

## POPULATION DENSITY AND EFFECT OF SOME WEATHER FACTORS ON THE MAIN INSECT PESTS ATTACKING COWPEA PLANTS AT MANSOURA DISTRICT.

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### ABSTRACT

Field experiments were carried out at the farm of Agriculture Research Center of the Faculty Agriculture, Mansoura University during the two successive seasons 2012 and 2013. The obtained results revealed that, six injurious insects were recorded infesting cowpea plants during the two successive seasons, these insect species namely: *Aphis gossypii* Glover, *Aphis craccivora* Koch, *Cosmlyce boeticus* L., *Liriomyza trifolii* Burgess, *Empoasca lybica* Berg, *Nezara viridula* L. The dominant abundant species was *A. craccivora*; the lowest abundant species was *C. boeticus* during the two seasons of study.

The data revealed that, *A. gossypii* had one peak in the first planting date, three peaks in the second planting date and two peaks in the third planting date respectively, during the first season of study. On other hand these insect species had three peaks in the first and the second planting dates, while that was two peaks in the third planting date during the second season of study.

*Aphis craccivora* had one peaks in the first planting date and three peaks in the second and the third planting date during the 2012 season. In the second season of study 2013, this species had three peaks in the first and second planting date and two during two peaks in the third planting date. *Cosmlyce boeticus* had two peaks during the first planting date; four peaks recorded in the second planting dates and three peaks in the third date during the two seasons of study.

*Nezara viridula* had three peaks occurred in the first date; the second planting date and three peaks in the third date during 2012 and 2013 seasons.

The data indicated that *E. lybica* had two peaks in the first planting date; four peaks during the second planting date and three peaks in the third planting date during the two season of study.

The leaf miner *L. trifolii* recorded three peaks in the first planting date and in the second planting date had two peaks and in the third planting date had four peaks during the first season of study. While in the second season of study, three peaks had occurred in the first planting date and in the second planting date had three peaks and in the third planting date had four peaks.

The effect of the temperature and relative humidity on the population density of the major insect attacking cowpea plants indicated that combined effect of these factors exerted negative or positive significant correlation in the two seasons of study. The results cleared that temperature and relative humidity affected greatly on the population density of the injurious insects

**Keywords:** cowpea plants, main insect pests population density, seasonal abundance, whether factors

## INTRODUCTION

Cowpea (*Vigna unguiculata* L.) is one of the important vegetable crops in Egypt and many countries. It is important for human consumption because it is an important source of protein. In Egypt 73022 feddans area cultivated with cowpea in the agricultural rotation system. (According to General administration for statistic 1997) Insects inhabiting cowpea crop seem to be of great economic importance as some of them are destructive due to their phytophagous habits causing injury to infested plants at all stages of growth. While others are beneficial on cowpea plants due to their entomophagous habits as they attack and feed on the insect pests infesting cowpea plants. Numerous entomologists in different parts of the world have dealt with major insect pests attacking cowpea plants and their natural enemies (Bouker and Fatokun 2009; Hesham *et al.*, 2009; Shukla *et al.*, 2009 ; Ehgo 2010; Nasgamlkadeadeatevi *et al.*, 2013). Several investigators studies the influence of some weather factors on the population density of some insect pests attacking cowpea plants and their predatory insects (Annan *et al.*, 1999; Bharathimeena *et al.*, 2008; Eid, 2008; Salah *et al.*, 2009; Patel *et al.*, 2009). Therefore, this investigation has been proposed to study the population density of the main insect pests infesting cowpea plants and the effect of certain weather factors on the population density of these insects.

## MATERIALS AND METHODS

### **Survey and population density of the main insect pests attacking cowpea plants:-**

Field experiments were carried out at the farm of Agriculture Research Center of the Faculty Agriculture, Mansoura University. Cowpea variety kream7 was sown during a period of two successive seasons, the samples date started from March 29<sup>th</sup> to July 14<sup>th</sup> during 2012 and 2013 respectively. The experimental area was about half feddan divided into four replicated. The normal agriculture treatment of land preparation, Irrigation, mechanical were done. Two methods were used for estimating the population abundance. The first sweep net (30, cm diameter, 50cm deep) was used for collecting flying insects from cowpea plants, 40 double stokes were taken across the two diagonals of the field at weekly intervals. The second methods was direct counting, twenty random cowpea leaves per plots were examined weekly intervals after ten days from plantation and placed in plastic bags for inspection in the laboratory. The immature stages of lepidopterous insects were reared and kept under laboratory conditions till emergence of adult for identification. Collected specimens were preserved in 70% alcohol for classification and identification. Samples were identified by the classification Research Department at the Plant Protection Research Institute.

