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Influence of Some Leguminous Vegetable Plant Varieties As Host Plants on The Seasonal Abundance of The Leafhopper and Planthopper Insects.

EL- Kady, H. A.*; E. F. AL- Khyatt;Hagar S. S .Awadalla* and M.A.M. Hegab***
***Economic Entomology Dept., Fac. Agric., Damietta Univ.**
****Plant Prot., Dept., Fac. Agric., Banha Univ.**

ABSTRACT

The present work was conducted to survey and study the seasonal abundance of different leafhopper and planthopper insects infesting some leguminous plants (broad bean ,pea ,cowpea and bean plants)as well as their varieties in Diarb–Nigm district, Sharkia Governorate ,Egypt during 2014/15 and 2015/16 seasons. The collected insect pests by using sweep net from leguminous plants were the leafhopper and planthopper insects specially, *Empoasca decipiens* (Paoli), *Empoasca decedens* (Paoli) , *Cicadulina chinai* (Ghaui), , Balclutha hortensis,(Lindb.),Nephotettix apicalis (Matsch) and planthoppers, *Sogatelle vibix* (Haupt) and *S. furcifera* (Horv.) . High population abundance for *E. decipiens* occurred on broad bean and pea plants during the fourth week of Febrauary.While in case of cowpea and bean plants two peaks of abundance were recorded at the second week of July and the second week of August, respectively. On the other hand, *E.decedens* had one peak of abundance at the second week of March for broad bean and pea plants. On cowpea and bean plants two peaks were also recorded at the second week of July and the second week of August, during the two successive seasons, respectively.Varieties such as broad bean, pea, cowpea and bean plants influenced the population density of leafhoppers, Cream7 cowpea, Bronco bean, Master B pea and Improved Giza 3 broad bean varieties showed lowest mean number of insects/sample. Chemical analysis results showed a positive relationship between protein & carbohydrate contents and the average number of the leafhopper insects on all tested leguminous plant varieties ,while a reverse relationship between pH values &leafhopper insect and also with quantity of yield was also shown.

INTRODUCTION

Leafhoppers are serious insect pests of leguminous plants. Several investigators recorded the role of some leafhopper species in transmitting the pathogens of plant diseases (Nielson, 1968) .The fauna of these insects in the field of vegetable crops and fruit trees were studied in Egypt (Ammar and Farrag, 1976; EL-Nahal et.al.1977; Aboul Atta 1983; Hegab*et. al* . 1989a ,1989b ; Helal, *et. al*.1996; EL-Khawas *et.al*. 2004; Awadalla *et. al* .2011; Shalaby *et. al.*2012 and Awadalla *et. al* . 2013 and 2014).

Considerable data are reported on the leafhoppers species found on vegetable plants. But still there is great shortage in the knowledge concerning other important insect pests infesting leguminous plants .

Therefore the aim of the present work is to survey the leafhopper and planthopper insects attacking leguminous plants (broad bean , pea , cowpea and bean plants) and also to study the seasonal abundance of the dominant species as well as to estimate the effects of plant varieties and their chemical constituents on the population density of aforementioned homopterousr insects during two successive seasons 2014/15 and 2015/16 at Diarb – Nigm district , Sharkia Governorate .

MATERIALS AND METHODS

An area of about 2000 m2 was chosen to carry out this study at Diarb- Nigm district, Sharkia Governorate, the experimental design used in all growing seasons of cowpea, bean, broad bean and pea plants was a completely randomized block design with three replications. Treatments were distributed randomly within blocks .Each plot consisted (10 meters wide and 8 meters long). The space between holes was 25-30 cm. The sowing date of winter plantation (broad bean and pea) was the second week of November while the sowing date of summer plantation (cowpea and bean) was during the last week of April during 2014/15 and 2015/16 seasons. All plots received normal agricultural practices and were kept free of any pesticide treatments.

The four broad bean varieties (Improved Giza 3, Giza 714 and Giza 843 and Sakha 1) and the varieties of pea were Master B, Loncoline, Prediction and Brogress as well as the cowpea plant varieties were used Cream 7 , Qaha 1, Dokki 331 and Azmerly.,while bean varieties were Bronco,Giza 6, Giza 3 and Nerina .Sampling started when the age of the plants reached about one month old and continued at weekly intervals throughout the growing seasons and prolonged to harvest time.

