef, 1986 and Mesbah 2000**). Plants of each plot (6 plants) for each treatment were subjected to artificial infestation with a specified number of new hatched larvae. Ten plants of each treatment were then covered with wooden cage measured 1.5 × 1.5 × 1.5 m^2 with wire gauze sides. Mortality percentage was carefully noted daily. At harvesting time, roots from each plot from every treatment were cut off and weighted individually. The sucrose percentage was estimated by means of a Saccaro meter apparatus.

RESULTS AND DISCUSSION

I- Seasonal abundance of three main insect pests and the common predators:

September plantation :

Data presented in Table (1) and illustrated in Fig. (1) obviously indicate that sugar beet plants were free from *C. vittata* infestation during a period elapsed from October to the beginning of February in the first and second seasons of study. The highest population of *C. vittata* was recorded in early April. *P. mixta* populations appeared early in the first half of November and gradually increased until it reached its highest density in the first of April, during the first (134 individuals) and (186 individuals) in second season. *S. littoralis* was recorded during October and November only on sugar beet plants in the two seasons. The number of total predators was recorded with relatively high abundance during October and November then decreased until reached the lowest numbers during December, January and February. Predators gradually increased during March and April.

October plantation :

Data obtained in Table (2) and illustrated in Fig. (1) shows that sugar beet plants were free from, *C. vittata* infestation from November to the First of February in both seasons of study. The highest occurrence of *C. vittata* was recorded in the first of May during the first (334) and second (267 individuals/20 plants) seasons, respectively. The sugar beet fly, *P. mixta* was recorded in the first of November and reached the highest number in the first and second seasons (176 & 174 individuals) in the mid and first March, respectively. *S. littoralis* was recorded during April and May only. The number of predators was somewhat low at the beginning of November - December and reached its lowest abundance during January - February. The tested predators recorded its relative abundance during April – May in both seasons of study.

November plantation :

November plantations indicated Table (3) and Fig. (1) showed that sugar beet plants were free from any stages of the beetle, *C. vittata* during a period elapsed from December to the mid of January in the two successive seasons. The highest population of the pest was recorded in May seeds it was (416 and 308 individuals/20 plants in the first and second seasons, respectively). The sugar beet fly, *P. mixta* populations gave its highest record (259 individuals) in Mid March in the first season and (269 individuals) in Mid April in Second season. *S. littoralis* was recorded during April and May only. The insect predator populations began with low abundance, then its gradually increased until reaching its maximum in May in the two seasons of study (Table 3).