**Influence of some weather factors on the activity of the main insects:-**

The meteorological data (temperature as well as the relative humidity) were recorded at each inspection date. Data were obtained from the Meteorological station at Mansoura region. The weekly figures of these weather factors were calculated simple correlation coefficients related with the weekly catch of the main insects pests were done to study the possible influence of these weather variables on the population density of the main insects attacking cowpea plants. Were subjected for one way analysis variance (ANOVA) and the mean were separated using Danca's Multiple Range test (Cohort software2004)

**RESULTS AND DISCUSSION**

Data illustrated in Table (1) showed that, the highest abundant insect pest infesting cowpea caught by sweep net during the first season 2012 was *Aphis craccivora* Koch and represented 2326 (46.64%) , 823 (36.35%) and 2167 individual (44.12%) during the first planting date(FPD), the second planting date (SPD) and the third planting date (TPD), respectively. On the other hand, the lowest abundant insect in the first season 2012 was *Cosmlyce beoticus* L. and represented by 135 (2.71%), 48(2.12%) and 133 individuals (2.73%) during the (FPD), (SPD) and (TPD), respectively.

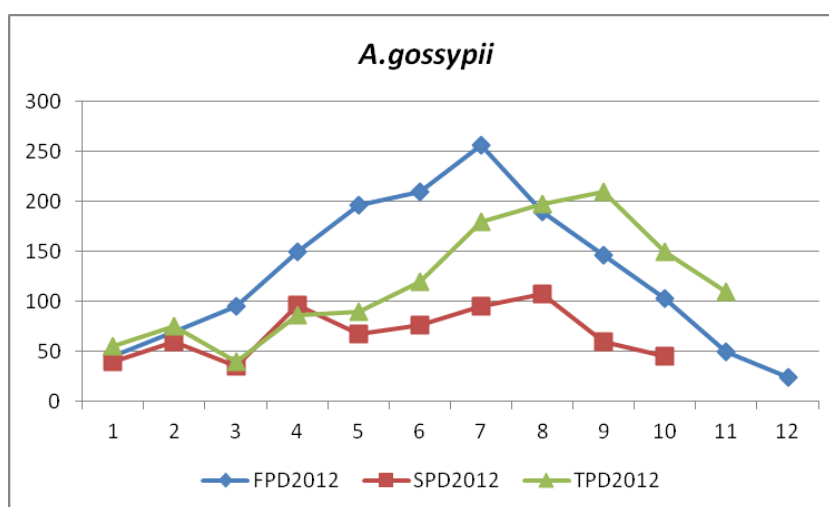
**Table (1): Numbers and percentages of the main insect pests attacking cowpea plants caught by sweep net during season 2012 at Mansoura district.**

Season	2012					
	First planting date (FPD)		Second planting date (SPD)		Third Planting date (TPD)	
Insect pests	No.	%	No.	%	No.	%
<i>A.gossypii</i>	1535	30.75	681	30.08	1313	26.92
<i>A.craccivora</i>	2326	46.64	823	36.35	2167	44.12
<i>C.beoticus</i>	135	2.71	48	2.12	133	2.73
<i>L. trifolii</i>	304	6.10	88	3.89	551	11.30
<i>E. lybica</i>	414	8.30	488	21.22	367	7.52
<i>N. viridula</i>	273	5.50	136	6.01	347	7.41
Toatal	4987	100	2264	100	4878	100

Data illustrated in Table (2) showed that, the highest abundant insect pest infesting cowpea caught by sweep net during the first season 2012 was *A. craccivora* and represented 2026 (55.67%) , 442 (29.12%) and 2341 individual (47.51%) during the first planting date(FPD), the second planting date (SPD) and the third planting date (TPD), respectively. On the other hand, the lowest abundant insect in the first season 2012 was *C. beoticus* and represented by 145 (3.98%), 19(1.25%) and 92 individuals (1.87%) during the (FPD), (SPD) and (TPD), respectively.

**Table (2): Numbers and percentages of the main insect pests attacking cowpea plants caught by sweep net during 2013 at Mansoura district.**

