POPULATION FLUCTUATION OF CERTAIN PESTS AND THEIR ASSOCIATED PREDATOR INSECTS ON SUGAR BEET IN SHARKIA GOVERNORATE, EGYPT

SHERIEF, E. A. H.[1], A. A. A. SAID[2], F.A.H. SHAHEEN[2] and H. A. M. FOUAD[1]

1. *Plant Protection Research Institute, ARC, Dokki, Giza, Egypt*
2. *Pesticides Dept., Fac. of Agric., Mansoura Univ., Egypt*

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Abstract

The present study was conducted on the sugar beet insect pests, *Cassida vittata, Pegomia mixta* and *Myzus persicae,* their related natural enemies inhabiting sugar beet fields of Zagazig district in Sharkia Governorate, Egypt during two successive growing seasons (2008/2009 and 2009/2010). In the first season, two peaks of *Cassida vittata* larvae and adult represented by 587, 695 larvae/50 plants and 243, 240 adult/50 plants, respectively. While, in the second season, two peaks for larvae were recorded and represented by 664, 2250 larvae/50 plants respectively. In case of adult stage, four peaks were recorded and represented by 64, 216, 420 and 616 adults/50 plants, respectively. The sugar beet fly *Pegomia mixta* started appear on the plants on the 1st week of December with few numbers (129 eggs/50 plants). Two peaks of eggs were found on sugar beet plant of the two seasons. These peaks were recorded and represented by 537, 446 eggs/50 plants, in the first season. In the second season, these peaks were recorded and represented by 558, 543 eggs/50 plants. As for larval instars, it was noticed that it had two peaks of 487, 533 larvae/50 plants, in the first season and the number of larvae reached 736 and 697 larvae/ plant in the second season. One peak of *Myzus persicae* on sugar beet plant during the two seasons. This peak was recorded and represented by 2945 insects/50 plants and 3089 insects/50 plants, respectively. About natural enemies *Coccinella undecimpunctata and Chrysoperla Carnea* appeared in November, 2008/2009 and 2009/2010 but *Paederus alfierii* was observed during January in both seasons. The peaks of the studied predacious insects occurred in February, of the first season almost similar trend was obtained during the second season of study and represented by 270, 522, 132, 159, 302 and 395 predacious, respectively.

Keywords: sugar beet, *Cassida vittata*, *Pegomia mixta*, *Myzus persicae* and predators.

INTRODUCTION

Sugar beet *(Beta vulgaris* L.) is one of the most important sugar crops in the world. It considered as an important source of feed for livestock and pectin production from the pulp of sugar beet (Fouad *et al.* 2011). Several numbers of insects attack this crop e.g. beet fly *Pegomia mixta* (Vill.), tortoise beetle *Cassida vittata* (Vill.) and the green beach aphid *Myzus persicae* (Sulzer) caused considerable damage in its

yield (Bassyouny 1987, Shaheen 1992, shalaby 2001 and El-Zoghbey *et al.* 2003). The total loss caused by insects in sugar beet was 8.2 % in 1954 and 12.4 % in 1965 (Kolbe 1967) .

In Egypt (Guirguis 1985) found that tortoise beetle *Cassida vittata* was one of the most serious and abundant species causing damage in sugar beet plants . The beet fly *P. mixta* live within the leaf between the upper and lower surfaces, their feeding at first creates winding mines caused acute damage for sugar beet chlorophyll content (Shaheen 1992).

Muska (2007) indicated that the green peach aphid (*Myzus persicae*) cause damage by sucking (aspiration) and transmission of virus diseases.

Population density of the predatory insects inhabiting sugar beet fields such as, *Chrysopa carnea* (Steph.), *Coccinella undecimpunctata, Paederus alfierii* (Koch), *Scymnus* sp and *Cydonia vicina* isis were studied by many author (Mesbah 1991, Ali *et al.* 1993, El-Agamy *et al.* 1996, El-Khouly 1998, Shalaby 2001, El-Khouly 2006.