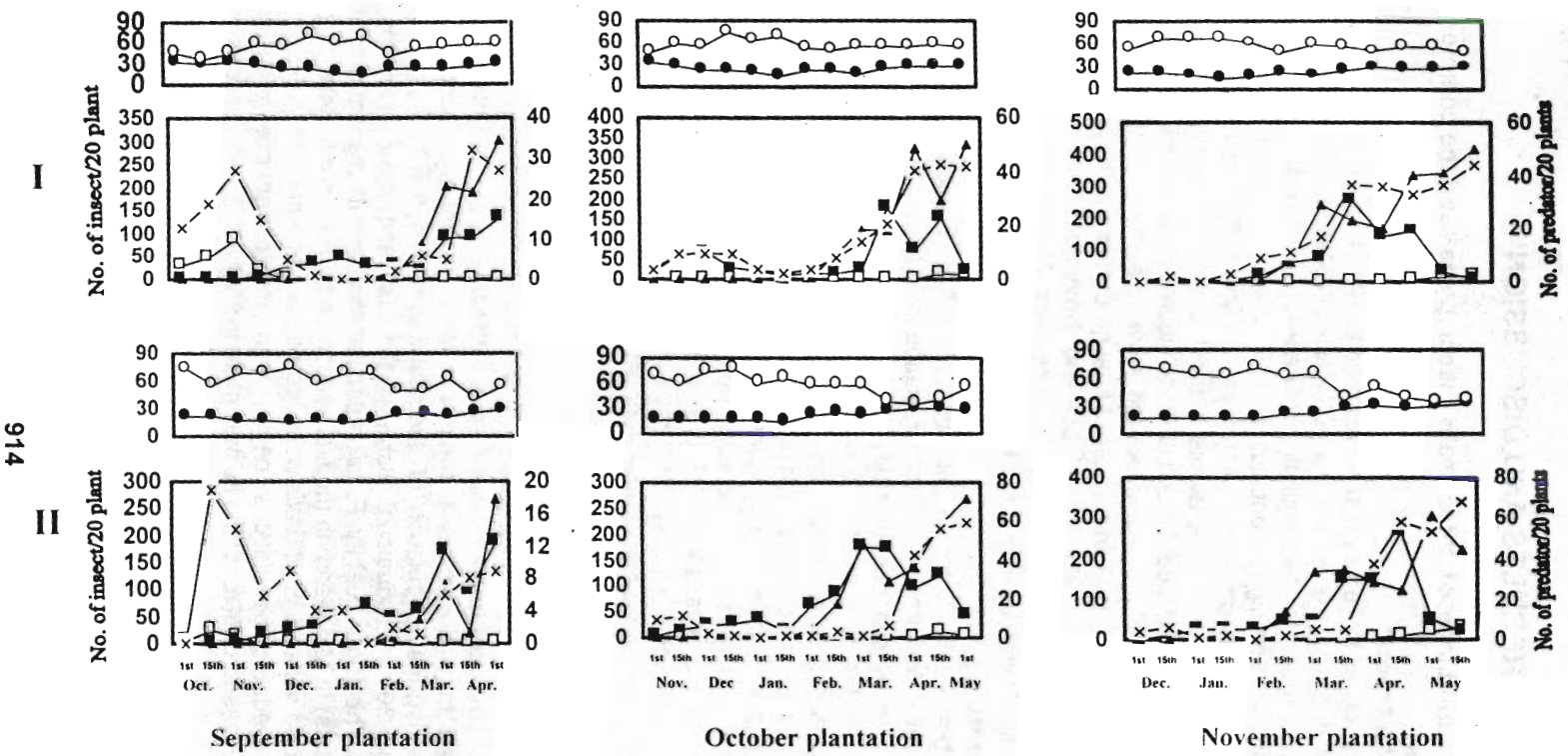

Fig. (1): Relative abundance of the main insect pests in three different plantation dates during the two successive seasons 1999/2000 (I) and 2000/2001 (II)

P. mixta *S. littoralis* *C. vitatta* Predators total R. H. Temp. °C

Table (1) : Number of the three insect pests and the predators/20 sugar beet plants in September plantation during two successive seasons 1999/2000 and 2000/2001 at Kafr El-Sheikh district.

Sampling date			*S. littoralis*	*P. mixta*			*C. vittata*					Total of insect pests	*P. alfierii*	Coccinallids group	*C. carnea*	Total
			L	E	L	Total	E	L	P	A	Total		A	A&L	L	
Season 1999/2000	Oct.	1st	30	0	0	0	0	0	0	0	0	30	3	5	5	13
		15th	49	0	0	0	0	0	0	0	0	49	5	9	5	19
	Nov.	1st	86	0	0	0	0	0	0	0	0	86	6	15	6	27
		15th	17	3	5	8	0	0	0	0	0	25	8	7	0	15
	Dec.	1st	0	15	15	30	0	0	0	0	0	30	3	1	1	5
		15th	0	16	18	34	0	0	0	0	0	34	1	0	0	1
	Jan.	1st	0	22	27	49	0	0	0	0	0	49	0	0	0	0
		15th	0	11	20	31	0	0	0	0	0	31	0	0	0	0
	Feb.	1st	0	15	16	31	0	0	0	9	9	40	2	0	0	2
		15th	0	6	24	30	57	6	0	14	77	107	5	0	1	6
	Mar.	1st	0	79	10	89	157	32	0	15	204	293	2	2	1	5
		15th	0	29	60	89	73	88	11	17	189	278	12	7	13	32
	Apr.	1st	0	89	45	134	62	153	29	57	301	435	3	9	14	26
	Total		182	285	240	525	349	279	40	112	780	1487	50	55	46	151
Season 2000/2001	Oct.	1st	5	0	0	0	0	0	0	0	0	5	0	0	0	0
		15th	23	0	0	0	0	0	0	0	0	23	16	1	2	19
	Nov.	1st	12	3	0	3	0	0	0	0	0	15	7	2	5	14
		15th	2	8	7	15	0	0	0	0	0	17	4	2	0	6
	Dec.	1st	2	15	10	25	0	0	0	0	0	27	2	7	0	9
		15th	0	14	19	33	0	0	0	0	0	33	2	2	0	4
	Jan.	1st	0	25	35	60	0	0	0	0	0	60	0	4	0	4
		15th	0	17	51	68	0	0	0	0	0	68	0	0	0	0
	Feb.	1st	0	12	34	46	9	0	0	4	13	59	2	0	0	2
		15th	0	42	20	62	42	0	0	1	43	105	1	0	0	1
	Mar.	1st	0	98	73	171	61	45	0	2	108	279	4	2	0	6
		15th	0	50	47	97	144	57	11	8	220	317	5	2	1	8
	Apr.	1st	0	69	117	186	47	124	14	82	267	453	4	5	0	9
	Total		44	353	413	766	303	226	25	97	651	1461	47	27	8	28