Weekly samples were taken by sweeping net technique (35 cm diameter and 60 cm. deep) to survey the leafhopper and planthopper insects on the aforementioned leguminous vegetable plant varieties and each sample consisted of 100 double strokes were taken from both diagonal direction of the experimental area.. The collected insects per a sample was kept in a tight closed paper bag and transferred to the laboratory for inspection by the hand lens.. Counts of collected leafhopper and planthopper insects were done for each sample according to Hegab et. al .(1987 &1988).

The amounts of yield for each experimental unites were also counted.

Chemical analyses of broadbean ,pea ,cowpea and bean plant varieties were carried out in central laboratory, Faculty of Agriculture, Zagazig University to determine the total protein, carbohydratecontents , PH values, Phosphorous, Calcium and Potassium contents.

The effect of different varieties of the aforementioned host plants on the population density of the dominant leafhopper insects along with resulted yield quantity were statistically analyzed according to completely randomized block design (Little and Hills 1975).

RESULTS AND DISCUSSION

1. Survey of the leafhopper and the planthopper insects on different leguminous vegetable plants:

Data arranged in Table (1) showed the leafhopper and the planthopper insects infesting different leguminous vegetable plants under study during the two successive seasons 2014/15 and 2015/16 on broad bean and pea plants and 2014 and 2015 seasons on cowpea and bean plants at Diarb – Nigm district , Sharkia Governorate .The obtained data show the incidence of fiver leafhoppers belonging to Family Cicadellidae and two planthoppers belonging to Fam. Delphacidae. The following leafhopper species *Empoasca decipiens* (Paoli) and *E. decedens* (Paoli)),*Cicadulina chinai* (Ghaur) , *Balclutha hortensis* and *Nephotettix apicali*,as well as two planthopper species (*Sogatelle furcifera* (Horv.) and *S. vibix* (Haupt) .

Date presented in Table (1) showed that , the total number of *E. diciepiens* were the highest number on broad bean followed by cowpea and represented by 1597 and 1786 individuals .on broad bean 2014/15 and 2015/16 seasons , respectively . while on cowpea were 1091 and 1255 individuals. during 2014 and 2015 , respectively . On the other hand , *E. decedens* recorded the highest total number on pea and bean and represented by 985 and 912 individuals during the first season , respectively . It is worth to mention that.*E. decipiens* and *E. decedens* were the most prevalent species whereas, the other species were observed in low numbers during the first and second seasons of investigation. These results agree with the findings of Hegab *et. al.* (1987&1988) they showed that sweeping net technique was the most efficient method to survey all leafhopper and planthopper insects in different field crops.

Table (1) Total number of leafhopper and planthopper species infesting some leguminous plants in Diarb-Nigm district , Sharkia Governorate collected by using sweep net technique during the seasons of 2014/15 and 2015/16.

Insect species	Total number of leafhopper and planthopper insects							
	2014/2015				2015/2016			
	Broad bean	Pea	Cowpea	Bean	Broad bean	Pea	Cowpea	Bean
E. decipiens	1597	943	1091	757	1786	1017	1255	827
E. decedens	1191	985	990	912	1350	1006	1094	988
C. chinai	148	102	126	98	164	112	147	110
B. hortensis	124	82	00	00	146	96	00	00
N. apicalis	00	00	118	68	00	00	126	84
S. vibix	132	88	122	72	184	96	134	84
S. frucifera	148	92	136	82	214	118	152	98

2. Seasonal abundance of the dominant leafhopper species on different leguminous vegetable plants. On broad bean and pea plants:

Date illustrated in Fig.(1) indicated that *E. decipiens* in the first season 2014/15 appeared in the third week of December on broad bean and in the fourth week of December on pea plants and increased gradually to reached its highest number on the two host plants on the fourth week of February 2015 and represented by 41 and 34 individuals. /sample at 18.8^{O}C and 64.0 % R.H .Moreover , *E. decedens* in the first season appeared in the fourth week of December on the two host plants broad bean and pea and increased gradually to reached its highest number on the second week of March 2015 and represented by 30 and 26 individuals /sample at 19.1^{O}C and 58.3%R.H., respectively.