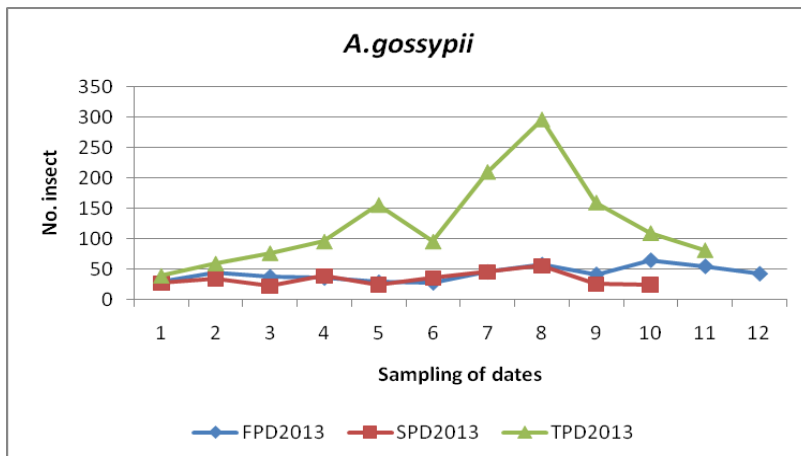
Season	2013					
	First planting date (FPD)		Second planting date (SPD)		Third Planting date (TPD)	
Insect pests	No.	%	No.	%	No.	%
<i>A.gossypii</i>	514	14.13	340	22.40	1383	28.07
<i>A.craccivora</i>	2026	55.67	442	29.12	2341	47.51
<i>C.beoticus</i>	145	3.98	19	1.25	92	1.87
<i>L. trifolii</i>	358	9.84	51	3.36	706	14.33
<i>E. lybica</i>	397	10.91	229	15.08	231	4.69
<i>N. viridula</i>	199	5.47	437	28.79	174	3.53
Total	3639	100	1518	100	1927	100



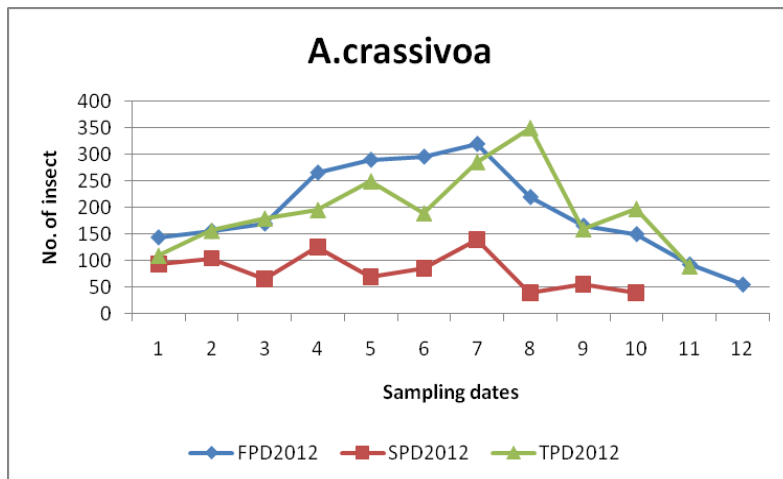
**Fig. (1) Population density of *A.gossypii* on cowpea plants (three planting dates) caught by sweep net during the second season of study 2012 at Mansoura district**

Data illustrated in Fig. (1) revealed that population density *A.gossypii* caught by sweep net during three planting dates of in 2012 season. In the first planting date had one peaks occurred in the first week of May, While in the second planting had three peaks occurred in the third week of April; in the first week of May and in the first week of Jun. In the third planting date had two peaks occurred in second week of May and in the last week of Jun. However, the data arranged in Fig. (2) showed the population density of *A.gossypii* by sweep net during three planting dates in 2013 season. In the first planting had three peaks occurred in the first week of April; in the third week of May and in the last week of May, While the second planting date had

three peaks occurred in the third week of April; in the first week of May and in the first week of Jun. In the third planting date had two peaks occurred in the second week of Jun and in the last week of Jun.



**Fig. (2) Population density of *A.gossypii* on cowpea plants (three planting dates) caught by sweep net during the second season of study 2013 at Mansoura district**



**Fig. (3) Population density of *A.crassivora* on cowpea plants (three planting dates) caught by sweep net during first season of study 2012 at Mansoura district**

The obtained results in Fig. (3) revealed that, the population density of *A.gossypii* Caught by sweep net during three planting dates in 2012 season. In the first planting had one peak occurred in the second week May. While the second planting date had three peaks occurred in the third week of Jun; in the first week of May and in the last week of May. In the third planting date

had three peaks occurred in the first week of Jun; in the last week of Jun and in the first week of July. The obtained results Fig. (4) revealed that, the population density of *A.craccivora* Caught by sweep net during three planting dates in 2013 season. In the first planting had three peaks occurred in the second week April; in the first week of May and the last week of May. While the second planting date had three peaks occurred in the third week of Jun; in the first week of May and in the last week of May. In the third planting date had two peaks occurred in the third week of Jun and last week of Jun