E: Egg, L: Larvae,P: Pupa, A: Adult

Table (2): Number of the three insect pests and the predators/20 sugar beet plants in October plantation during two successiveseasons 1999/2000 and 2000/2001 at Kafr El-Sheikh district.

Sampling dae			*S. littoralis*	*P. Mixta*			*C. vittata*					Total of insect pests	*P. alfierii*	Coccinallids group	*C. carnea*	Total
			L	E	L	Total	E	L	P	A	Total		A	A&L	L	
Season 1999/2000	Nov.	1st	6	13	5	18	0	0	0	0	0	24	2	2	0	4
		15th	0	23	36	59	0	0	0	0	0	59	6	4	0	10
	Dec.	1st	0	29	41	70	0	0	0	0	0	70	2	8	0	10
		5th	0	16	13	29	0	0	0	0	0	29	5	5	0	10
	Jan.	1st	0	9	10	19	0	0	0	0	0	19	4	0	0	4
		15th	0	3	5	8	0	0	0	0	0	8	2	0	0	2
	Feb.	1st	0	7	6	13	0	0	0	4	4	17	4	0	0	4
		15th	0	9	8	17	50	9	0	7	66	83	8	0	0	8
	Mar.	1st	0	12	13	25	92	18	2	9	121	146	6	6	2	14
		15th	0	73	103	176	46	47	16	16	125	301	5	9	7	21
	Apr.	1st	0	52	24	76	42	204	14	67	327	403	12	13	16	41
		15th	15	74	81	155	33	67	47	53	200	370	8	26	9	43
	May	1st	8	12	9	21	66	82	37	149	334	363	7	22	13	42
	Tota		29	332	354	686	329	427	116	305	1177	1892	71	95	47	213
Season 2000/2001	Nov.	1st	0	5	0	5	0	0	0	0	0	5	3	3	3	9
		15th	0	7	7	14	0	0	0	0	0	14	2	3	6	11
	Dec.	1st	0	14	9	23	0	0	0	0	0	23	2	0	0	2
		15th	0	12	14	26	0	0	0	0	0	26	1	0	0	1
	Jan.	1st	0	19	16	35	0	0	0	0	0	35	0	0	0	0
		15th	0	3	10	13	0	0	0	0	0	13	1	0	0	1
	Feb.	1st	0	22	0	62	5	0	0	11	16	78	1	0	0	1
		15th	0	32	55	87	68	0	0	9	77	164	3	0	0	3
	Mar.	1st	0	79	9	174	134	46	0	3	183	357	1	0	0	1
		15th	0	63	108	171	46	53	7	3	109	280	3	1	2	6
	Apr.	1st	0	37	62	99	22	36	37	42	137	236	10	19	14	43
		15th	12	42	80	122	27	138	25	28	218	352	15	22	19	56
	May	1st	3	2	39	41	82	55	47	83	267	311	16	18	25	59
	Total		15	337	535	872	384	328	116	179	1007	1894	58	66	69	193

E: Egg, L: Larvae, P: Pupa, A: adult

Table (3) : Numbr of the the insect pests and predators/20 sugar beet plants in November plantation during two successive seasos 1999/200a 2000/2001 at Kafr El-Sheikh district.