The obtained date represented in Fig.(2) showed that, *E. decipiens* during the second season 2015/16 appeared in the third week of December then increased gradually until reached its highest number on the fourth week of February 2016 and represented by 54 and 34 individuals at 20.0 ^{O}C and 61.4 R.H. on the two host plants broad bean and pea , respectively. On the other hand , E. decedens reached its highest number during the second season on the second .week of March 2016 and represented by 42 and 30 individuals / sample on broad bean and pea , at 19.3 ^{O}C and 62.1%R.H. respectively. It is worth to mention that both of *E.decipiens* and *E.decedens* have one peak of abundance on broad bean and pea plants during the two successive seasons 2014/15 and 2015/16.

These results are in agreement with the findings of Hegab *et al.*, (1989 a, b) , Abdel-Samad and ,Al - habashy (2013) and Awadella *et.al.*(2014) and disagree with the results obtained by Herakly (1980) and Hemeida (1981) who mentioned that *E. decipiens* had five peaks of population density on some solanaceous vegetable plants in summer plantation. These differences may be attributed to locality, crop rotation, agricultural practices and environmental conditions prevailing during execution of these experiments.

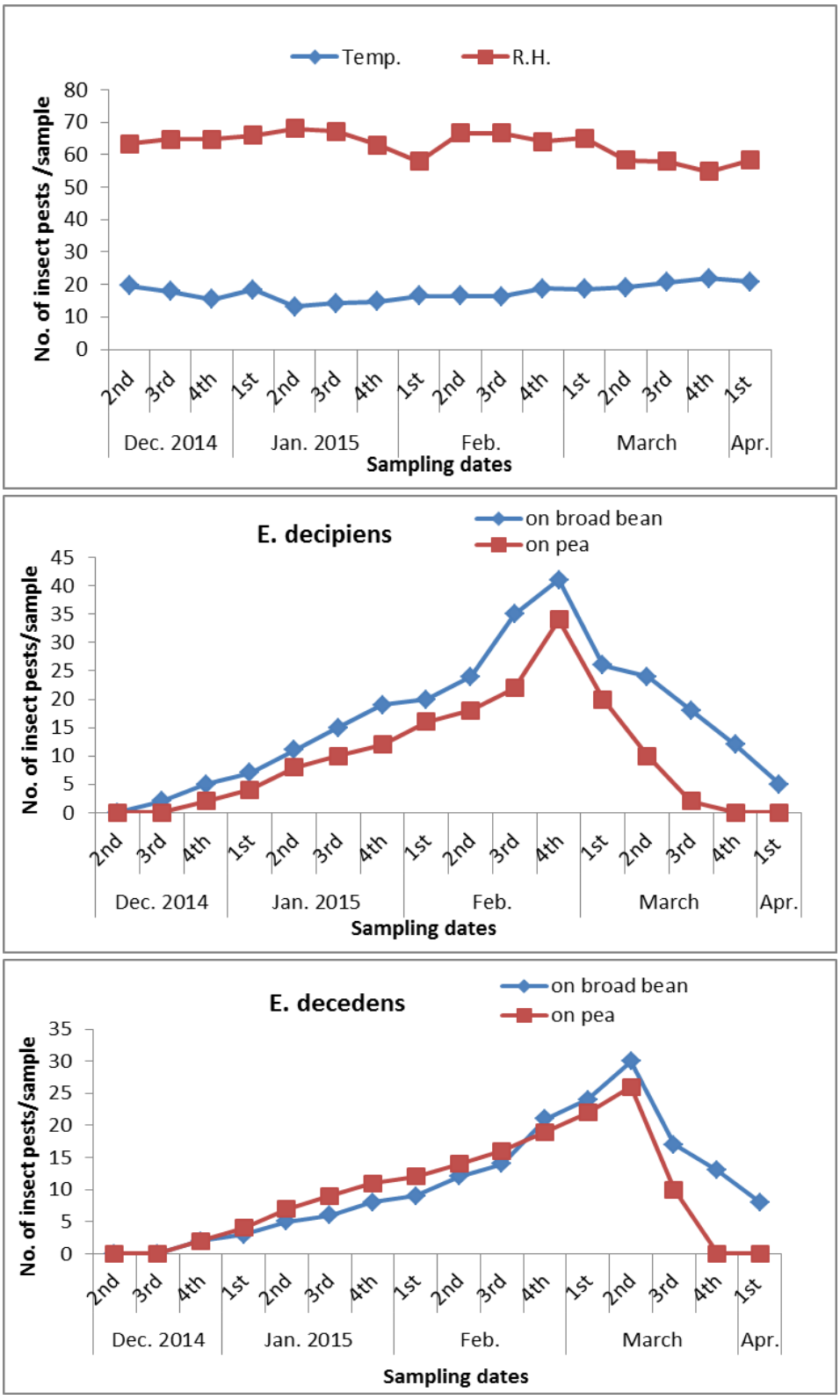

Fig.(1) The seasonal abundance of the main leafhoppers *E. decipiens* and *E. decedens*infesting broad bean and pea plants during the first season 2014/15 at Diarb – Nigm district ,Sharkia Governorate.