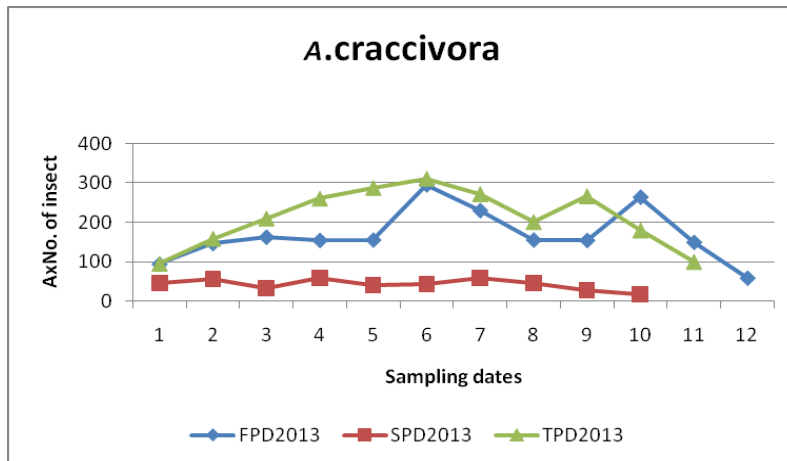


Fig. (4) Population density of *A.craccivora* on cowpea plants (three planting dates) caught sweep net during the second season of study 2013 at Mansoura district

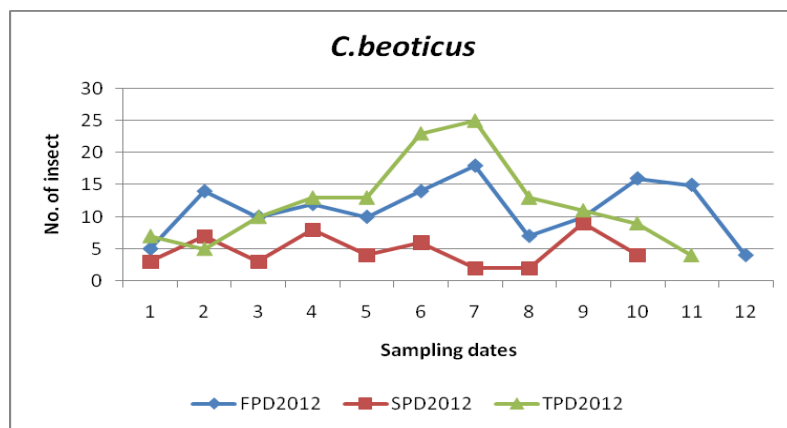
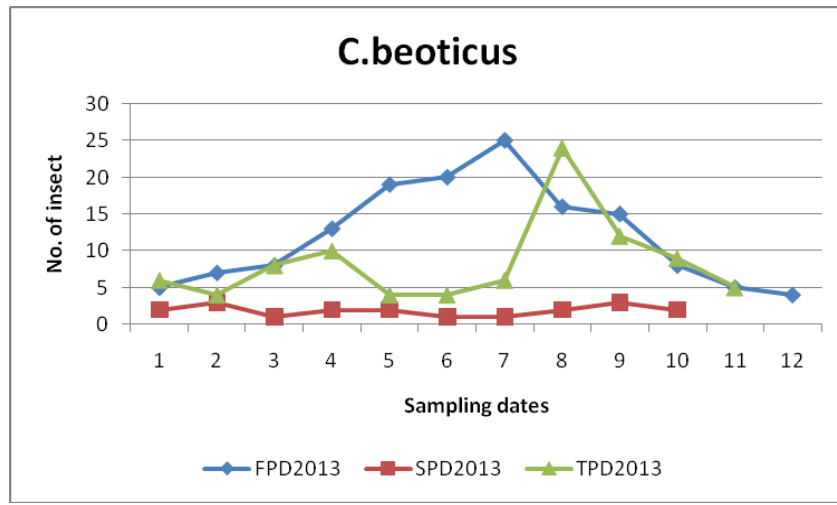


Fig. (5) Population density of *C.beoticus* on cowpea plants (three planting dates) caught by sweep net during one season of study 2012 at Mansoura district

Fig. (5) showed that, the population density of *C.beoticus* caught by sweep net during three planting dates in 2012 season. In the first planting date had four peaks occurred in the first week of April; in the third week of April; in the second week of May and the last week of May. While the second planting date had three peaks occurred in the third week of April; in the first week of May; in the Third week of May and in the second week of Jun. In the third planting date had two peaks occurred in the first week of May and third week of Jun. Date in Fig. (6) presented that, the population density of *C.beoticus* Caught by sweep net during three planting dates 2013. One peak occurred in the second week of May during the first planting date, moreover, the second planting date had three peaks occurred in the third week of April; first week of May and the second week of Jun. in the third planting date had three peaks occurred in the second week of May; in the second week of Jun and the first week of July.