Sampling ate			*S. littoralis*	*P. mixta*			*C. vittata*					Total of Insect Pests	*P. alfierii*	Coccinallids group	*C.carnea*	Total
			L	E	L	Total	E	L	P	A	Total		A	A&L	L	
Season 1999/2000	Dec.	1st	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		15th	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	Jan.	1st	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		15th	0	3	5	8	0	0	0	0	0	8	2	1	0	3
	Feb.	1st	0	13	5	18	0	0	0	4	4	22	3	0	6	9
		15th	0	13	19	32	43	10	0	10	63	95	2	3	6	11
	Mar.	1st	0	29	45	74	192	37	0	12	241	315	5	2	10	17
		15th	0	142	117	259	126	45	4	16	191	450	7	16	14	37
	Apr.	1st	0	69	76	145	28	97	19	22	166	311	10	14	12	36
		15th	8	77	88	165	24	182	57	77	340	513	12	14	7	33
	May	1st	21	8	26	34	108	148	23	63	342	397	8	15	14	37
		15th	17	0	0	0	48	162	87	119	416	433	13	16	15	44
	Total		46	354	381	735	569	681	190	323	1763	2544	64	81	84	229
Season 2000/2001	Dec.	1st	0	0	0	0	0	0	0	0	0	0	2	1	1	4
		15th	0	5	5	10	0	0	0	0	0	10	3	3	0	6
	Jan.	1st	0	16	7	23	0	0	0	0	0	23	1	0	0	1
		15th	0	17	9	26	0	0	0	2	2	28	2	0	0	2
	Feb.	1st	0	14	10	24	0	0	0	4	4	28	0	0	0	0
		15th	0	25	21	46	57	4	0	6	67	113	2	0	0	2
	Mar.	1st	0	20	22	42	103	49	0	17	169	211	4	0	1	5
		15th	0	56	92	148	68	53	7	19	147	295	2	2	1	5
	Apr.	1st	6	67	79	146	31	72	27	13	143	295	13	18	7	38
		15th	11	160	109	269	10	43	17	53	123	403	11	23	24	58
	May	1st	19	14	34	48	57	77	54	120	306	375	7	27	19	53
		15th	31	0	18	18	22	111	43	45	221	270	24	25	19	68
	Total		67	394	406	800	348	409	148	279	1184	2051	71	99	72	242

E: Egg, L: Larvae, P: Pupa, A: Adult

II- Effect of planting dates on the relative abundance of the main insect pests and the associated predators :

Insect pests :

The mean number of the main insect pests attacking sugar beet plants and the common predators in the three planting dates (the first week of September, October and November) during the two seasons of study are presented in Table (4). The obtained data indicates that the relative abundance of the most common insect pests increased, by the increase of planting date was late. However, the relative abundance of both *P. mixta* and *C. vitatta* in September plantation was significantly low in comparison with that in October and November plantation, respectively. For example, in the first season, the mean number of insect pests/ five sugar beet plants in September plantation was 71.25, 60.00 for *P. mixta* (eggs and larvae); 87.25, 69.75, 10.00 and 28.0 for *C. vittata* (eggs, larvae, pupae and adults, respectively) and 45.50 for *S. littoralis* (Larvae). While, it was, 88.5, 95.25 for *P. mixta*; 142.25, 170.25, 47.5 and 80.75 for *C. vittata* (eggs, larvae, pupae and adults) and 11.50 for *S. littoralis* larvae in early November plantation. In the second season, the relative abundance of these insects recorded the same trend as shown in Table (4). The statistical analysis of variance showed that the infestation with *S. littoralis*, *P. mixta* and *C. vittata* were significant among the three tested plantations during the two seasons. The present results clearly revealed that September plantation is the better date for sowing sugar beet at Kafr El-Sheikh district. These results agrees with the findings of Youssef (1986), Awadalla *et al.* (1992), Aly *et al.* (1993), Bassyowny and Bleih (1996) and Talha (2001). Therefore, that data is recommended for planting sugar beet to avoid the high level of infestation with the main insects attacking sugar beet.

Predators :

Data presented in Table (4) indicated clearly that the total number of predators / five sugar beet plants in the first season was low (36.5 individuals) in September plantation, while it was high (57.25 individuals) in October plantations. In the second season, the total number of recorded predators goes same trend as shown in Table (4).