The average daily number of *C. vittata* larvae consumed by one *C. carnea* larvae varied according to the age of prey, being 122.9, 6.08 and 4.06 for the three larvae instars of C. *vittata,* respectively. Present study is to contribute towards a better knowledge of the following aspects:

1- Survey and population fluctuation of *C. vittata, P. mixta* and *M. persicae* infesting sugar beet plants and their associated predatory insects.
2- Effects of some climatic factors on the population densities of these insects and their predators.

MATERIALS AND METHODS

The present investigation was carried out to survey and study the seasonal abundance of some important common insect pests, *Cassida vittata* (Vill.), *Pegomyia mixta* (Vill.) and *Myzus persicae* (sulzer.) and which attacking sugar beet plants ther associated predators. The experiments were conducted at Kafr El-hamam village, Zagazig district, Sharkia Governorate Egypt, during 2008/2009 and 2009/2010 seasons.

An area of about half feddan was sowed with sugar beet " Baraca" variety, during the Mid. of November. Sampling from the experimental started after the completion of the vegetative growth and was carefully examined weekly in the morning from December until June during the two seasons. All regular cultural practices were carried out and no chemical control was applied. Weekly random samples of 50 plants were taken from the four field borders and the center of the field and counts of the immature stages and adults of pests and their associated predator

so the samples were took weekly and calculated monthly, also the weekly temperature and relative humidity had been calculated to find out the relation ship between the temperature, relative humidity and certain sugar beet pests and predators during the two successive seasons.

Costat software program (2004) was applied for statistically analysis of results.

RESULTS AND DISCUSSION

Seasonal abundances of certain insect pests attacking sugar beet plants:

The seasonal abundance of the insect pests infesting sugar beet plants (Baraca variety): the sugar beet beetle, *Cassida vittata* Vill, the sugar beet fly, *Pegomyia mixta* Vill and the Aphids, *Myzus persicae* sulzer, was investigated in two consecutive seasons 2008/2009 and 2009/2010.

Sugar beet beetle, *C. vittata*:

Data represented in Fig. (1) showed that sugar beet plants were free from infestation or any stages of the beetle during a period elapsed of whole December and January for the two seasons of study.

In the first season, two peaks of both larvae and adult stages were recorded in 4th week of April and 3rd week of June and represented by 587 and 695 larvae/50 plants. While, two peaks were found for adult 1st week of May and 1st week of June and represented by 243 and 240 adult/50 plants, respectively. In the second season, two peaks of both larvae and pupae were recorded in, 1st week of March and at the end of April and represented by 664, 2250 larvae/50 plants respectively, for larvae. While, pupae was recorded on 1st and 5th weeks of April and represented by 205, 290 pupae/50 plants. In case of adult stage, four peaks were found in 2nd week of February, 1st and 5th weeks of April and 3rd week of June and represented by 64, 216, 420 and 616 adults/50 plants, respectively.

Our results agree with that obtained by El-Khouly (1998) mentioned that the adults of *C. vittata* appeared in sugar beet fields by late February with low numbers and increased to its maximum in April recording two peaks. Shalaby (2001) showed that the *C. vittata* reached maximum as a complex of larvae and adults during March and April. El-Khouly (2006) observed that the initial appearance of *C. vittata* survivors occurred in January 2005 and 2006 reached a peak in April in both 2005 and 2006.