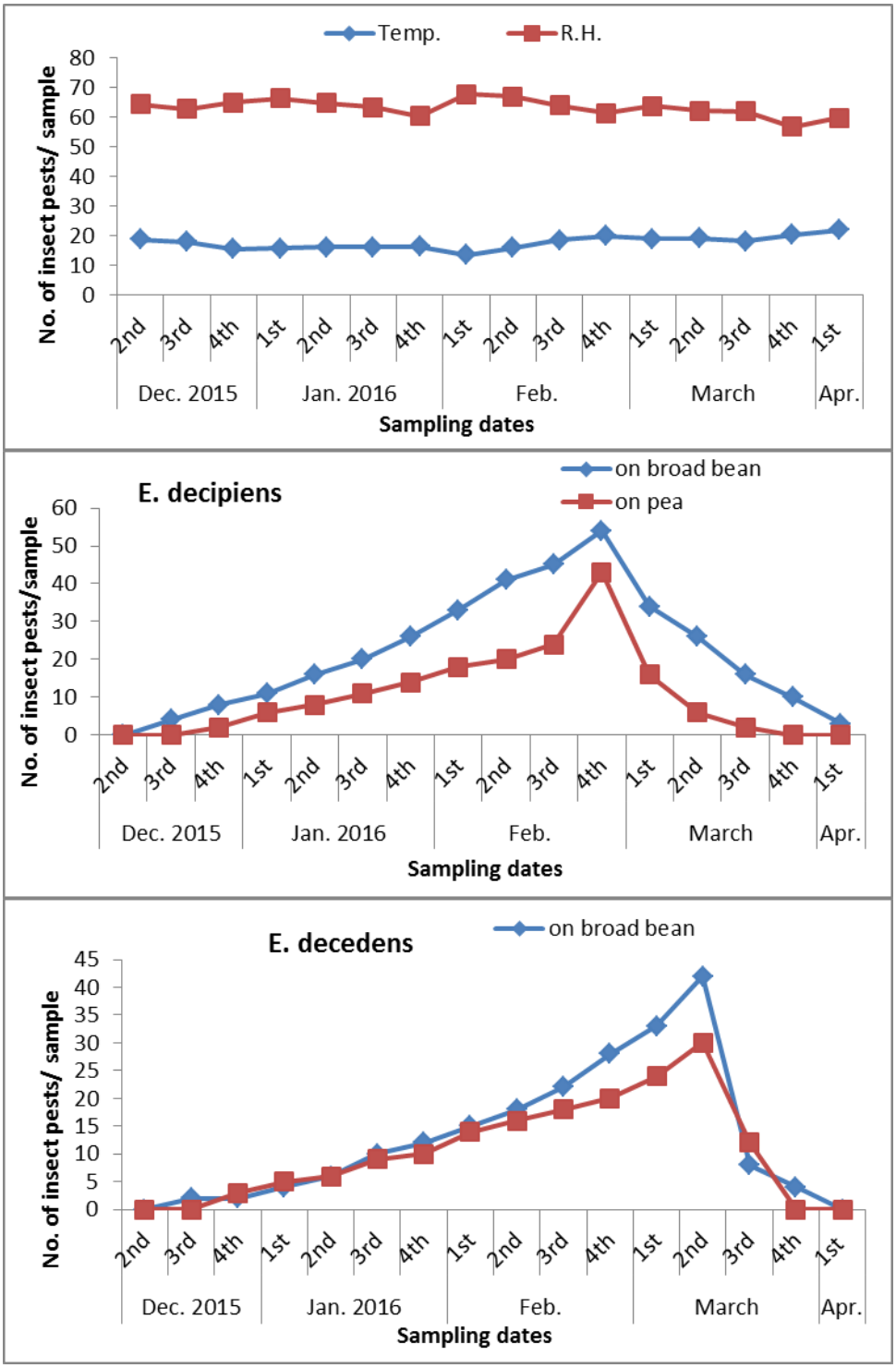

Fig.(2) The seasonal abundance of the main leafhoppers *E. decipiens* and *E. decedens* infesting broad bean and pea plants during the second season 2015/16 at Diarb – Nigm district ,Sharkia Governorate.

On cowpea and bean plants:

Date arranged in Fig.(3) indicated that *E.decipiens* during the first season 2014 appeared in the second week of June on cowpea and in the third week of June on bean plants and increased gradually to reach the first peak of abundance in the second week of July (28 and 20 individuals / sample on cowpea and bean , respectively) and reached the second peak of abundance in the second week of August (42 and 38 individuals /sample , on cowpea and bean , respectively. Moreover ,*E. decedens* during the first season 2014 appeared also in the second week of June on the two host plants cowpea and bean , then increased to reach the first peak of abundance in the second week of July and represented by 18 and 24 individuals/sample at 30.4OC and 65.7% R.H. and reached the second peak of abundance in the second week of August and represented by 35 and 42 individuals /sample at 30.2OC and 66.3% R.H. on cowpea and bean , respectively.