III- Correlation coefficient (r) between weather factors (temp. & R.H.) and insect populations:

The calculated simple correlation coefficients between weather factors (temperature and relative humidity) and the population of insect pests, *S. littoralis*, *P. mixta*, *C. vittata* and the common predators are given in Table (5).

In September plantations, the statistical analysis showed highly positive significant correlation between *S. littoralis* (+0.703), *C. vittata* (+0.774) and the mean temperature during the first and second seasons, respectively. Also, there was a significant correlation (+0.682) for predators in the first season. As shown in Table (5) there was significantly negative correlation between *C. vittata* and R.H. (r = - 0.586) in the second season.

Table (4) : Mean number of the three insects and the common predators found inhabiting sugar beet sowed in three different dates at Kafr El-Sheikh district during the two successive seasons (1999/2000 and 2000/2001).

Planting dates		Mean number of insects/5 plants										
		S. littoralis	*P. mixta*		*C. vittata*				*P. alfierii*	Coccinallids group	*C. carnea*	Total common predators
		L	E	L	E	L	P	A	A	A&L	L	
1999/2000	Sept.	45.50 a	71.25 N.S	60.00 b	87.25 b	69.75 c	10.00 c	28.0 b	12.50 N.S	12.50 b	11.50 b	36.50 b
	Oct.	7.25 b	83.00 N.S	88.50 a	82.25 b	106.75 b	29.00 b	76.25 a	17.75 N.S	23.75 a	11.75 b	53.25 a
	Nov.	11.50 b	88.50 N.S	95.25 a	142.25 a	170.25 a	47.50 a	80.75 a	16.00 N.S	20.25 a	21.00 a	57.25 a
2000/2001	Sept.	11.00 b	88.25 b	103.25 b	75.75 b	56.50 c	6.25 b	24.25 b	11.75 b	6.75 a	2.00 b	20.50 c
	Oct.	3.75 c	84.25 b	133.75 a	96.00 a	82.00 b	29.00 a	44.75 a	14.50 b	16.50 b	17.25 a	48.25 b
	Nov.	16.75 a	98.5 a	101.50 b	87.00 a	102.25 a	37.00 a	69.75 d	17.75 a	24.75 c	18.00 a	60.50 a

In the same column, means followed by the same letter are not significantly different at 5% level by Duncan (1955).

Table (5): Correlation (r) coefficients values between population of insects and weather factors (temperature and relative humidity) at Kafr El-Sheikh district during two seasons (1999/2000 and 2000/2001 season).

Plantation date	Season	Insects	Tem. °C	R.H. %
September	1999-2000	*S. littoralis*	0.703**	-0.546
		P. mixta	-0.226	0.356
		C. vittata	0.087	0.116
		Predators	0.682*	-0.312
	2000-2001	*S. littoralis*	-0.104	0.077
		P. mixta	0.535	-0.375
		C. vittata	0.774**	-0.586*
		Predators	-0.021	-0.068
October	1999-2000	*S. littoralis*	0.519	-0.198
		P. mixta	0.332	-0.116
		C. vittata	0.709	-0.222
		Predators	0.488	-0.137
	2000-2001	*S. littoralis*	0.476	-0.389
		P. mixta	0.669*	-0.709**
		C. vittata	0.833**	-0.661*
		Predators	0.731**	-0.592*
November	1999-2000	*S. littoralis*	0.617*	-0.315
		P. mixta	0.386	-0.289
		C. vittata	0.752**	-0.542
		Predators	0.828**	-0.618*
	2000-2001	*S. littoralis*	0.767**	-0.738**
		P. mixta	0.480	-0.482
		C. vittata	0.585**	-0.840*
		Predators	0.849**	-0.814**

*** Significant (P<0.05) ** Highly significant (P<0.01)**

In October plantation, there is no significant correlation between temperature or R.H.% and all tested insect populations was found including predators during the first season 1999/2000. While, in the second season 2000/2001, there was a significant correlation (+0.669) between *P. mixta* and temperature and highly significant in both of *C. vittata* (+0.833) and predators (+0.731). A highly negative significant correlation between R.H. and *P. mixta* (-0.709), while it was negatively in both of *C. vitatta* (-0.661) and predators (-0.592).