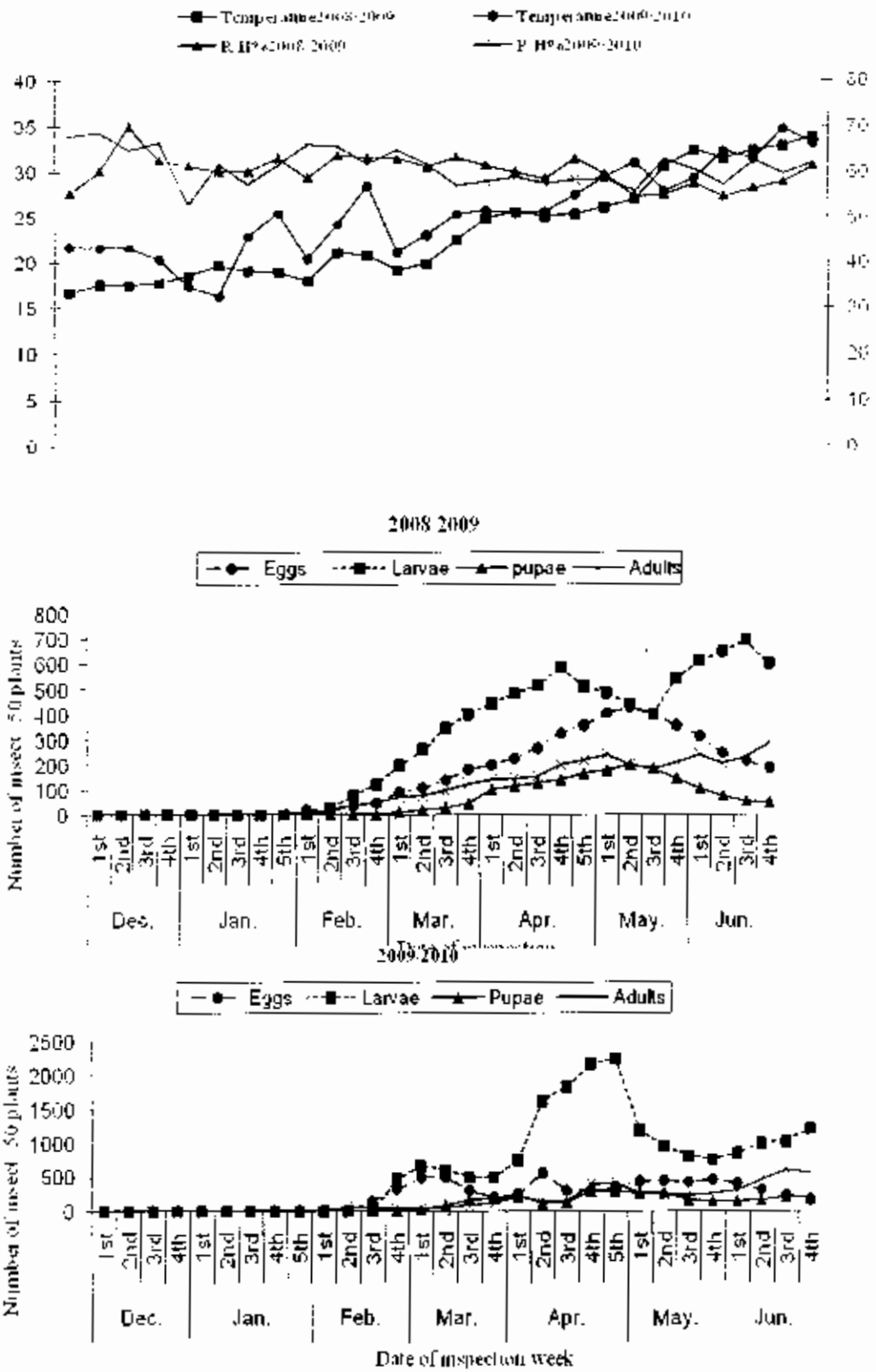

Fig. 1. Population fluctuation of *Cassida vittata* infesting sugar beet plants in Sharkia Governorate during 2008/2009 and 2009/2010 seasons.

Sugar beet fly, *P. mixta*:

Results in Fig. (2) illustrated that eggs began to appear in 1st week of December with few numbers (129 eggs/50 plants). The number of the eggs had two peaks during the two seasons 2009/10 and 2010/11. These peaks were recorded in 3rd week of March and 1st week of June, and represented by 537, 446 eggs/50 plants, respectively, in the first season. In the second season, these peaks were noticed in 2nd week of February and 3rd week of April and represented by 558, 543 eggs/50 plants, respectively. As for larval instars, it was noticed that it had two peaks of 487, 533 larvae/50 plants in 4th week of March and 4th week of May, respectively, in the first season. While, in the second season, three peaks of 736, 697 and 329 larvae/50 plants were recorded, in 4th week of February, 4th week of April and 2nd week of May, respectively.