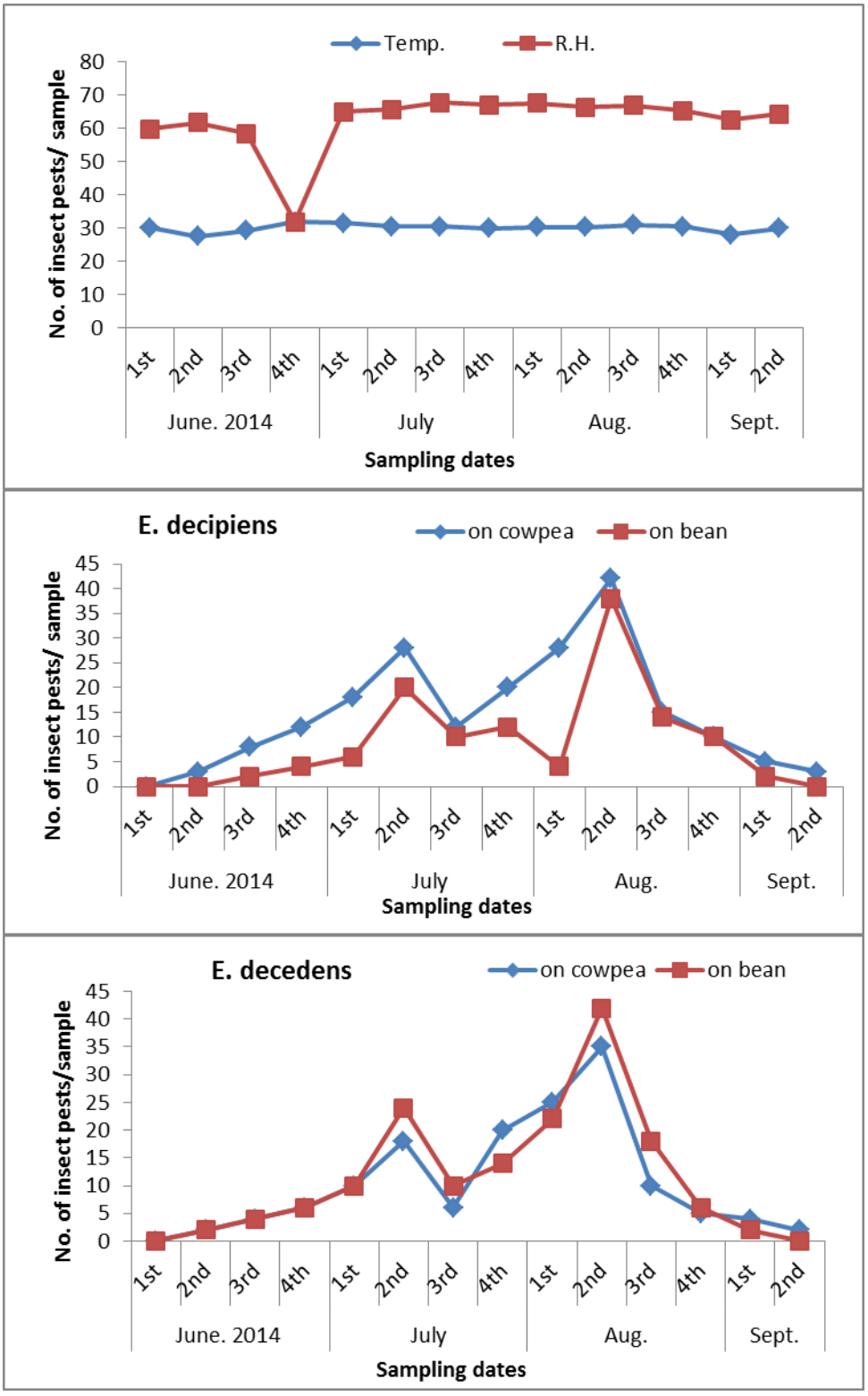

Fig.(3) The seasonal abundance of the main leafhoppers *E. decipiens* and *E. decedens* infesting cowpeaand bean plants during the first season 2014 at Diarb – Nigm district ,Sharkia Governorate

Date presented in Fig. (4) indicated that *E.decipiens* during the second season 2015 appeared in the second week of June on two host plants and increased gradually to reach its first peak of abundance in the second week of July (38 and 24 individuals/ sample on cowpea and bean , respectively) .The second peak of abundance occurred in the second week of August (48 and 32 individuals /sample on cowpea and bean , respectively) .On the other hand ,*E. decedens* reached the first peak of abundance in the second week of July and represented by 28 and 28 individuals./sample at 31.2OC and 64.7% R.H. on cowpea and bean . While , the second peak of abundance occurred in the second week of August and recorded 40 and 46 individuals /sample at 31.7O C and 69.6% R.H. on cowpea and bean, respectively (Fig.4).