In November plantations, a positive significant correlation a course between temp. and *S. littoralis* (+0.617), while the same relation was found highly significant between R.H. and *C. vittata* (+0.752) and predators (+0.828) during the first season 1999/2000. The correlation between R.H. and predators was significantly negative (-0.618).

At the second season 2000/2001, the correlation between temperature and *S. littoralis*; *C. vitatta* and predators was highly significant (0.767, 0.585 and 0.849, respectively). Regarding the effect of R.H.% on the same previously mentioned insects was highly significant negative with *S. littoralis* (-0.738) and negatively significant with *C. vittata* (-0.840) and highly negative significant with predator (-0.814) as shown in Table (5).

Talha (2001) reported that the correlation coefficient between weather factors and the main insect pests and their predators varied right to really significant negative or positive values.

IV- Relation between some predators populations and sugar beet insect pests:

Statistical analysis showed that the correlation coefficients between the common predator populations and insect pests were positively significant in the first year (r = + 0.54) and insignificantly in the second season (r = + 0.07) during September plantation. The relation between predators (N_P) and insect pests (N_I) populations could be represented by the following sub models.

N_P = 40.44 + 6.41 N_I (during the first season)
N_P = 101.30 + 1.76 N_I (during the second season)

In October plantation, the correlation coefficients between predator populations and insect pests were positively highly significant (+0.96) and significant (+0.54) in the first and second seasons, respectively. The relation between predator (N_P) and insect pests (N_1) population could be represented by the following sub models.

N_P = -10.66 + 9.42 N_I (during the first season)
N_P = 89.21 + 3.24 N_I (during the second season)

In November plantation the correlation coefficient values significant in the first (+0.94) and second (+0.78) season respectively. The relation between predator (N_P) and insect pests (N_1) could be represented by the following sub models

N_P = -11.43 + 11.55 N_I (during the first season)
N_P = 78.20 + 4.60 N_I (during the second season)

It could be concluded from the data, the numbers of insect predators take the same trend of pests. Awadallah *et al.* (1991) stated that, the number of predators increased by increasing their preys.

V- Effect of *P. mixta* infestation on the weight and sucrose percentage of sugar beet roots :

The relationship between the artificial infestation of sugar-beet plants with different levels of *P. mixta* larvae and both weight of and sucrose percentage, is shown in Table (6) results indicated that the mean weight of sugar-beet root and sucrose percentage decreased by increasing the infestation level. Artificial infestation of sugar-beet plants with 30, 60 and 90 larvae/plant decreased the mean weight of roots by 24.1%, 37.1% and 46.6% respectively, while, Sucrose percentages were 16.73, 12.42 and 10.42 respectively for the same levels of artificia infestation.

Table (6): Mean of root weight, percentage of reduction in root weight and sucrose percentage resulted from artificial infestation of sugar-beet plants with different levels of *P. mixta* larvae during the third generation.

Number of Larva/plant	Mean weight of root (g)	Root weight decrease (%)	Sucrose percentage (%)
0 (control)	1544.75 a	0.0	18.75 a
30	1172.25 b	24.1	16.73 a
60	973.75 c	37.1	12.42 b
90	852.00 c	46.6	10.42 b

In the same column, means followed by the same letter are not significantly different at 5% level by Duncan (1955).

In general, sugar-beet plants infested with *P. mixta* larvae during the time corresponded with its high peak (G^3) showed greatest degree of sensitivity to all artificial infestation treatments with significant decrease in root weight. But no significant decrease in sucrose percentage was noticed between control treatment and artificial infestation treatment with 30 larvae/plant.

REFERENCES

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

Abou-Attia, F.A. (1999). Seasonal abundance of *Pegomyia mixta* Vill. and efficiency of its parasitoid *Opius nitidulator* (Nees) on sugar beet and wild beet plants. J. Agric. Sci. Mansoura Univ., 24 (11): 6929-6935.

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

Awadalla, S.S.; L.M. Shanab; H.M. Fathy and M.F. Zawrah (2001). Ecological studies on the sugar beet fly, *Pegomyia mixta* Vill. and its internal larval parasitoid, *Opius nitidulator* (Nees) in Mansoura district. Safe Alternatives of Pesticides for Pest Management Assiut Univ., Egypt.