Our results agree with that obtained by Helal (2004) indicated *that P. mixta* population gradually increased until it reached its highest density in the March and April. In this respect, El-khouly (2006) found that the reliable occurrence of *P. mixta* individuals occurred in November was gradually increased forming distinct peak in March.

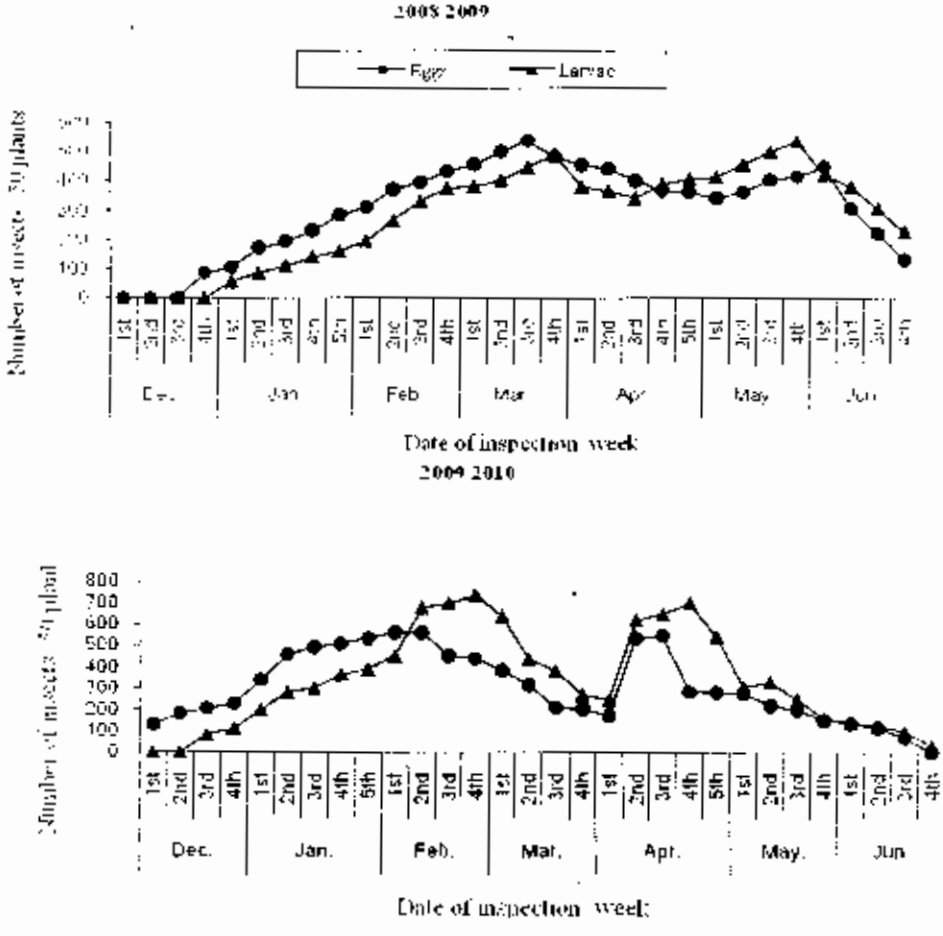

Fig. 2. Population fluctuation of *Pegomyia mixta* infesting sugar beet plants in Sharkia Governorate during 2008/2009 and 2009/2010 seasons.

Green beach aphid, *Myzus persicae*.

Data presented in Fig. (3) revealed that *Myzus persicae* had one peak of abundance in the first season. This peak was recorded in 2nd week of February and represented by 2945 insect/50 plants. While in the second season, also one peak of abundance was found in 3rd week of February and represented by 3089 insect/50 plants.