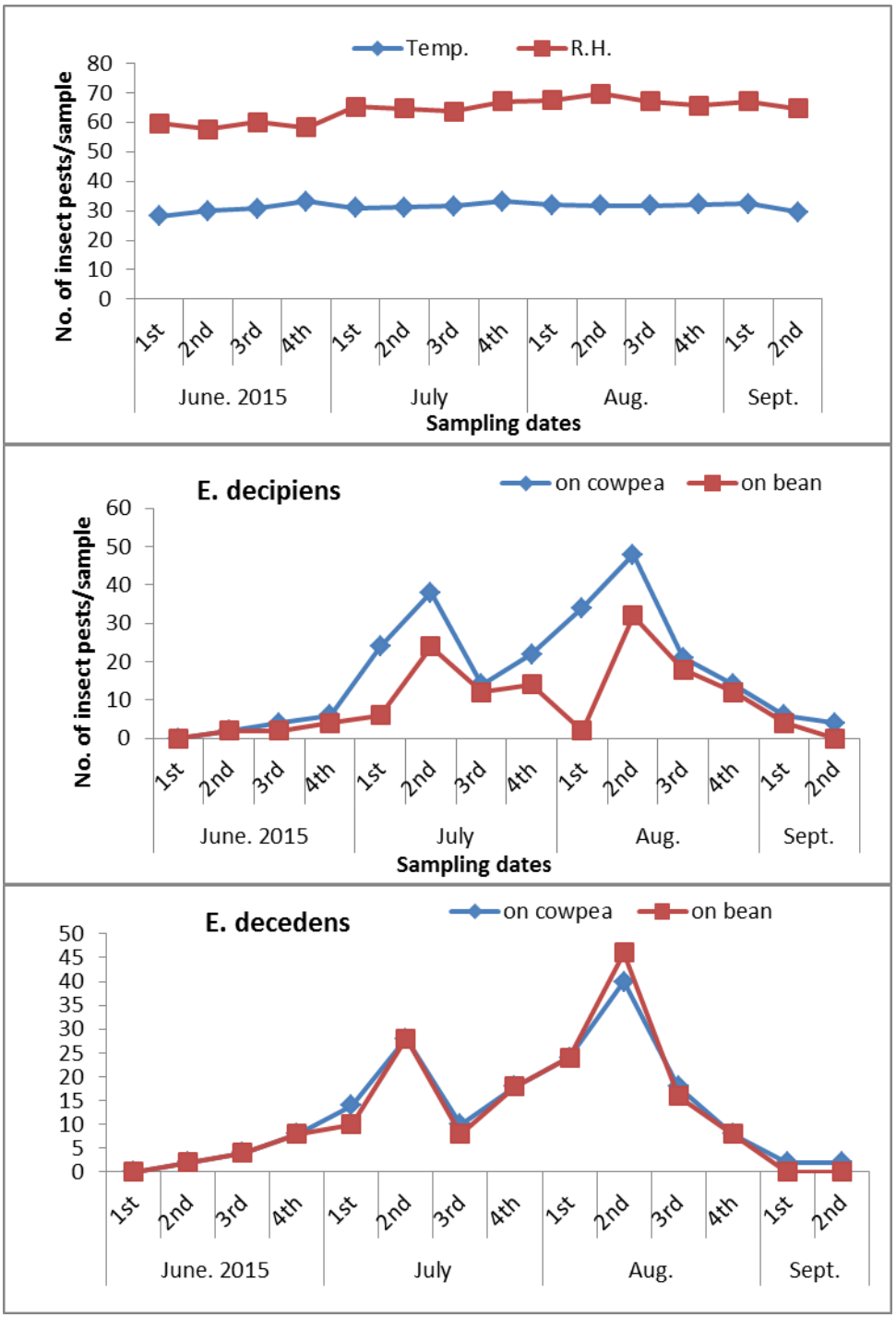

Fig.(4) The seasonal abundance of the main leafhoppers *E. decipiens* and *E. decedens* infesting cowpeaand bean plants during the second season 2015 at Diarb – Nigm district ,Sharkia Governorate

It is worth to mention that both of *E. decipiens* and *E . decedens* had two peaks of abundance on cowpea and bean plants during the two successive seasons 2014 and 2015. These results agree with the findings of Hegab *et al.*, (1989 a and b) and Awadalla *et.al.*2011and disagree with the results obtained by Herakly (1980) and Hemeida (1981) who recorded that *E. decipiens* had five peaks of population density on some solanaceous vegetable plants in summer plantation. These differences may be attributed to locality, crop rotation, agricultural practices and environmental conditions prevailing during execution of these experiment.

Effect of different leguminous plant varieties on the seasonal occurrence of the dominant leafhopper insects :-

Date presented in Table (2) showed the influences of certain leguminous varieties on the seasonal occurrence of the dominant leafhopper insects as broad bean, pea ,cowpea and bean plants under the field conditions at Diarb-Nigm distract, Sharkia Governorate were studied during two successive seasons of 2014/15 and 2015/16.

Broad bean varieties:-