**Fig. (6) Population density of *C.beoticus* on cowpea plants (three planting dates) caught by sweep net during the second season of study 2013 at Mansoura district**

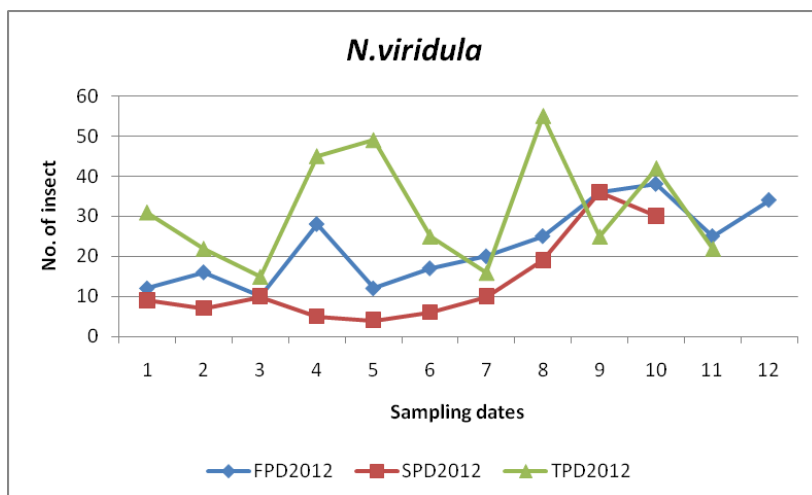


Fig. (7) Population density of *N. viridula* on cowpea plants (three planting dates) caught by sweep net during the first season of study 2012 at Mansoura district

The obtained results in Fig. (7) revealed that, the population density of *N. viridula* caught by sweep net during the three planting dates in 2012 season. In the first planting date had four peaks occurred in the first week of April; the third week of April; in the last week of May and the second week of Jun. while, two peaks occurred in the last week of April and in the third week of May during the second sowing date. The third planting date had three peaks occurred in the first week of May; the first week of Jun and the last week of Jun.

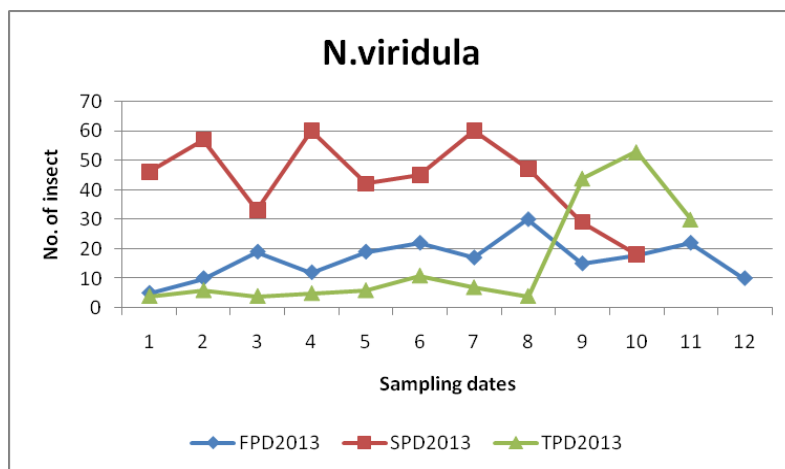
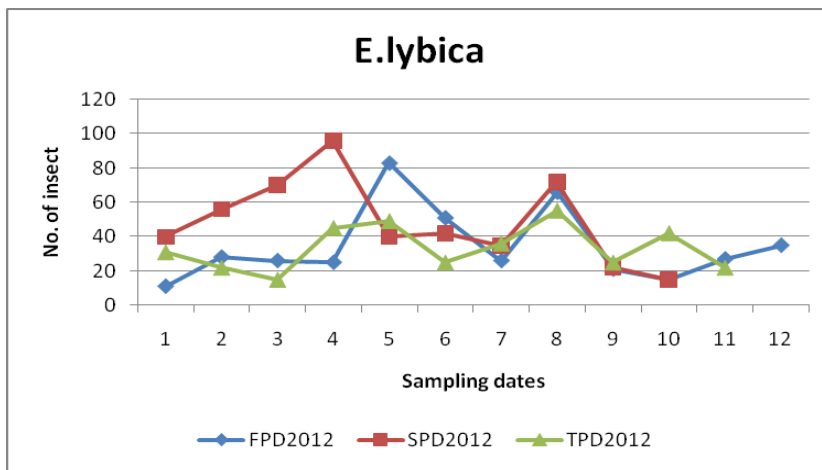


Fig. (8) Population density of *N. viridula* on cowpea plants (three planting dates) caught by sweep net during the second season of study 2013



The data in Fig. (8) showed that, in the first planting date had four peaks occurred in the second week of April; in the first week of May; in the third week of May and in the second week of Jun, while this insect had three peaks occurred in the third week of April; in the first week of May and in the last week of May during the second planting date. In the third planting date had three peaks occurred during the second of May; and in the second week of Jun and in the second week of July.