Awadalla, S.S.; M.E. Ragab and Laila A. El-Batran (1992). Insect infestation levels of sugar beet plants in relation to varieties and planting dates. J. Agric. Sci. Mansoura Univ. 17 (5): 1121-1126.

Bassyouny, A.M. and F.A. Abou-Attia (1998). Effect of organic manures on sugar beet properties and the insect infestation. J. Agric. Sci. Mansoura Univ., 23 (4): 1729-1737.

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. 17 (3): 283-296.

Duncan, D.B. (1955). Multiple range and multiple F-tests. Biometrics, 11: 1-42.

Ebieda, A.M. (1997). Studies on sugar beet pests. VI. Effect of beet fly, *Pegomyia mixta* Vill, on sugar beet with special reference to the determination of its injury levels and economic threshold. Egypt, J. Agric. Res. 76 (2): 681-692.

El-Khouly, M.I. (1998). Ecological studies and control of the tortoise beetle *Cassida vittata* Villers in sugar beet ecosystem. Ph. D. Thesis, Al-Azhar University.

Fisher, R. and F. Yates (1957). Statistical tables for biological agricultural and medical research Oliver and Boyd Ed., Edinburgh & London.

Mesbah, I.I. (2000). Consumption of sugar beet area by the tortoise beetle, *Cassida vittata* Vill. J. Agric. Sci. Mansoura Univ., 25 (6): 3677-3685.

Talha, E.A.M.M. (2001). Integrated pest management of sugar beet insects. M.Sc. Thesis, Fac. of Agric. Mansoura Univ.

Youssef, A.E. (1986). Studies on some insects infesting sugar beet. M. Sc. Thesis. Fac. of Agric. Kafr El-Sheikh, Tanta Univ.

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

Zawrah, M.F.M. (2000). Studies on some insect pests infesting sugar beet and their natural enemies. M. Sc. Thesis, Fac. of Agric. Mansoura Univ., 79 pp.

دراسات ايكولوجية على بعض الآفات الحشرية الرئيسية التى تصيب محصول البنجر والمفترسات المرتبطة بها فى منطقة كفرالشيخ

رمضان مصرى هلال

قسم الحشرات الإقتصادية – كلية الزراعة بكفرالشيخ

أجريت هذه الدراسة فى محافظة كفرالشيخ فى موسم ١٩٩٩/٢٠٠٠م وموسم ٢٠٠٠/٢٠٠١م بهدف إجراء دراسات ايكولوجية على بعض الآفات الحشرية الرئيسية التى تصيب محصول البنجر والمفترسات المرتبطة بها فى منطقة كفرالشيخ.

تم زراعة صنف البنجر فى ثلاث مواعيد زراعة مختلفة هى الأسبوع الأول لكل من شهر سبتمبر، أكتوبر، نوفمبر وفى كل عروة تم تقدير الوفرة النسبية للتعداد كل أسبوعين لكل من الحشرات الآتية : دودة ورق القطن، ذبابة أوراق البنجر، خنفساء البنجر السلحفائية وكذلك المفترسات المرتبطة بها وهى: الحشرة الرواغه، خنافس أبوالعيد وأسد المن إتضح من النتائج المتحصل عليها وجود فروق معنوية بين مستوى الإصابة بالآفات فى كل من العروة الأولى (سبتمبر) والعروة الأخيرة (نوفمبر) فى كلا الموسمين.

كما تم دراسة تأثير درجات الحرارة والرطوبة بين النباتات فى الحقل على مستوى الإصابة بالحشرات تحت الدراسة فى العروات المختلفة. ووجد ارتباط معنوى موجب بين المفترسات والآفات التى تصيب المحصول فى المواعيد المختلفة للزراعة.

تم دراسة العلاقة بين مستوى الإصابة الصناعية بيرقات ذبابة البنجر ووزن درنات البنجر وكذلك نسبة السكر بها وقد توصلت الدراسة الى وجود علاقة عكسية بين مستوى الإصابة والعناصر المذكورة.

وتخلص الدراسة الى أن زراعة البنجر فى العروة الأولى فى الأسبوع الأول من سبتمبر مناسبة للزراعة عن العروة المتأخرة فى الأسبوع الأول من شهر نوفمبر وذلك لقلة إصابتها بالعديد من الحشرات الهامة تحت ظروف منطقة كفرالشيخ.