As shown in Table (2) the highest average number of *E.decipiens* during the two successive seasons 2014/15 and 2015/16 were recorded on Sakha 1 variety (34.68 and 35.75 individuals)followed by Giza 843 variety (28.62 and 30.0 individuals) while , the lowest average were recorded on Giza 3 variety with an average of 16.5 and 21.68 individuals , respectively.

Table (2): Effect of some leguminous plant varieties on the population density of leafhopper insects and the resulted yield quantity during 2014/2015 and 2015/2016 seasons at Diarb- Nigm district , Sharkia Governorate ,Egypt.

Plant species	varieties	*E. decipiens*		*E.decedins*	
		2014/15	2015/16	2014/2015	2015/16
Broad bean	Improved Giza 3	16.50	21.68	10.75	12.87
	Giza714	20.00	24.18	14.31	17.00
	Giza843	28.62	30.00	22.50	24.50
	Sakha 1	34.68	35.75	26.86	30.00
pea	Master B	11.28	12.14	10.85	11.92
	Loncoline	14.21	15.35	14.14	15.00
	Preifction	18.28	20.00	19.85	20.42
	Brogress	23.57	25.14	25.50	24.50
Cowpea	Cream 7	14.57	16.92	10.50	12.71
	Qaha 1	15.14	18.42	15.00	16.50
	Dokki 331	21.42	25.00	20.71	22.42
	Azmerly	26.78	29.28	24.50	26.50
Bean	Bronco	9.38	10.15	12.30	13.23
	Giza 6	11.64	12.92	14.61	16.61
	Giza3	16.92	18.38	19.61	20.76
	Nerina	20.46	22.15	23.61	25.38

Also, the same trend was observed with *E. decedens* where the highest average number during the two seasons were recorded on Sakha 1 variety and represented by 26.87 and 30.0 individuals . Meanwhile, the lowest average number of *E. decedens* were recorded on Giza3 variety and represented by 10.75 and 12.87 individual , respectively.