**Fig. (9) Population density of *E.lybica* on cowpea plants during (three planting dates) caught by sweep net the first season of study 2012 at Mansoura district**

The obtained results Fig. (9) revealed that, the population density of *E.lybica* caught by sweep net during three planting dates in 2012 season. In the first planting date, four peaks occurred in the first week of May; in the first week of Jun; in the last week of Jun and the first week of July. While, *E.lybica* had three peaks occurred in the first week of May; third week of May and in the second week of Jun during the second sowing date. In the third planting date had four peaks occurred in the second week of May; in the third week of May; in the second week of Jun and in the first week of July. The obtained results Fig. (10) revealed that, the population density of *E.lybica* caught by sweep net during three planting dates in 2013 season. The first planting date had three peaks occurred in the second week of April; in the first week of May and in the third week of May. However, had three peaks occurred in the third week of April; in the first week of May and in the second week of Jun during the second planting date. In the third planting date had four peaks occurred in the first and the last week of May and in the second and in the last week of Jun.

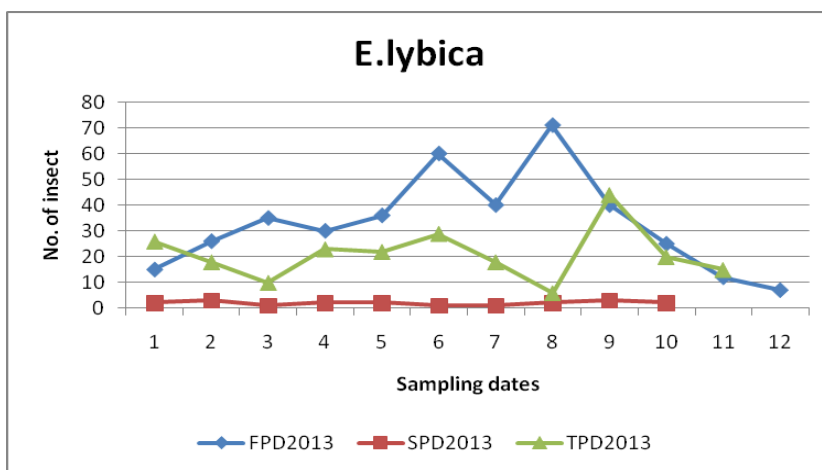


Fig. (10) Population density of *E.lybica* on cowpea plants( three planting dates) caught by sweep net during the second season of study 2013 at Mansoura district

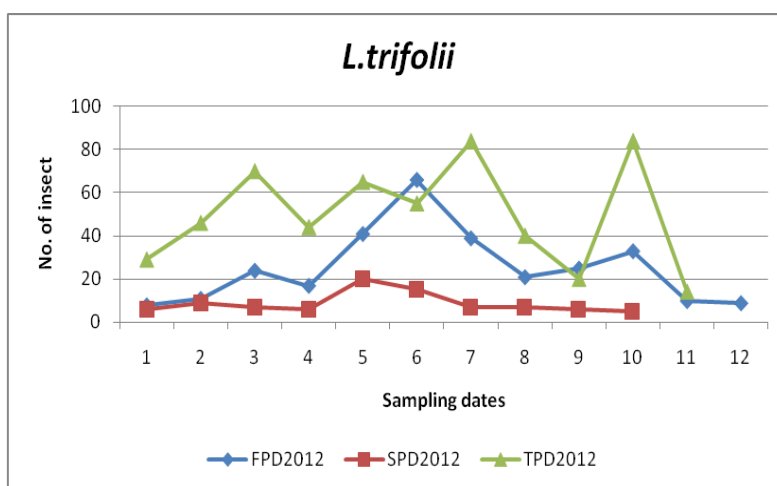
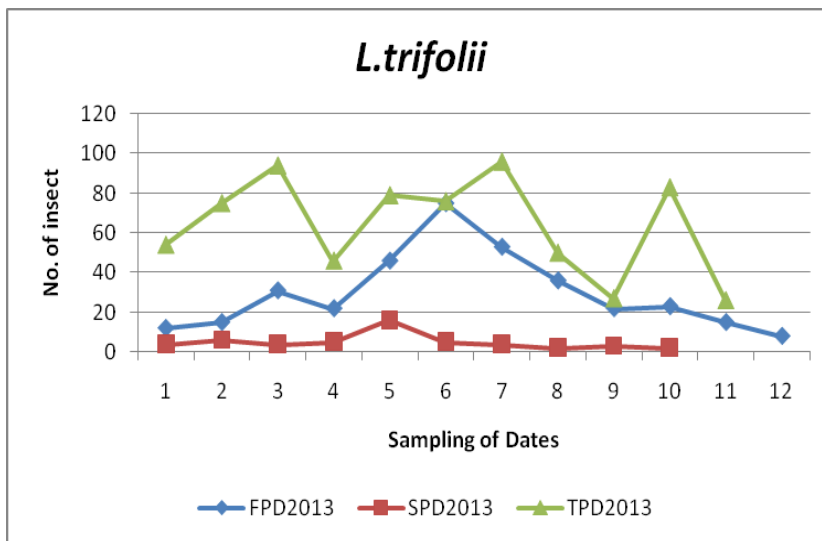