Our results agree with that obtained by Ali *et al.* (1993) who mentioned that sever infestation of aphids were concentrated in October and November plantation. Talha (2001) found that the infestation with aphids was minimized at the late planting date.

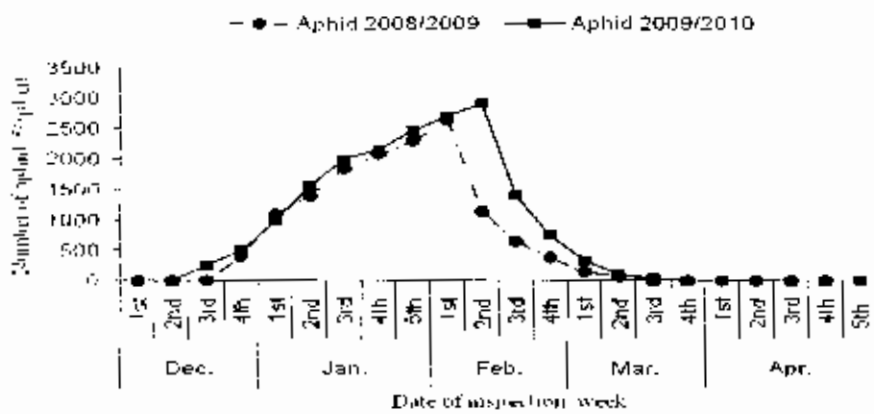

Fig. 3. Population fluctuation of *Myzus persicae* infesting sugar beet plants in Sharkia Governorate during 2008/2009 and 2009/2010 seasons.

Results in table (2) indicated that three injurious pests were recorded attacking sugar beet plants, these species are namely, *C. vittata, P. mixta* and *M. persicae*. The total numbers and ratio of these species were *C. vittata* (3230 individuals = 10.23% and 4786 individuals = 10.77%), *P. mixta* (8536 individuals = 27.03% and 10186 individuals = 22.93%) and *M. persicae* (19818 individuals = 62.74% and 29460 individuals = 66.30%).

Table 2. Total number of some injurious insect species and their percentages to the total catch on sugar beet during 2008/2009 and 2009/2010 seasons in Sharkia Governorate.

Species	Season (2008/2009)		Season (2009/2010)	
	Number of insects species	% of total number	Number of insects species	% of total number
Cassida vittata	3230	10.23	4786	10.77
Pegomyia mixta	8536	27.03	10186	22.93
Myzus persicae	19818	62.74	29460	66.30
Total	31584	100	44432	100.00

Population density of predacious insects:

Concerning the predacious insects in fig. (4) indicated that the monthly numbers of *C. undecimpunctata, P. alfierii* and *C. Carnea*. The first and the 3rd ones were appeared in November, while *P. alfierii* was observed in January, 2008/2009 and 2009/2010. The peaks of the studied predacious insects occurred in February, 2008/2009 and 2009/2010 for first season. Almost similar trend was obtained during the second season of study and represented by 270, 522, 132, 159, 302 and 395 predacious, respectively.

Our results agree with that obtained by El-Khawalka *et al.* (1991) in Egypt found that the average daily number of *C. vittata* larvae consumed by one *C. carnea* larvae varied according to the age of prey, being 122.9, 6.08 and 4.06 for the three larvae instars of C. *vittata,* respectively. Youssef (1994) reported that three distinct peaks of *P. alfierii*, two peaks of coccinellid predators and two peaks of *chrysopa carnea* were recorded in September. Shalaby (2001) observed that the population density of coccinellids was high during March, April and may, after that he also found that population density of *C. carnea* was the highest in September plantation