Fig. (11) Population density of *L.trifolii* on cowpea plants( three planting dates) caught by sweep net during first season of study 2012 at Mansoura district

Data illustrated in Fig (11) indicated that, the population density of *L.trifolii* caught by sweep net during three planting dates in 2012 season. In the first planting date had three peaks occurred in the second week of April; in the first week of May: and in the last week of May. *L.trifolii* had two peaks found in the third week of April and in the second week of May in the second planting date. While the third planting date had four peaks occurred in the third week of May; in the first week of Jun; in the third week of Jun and the first week of July. Data illustrated in Fig (12) indicated that, the population

density of *L.trifolii* caught by sweep net during three planting dates in 2013 season. In the first planting date had three peaks occurred in the second week of April; in the first week of May: and in the last week of May. Moreover had three peaks in the second planting date found in the third week of April; and in the second week of May and the third week of Jun. While the third planting date had four peaks occurred in the third week of May; in the first week of Jun; in the third week of Jun and in the first week of July.



**Fig. (12) Population density of *L.trifolii* on cowpea plants (three planting dates) caught by sweep net during the second season of study 2013**

**Evaluating the effect of some weather factor on the population density of certain insect pest attacking cowpea plants.**

Data given in Tables (3,4,5) showed that, simple correlation coefficients values between the temperature, relative humidity and the weekly catch of some insect pests infesting cowpea plants during 2012 and 2013 first planting date, the results in this tables revealed that, the both temperature and relative humidity exerted positive and negative effect varying from slight to significant on the population density.

*Aphis gossypii* the relative humidity parameter had no significant effect on the population density of this insect caught by sweep net during three planting date during 2012, while the first planting dates maximum temperature had significant effect on the population density of this species

*Aphis craccivora* the relative humidity parameter had no significant effect on the population density of *A.craccivora* caught by sweep net during 2012 and 2013 in the first and second planting dates. While maximum temperature and relative humidity had significant effect of population density on this insect during 2012 and 2013.

**Table (3): Simple correlation coefficients between the catch of main insects infesting cowpea plants, and the temperature and relative humidity during the first planting date by sweep net.**

seasons		2012				2013			
Insect pests	Weather factors	T.avr	Tmin	T.max	Mean RH%	T. max	T. min.	T. avr.	Mean RH%
	<i>A.A.gossypii</i>		0.1452	-0.1188	-0.0726	-0.1065	0.7540**	0.45790	0.74832**
<i>A.craccivora</i>		0.00923	-0.2885	-0.0383	-0.1634	0.3442	-0.134	0.38072	-0.3919
<i>L. beoticus</i>		-0.1782	-0.2444	0.3061	0.3398	-0.092	-0.517	-0.08935	-0.251
<i>N.viridula</i>		0.59278*	0.5732	0.4107	0.4864	0.3169	-0.3504	0.19875	-0.309
<i>E.lybica</i>		-0.1204	-0.2928	-0.4151	-0.2848	-0.113	-0.439	0.08882	-0.368
<i>L.trifolii</i>		-0.0145	-0.1708	0.0999	0.1386	-0.033	-0.478	-0.07555	-0.3634

*Cosmlyce beoticus* the relative humidity parameter had no significant effect the population density of *C.beoticus* caught by sweep net during 2012 and 2013 for the three planting dates.

*Liriomyza trifolii* had no significant effect on the population density of *L.trifolii* with temperature parameters and relative humidity during 2012 and 2013 caught by sweep net in the three planting dates.

*Empoasca Lybica* non significant effect on the population density of this insect with Temperature parameters and relative humidity parameter in the first and second planting dates 2012 and 2013 caught by sweep net. While, had significant effect on the population density of *E.lybica* with temperature parameters during the second planting date.

*Nezara viridula* had significant effect on the population density of this insect with temperature parameters and relative humidity parameter during 2012 and 2013 caught by sweep net in the three planting dates.