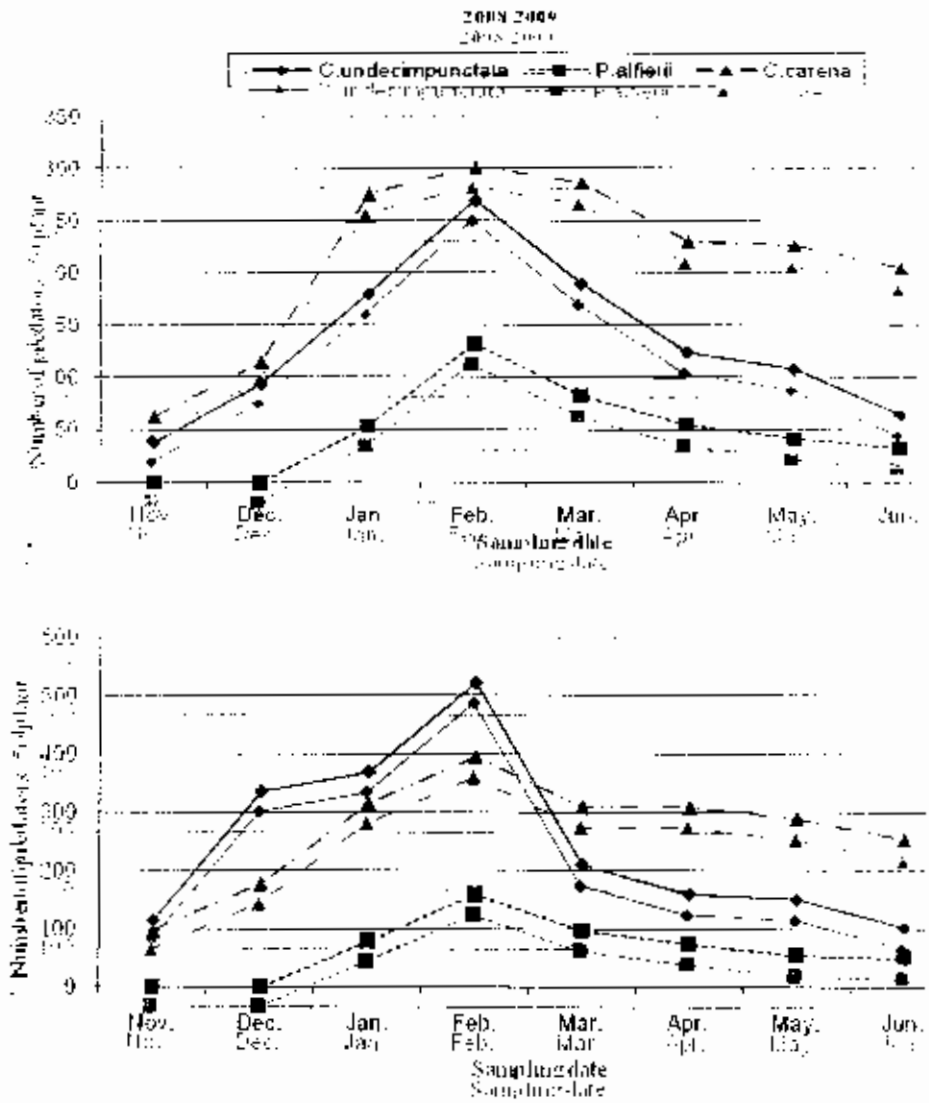

Fig. 4. Population fluctuation of associated predators in sugar beet fields in Sharkia Governorate during 2008/2009 and 2009/2010 seasons.

Results in table (3) showed predatory species found on sugar beet plants 2008/2009 and 2009/2010 seasons. Three beneficial insects, belonging to order: Coleoptera and Neuroptera. The mean numbers and ratio of these species were *Coccinella undecimpunctata* (136.14 individuals = 31.78% and 276.57 individuals = 43.42%), *Paederus alfierii* (57.71 individuals = 13.47% and 73.43 individuals = 11.53%) and *Chersoperla carnea* (234.57 individuals = 54.75% and 287 individuals = 45.05%) in the two successive seasons, respectively.

Table. 3. Mean number of predator's species and their percentages to the total catch on sugar beet crop during 2008/2009 and 2009/2010 seasons in Sharkia Governorate.

Species		Season (2008/2009)		Season (2009/2010)	
		Number of predators species	% of total number	Number of predators species	% of total number
Coleoptera	*C. undecimpunctata*	136.14	31.78	276.57	43.42
	P. alfieri	57.71	13.47	73.43	11.53
Neuroptera	*C. carnea*	234.57	54.75	287	45.05
Total		428.42	100.00	637.00	100.00

Relation between temperature, relative humidity and certain sugar beet insects:

Sugar beet beetle, *C. vittata*:

The results obtained in Table (4) revealed that the correlation coefficient between total numbers of larvae and adult of *C. vittata* and maximum, minimum temperature was positive and high significant (r_1= 0.841**, 0871**), (r_2= 0.838**, 0.878**), in the first season respectively, and it was (r_1= 0.593**, 0.793**), (r_2= 0.576**, 0.583**, 0.872**) in the second season, respectively. Whereas, it was negative and high significant with minimum relative humidity (r_4=-0.527**, -0.553**), (r_1= -0.581**, -0.568**), respectively during the two seasons.

Sugar beet fly, *P. mixta*:

The correlation coefficient between larvae of *P. mixta* and maximum temperature, it was positive and high significant (r1= 0.532**). While, minimum temperature it was positive and significant (r2= 0.391*) in the first season, respectively.

And about maximum and minimum relative humidity it was positively significant (r3= 0.427*), and high negatively significant (r4= -0.513**) in the first season, respectively.

Green beach aphid, *Myzus persicae*:

The correlation coefficient between *M. persicae* and maximum, minimum temperature, it was high negatively significant (r1 = -0.506**), (r2 = -0.585**) in the first season, and also during the next season it was (r1 = -0.587**), (r2 = -0.655**), respectively.

Table. 4. Simple correlation coefficients between certain temperature components, relative humidity and total numbers of *Cassida vittata*, *Pegomyia mixta* and *Myzus persicae* on sugar beet plants in Sharkia Governorate during the period of 2008-2010.

Insects	Stages of growth	Simple correlation coefficients							
		2008/2009				2009/2010			
		r1	r2	r3	r4	r1	r2	r3	r4
Cassida vittata	Larvae	0.841** ±0.102	0.838** ±0.102	0.298 ±0.180	-0.527** ±0.161	0.593** ±0.152	0.583** ±0.153	0.207 ±0.185	-0.581** ±0.154
	adults	0.871** ±0.092	0.878** ±0.090	0.280 ±0.181	-0.553** ±0.157	0.793** ±0.115	0.872** ±0.092	0.268 ±0.182	-0.568** ±0.156
Pegomyia mixta	Larvae	0.532** ±0.160	0.391* ±0.174	0.427* ±0.171	-0.513** ±0.162	-0.130 ±0.187	-0.329 ±0.178	0.290 ±0.180	-0.227 ±0.184
Myzus persicae		0.506** ±0.162	0.585** ±0.153	0.176 ±0.186	-0.275 ±0.181	-0.587** ±0.153	-0.655** ±0.143	0.188 ±0.185	-0.195 ±0.185

r1=correlation coefficient between max. Temp. and number of insects

r2=correlation coefficient between min. Temp. and number of insects

r3=correlation coefficient between max. R.H. and number of insects

r4=correlation coefficient between min. R.H. and number of insects

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POPULATION FLUCTUATION OF CERTAIN PESTS AND THEIR ASSOCIATED PREDATOR INSECTS ON SUGAR BEET IN SHARKIA GOVERNORATE, EGYPT

التذبذب العددي لبعض الآفات والمفترسات الحشرية التي تتواجد على نباتات بنجر السكر في محافظة الشرقية - مصر

السيد علي حسن شريف[1]، علي علي عبد الهادي سعيد[1]، فؤاد عبدالله حسام الدين[2] و حاتم عبد المنعم محمد فؤاد[3]

١ - معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - جيزة - مصر
٢ - قسم المبيدات - كلية الزراعة - جامعة [illegible]
٣ - قسم الحشرات - كلية الزراعة - جامعة المنصورة - مصر

أجريت هذه الدراسة لحصر بعض الآفات الحشرية على محصول البنجر [illegible] من النجيل الأخضر وكذلك الأعداء الطبيعية المتواجدة في حقول بنجر السكر في مركز [illegible] بمحافظة الشرقية - مصر خلال موسمي ٢٠٠٨/٢٠٠٩ و ٢٠٠٩/٢٠١٠.