**Table (4): Simple correlation coefficients between the catch of main insects infesting cowpea plants, and the temperature and relative humidity during the second planting date by sweep net.**

seasons		t2012				2013			
Insect pests	Weather factors	T.avr	Tmin	T.max	Mean RH%	T. max	T. min.	T. avr.	Mean RH%
	<i>A.gossypii</i>		-0.3419	-0.1823	-0.0210	0.4352	0.436	0.2700	0.22545
<i>A.craccivora</i>		-0.2336	0.0427	-0.2036	0.3126	-0.224	-0.4594	-0.4682	0.1251
<i>L. beoticus</i>		-0.3486	-0.5335	-0.3726	0.1141	-0.035	0.1257	0.14741	-0.0478
<i>N.viridula</i>		0.0593	0.0917	0.1642	-0.4074	-0.264	-0.4707	-0.4535	0.1879
<i>E.lybica</i>		-0.5549	-0.6182	-0.3219	0.8515**	-0.035	0.1257	0.14741	-0.0478
<i>L.trifolii</i>		0.0800	-0.0882	0.0618	-0.0321	0.150	-0.1805	-0.0895	-0.3035

**Table (5): Simple correlation coefficients between the catch of some insect infesting cowpea plants, and the temperature and relative humidity during the third planting date by sweep net.**

seasons Weather Factors Insect pests	2012				2013			
	T.avr	T.min	T.max	Mean RH%	T. max	T. min.	T. avr.	Mean RH%
A..gossypii	0.1505	0.2569	0.1321734	-0.26517	0.1727	0.2826	0.0578	0.4166
A. craccivora	0.6178*	0.6403*	0.456161	-0.74054**	0.2442	-0.0536	0.1169	0.2227
L. beoticus	0.4939	0.5083	0.1323	-0.60005	-0.1349	0.0340	-0.3214	0.2517
N.viridula	0.4951	0.4412	0.703947**	-0.25128	0.5683	0.6356*	0.1764	-0.6338*
E.lybica	0.5055	0.5050	0.676066*	-0.44425	0.3578	0.2260	0.1062	-0.2267
L.trifolii	0.0735	0.1760	-0.08731	-0.16192	-0.1180	-0.1540	0.3834	0.1734

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### الكثافة العددية وتأثير بعض العوامل الجوية لأهم الآفات الحشرية التي تهاجم محصول اللوبيا في منطقة المنصورة

عادل حسن عبدالسلام\*، عبدالبدیع عبد الحمید غانم\*، هالة أحمد كامل الصيرفي\*، احمد محسن طة\*\* و أمنیه فیصل حامد\*\*  
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أجريت تجارب حقلية خلال موسمين متتاليين 2012 و2013 في مزرعة مركز التجارب والبحوث الزراعية - كلية الزراعة- جامعة المنصورة، وأوضحت النتائج أن أهم الآفات الحشرية التي تصيب محصول اللوبيا خلال موسمين الدراسة المتتالية بمنطقة المنصورة كالتالي. من القطن، من اللوبيا، أبي دقيق البقوليات، البقعة الخضراء، نطاط اوراق القطن، ذبابة صانعات الأنفاق. وأظهرت النتائج أن أعلى تعداد تواجد كان لحشرة من البقوليات، وأقل تعداداً للتواجد كانت لحشرة أبي دقيق البقوليات. ومن جهة اخرى أوضحت النتائج المتحصل عليها ان من القطن *Aphis gossypii* Glover كان له ذروة تواجد واحدة في ميعاد الزراعة الاول وكا له ثلاث ذروات وذروتان خلال ميعاد الزراعة الثاني والثالث على التوالي في الموسم الاول من الدراسة. أما بالنسبة للموسم الثاني فوجد لهذا النوع ثلاثة ذروات في ميعاد الزراعة الاول والثاني، أما بالنسبة لميعاد الزراعة الثالث فكان لهذا النوع ذروتين من التواجد.

من البقوليات *Aphis Carccivora* Koch كان له ذروة واحدة للتواجد في موسمين في ميعاد الزراعة الاول وكان لهذة الحشرة ثلاث ذروات أو قمم للتواجد خلال ميعاد الراعة الثاني والثالث في موسم عام 2012 من الدراسة، أما في موسم الدراسة الثاني 2013 فكان لهذا النوع ثلاثة قمم او ذروات خلال ميعاد الزراعة الاول والثاني وذروتين خلال ميعاد الزراعة الثالث

*Cosmlyce boeticus* L. كانت لها ذروتين في الميعاد الاول واربع ذروات في الميعاد الثاني وثلاثة في الميعاد الثالث وذلك في الموسم الاول و الموسم الثاني.

*Empoasca lybica* Berg فكان ذروتين في الميعاد الاول. وثلاثة ذروات في الميعاد الثاني واربعة ذروات في الميعاد الثالث وذلك خلال موسمين الدراسة.

*Liriomyza trifolii* Burgess حيث كان في الموسم الاول. ثلاث ذروات في الميعاد الاول وذروتين في الميعاد الثاني والثالث.

أكدت نتائج التحليل الاحصائي أن معامل الارتباط بين درجات الحرارة والرطوبة والتعداد الأسبوعي للحشرات الضارة كان له تأثير معنوي اما سالباً أو موجياً على تعداد هذه الحشرات، وأوضحت النتائج أن درجات الحرارة والرطوبة كانت لها تأثير كبير على تعداد الحشرات والضارة على نبات اللوبيا.