حيث تم تسجيل قمتين ليرقات خنفساء البنجر السلحفائية في الأسبوع الرابع من [illegible] والأسبوع الثالث من شهر يونيه حيث سجلت ٥٨٧ و ٦٩٥ يرقة/٥٠ نبات على الترتيب، أما الحشرات الكاملة فقد وجدت قمتين في الأسبوع الأول من مايو وفي الأسبوع الأول من يونيو خلال موسم ٢٠٠٨/٢٠٠٩ حيث كانت ٢٤٣ و ٢٤٠ حشرة كاملة/٥٠ نبات على التوالي، أما في موسم ٢٠٠٩/٢٠١٠ تم تسجيل قمتين لليرقة في الأسبوع الأول من مارس والأسبوع الخامس من أبريل حيث كانت ٢٦٤ و ٢٢٥٠ يرقة/٥٠ نبات على التوالي. أما في حالة الحشرات الكاملة فتم تسجيل [illegible] قمم في الأسبوع الثاني من فبراير والأسبوع الأول والخامس من أبريل والأسبوع الثالث من مايو موسم ٢٠٠٨/٢٠٠٩ حيث كانت على التوالي ٦٤، ٢١٦، ٢٢٠ و ٢١٦ حشرة كاملة/٥٠ نبات على التوالي.

كما بدأت ذبابة البنجر في الظهور على نباتات البنجر في الأسبوع الأول من ديسمبر موسم ٢٠٠٨/٢٠٠٩ حيث كان العدد ١٢٩ بيضة/٥٠ نبات. وتم تسجيل قمتين للبيض خلال موسمي النمو [illegible] كانت على التوالي ٣٣٧ و ٤٤٢ بيضة/٥٠ نبات في الموسم الأول بينما في الموسم الثاني كانت على التوالي ٥٢٨ و ٤٤٣ بيضة/٥٠ نبات. أما اليرقات فقد سجلت قمتين خلال موسمي النمو ٢٠٠٨/٢٠٠٩ و ٢٠٠٩/٢٠١٠ حيث كانت ٤٨٧ و ٤٣٣ يرقة/٥٠ نبات خلال الموسم الأول، بينما في الموسم الثاني كانت ٧٣٦ يرقة في الأسبوع الرابع من فبراير و ٦٩٧ يرقة في الأسبوع الرابع من [illegible] لكل ٥٠ نبات على التوالي.

بينما سجلت قمة واحدة على نباتات البنجر خلال موسمي النمو حيث كانت في الموسم الأول في الأسبوع الثاني من فبراير ٥٤٣٢ فرد/٥٠ نبات، بينما في الموسم الثاني فكانت في الأسبوع الثالث من فبراير ٣٠٦٩ فرد/٥٠ نبات.

أيضا تم عمل حصر للأعداء الحيوية (أبو العيد، أسد المن والحشرة الرواغة)، حيث ظهر كل من أبو العيد والرواغة في نوفمبر ٢٠٠٨/٢٠٠٩ بينما ظهر أسد المن في يناير خلال موسمي النمو ٢٠٠٨/٢٠٠٩ و ٢٠٠٩/٢٠١٠ وكانت قمة النشاط لهذه المفترسات في فبراير خلال الموسمين وكانت كالآتي أبو العيد ٢١٠ و ٢٢٥، الرواغة ١٣٢ و ١٥٩ بينما أسد المن ٣٠٢ و ٣٥٢ على التوالي.