Pea varieties:-

As shown in Table (2) the highest average number of *E. decipiens* during the two successive seasons 2014/15 and 2015/16 were recorded on Brogress variety (23.51 and 25.14 individuals) followed by Preifction variety (18.28 and 20.0 individuals) while , the lowest average were recorded on Master B variety with an average of 11.28 and 12.14individuals , respectively.

Also, the same trend was observed with *E. decedens* where the highest average number during the two seasons were recorded on Brogress variety and represented by 25.5 and 24.5 individuals. Meanwhile, the lowest average number for *E. decedens* were recorded on Master B and represented by 10.85 and 11.92 individuals , respectively.

Cowpea varieties :-

As shown in Table (2) the highest average number of *E. decipiens* during the two successive seasons 2014/15 and 2015/16 were recorded on Azmerly variety (26.78 and 29.28 individuals) followed by Dokki 331 variety (21.42 and 25.0 individuals) while , the lowest average were recorded on Cream 7 variety with an average of 14.57 and 16.92 individuals , respectively .

Also, the same trend was observed with *E. decedens* where the highest average number during the two seasons were recorded on Azmerly variety and represented by 24.5 and 26.5 individuals . Meanwhile, the lowest average number for *E. decedens* were recorded on Cream 7 and represented by 10.5 and 12.71 individuals.. , respectively.

Bean varieties:-

As shown in Table (2) the highest average number of *E.decipiens* during the two successive seasons 2014/15 and 2015/16 were recorded on Nerina variety (20.46 and 22.15 individuals) followed by Giza 3 variety (16.92 and 18.38 individuals..) while , the lowest average were recorded on Bronco variety with an average of 9.38 and 10.15 individuals , respectively.

Also, the same trend was observed with *E.. decedens* where the highest average number during the two seasons were recorded on Nerina variety and represented by 23.61 and 25.38 individuals. Meanwhile, the lowest average number for *E. decedens* were recorded on Bronco variety and represented by 12.30 and 13.23 individuals , respectively.

As a conclusion , the highest average number of *E. decipiens* and *E. decedens* were found on broad bean variety Sakha 1 followed by Giza 843 variety .While the highest average number for these insect pests on pea variety Brogress followed by Preifction and the lowest average number were recorded on pea Master B variety , While , the highest average number for these insect pests on cowpea variety Azmerly followed by Dokki 331 variety and the lowest average number were recorded on cowpea Cream7 variety. On the other hand,the highest average number for these insect pests on bean variety Nerina followed by Giza 3 variety and the lowest average number were recorded on bean Bronco variety.

The obtained results are in agreement with the findings of Nosser (1996) ; El-Gindy (2002; Youssef (2006) ;Awadalla*et.al.* (2011 and 2013) who mentioned

that varieties of host plants as kidney bean and faba bean plants had a great effect on incidence of sucking – piercing insects.

Relationship between certain chemical constituents of different leguminous varieties and seasonal abundanve of the dominant leafhopper insects:

The chemical contents of broad bean, pea, cowpea and bean varieties were chemically analyzed and obtained results are recorded in (Table 3).

Data represented in Table (3) suggested that, the average number of the dominant leafhopper insects affected by the chemical constituents of the leguminous varieties and resulting the yield were influenced.

Broad bean varieties:-

From the obtained results in (Table 3) Improved Giza 3 variety proved to be the lowest total protein and carbohydrate contents and the highest PH value , the least susceptible to leafhoppers infestations and the highest yield (Table 3)..

Table (3) : Effect of certain chemical constituents of some leguminous plant varieties on the seasonal abundance of the main leafhopper insects during 2014/15 season.

Plant species	varieties	Total Protein%	Carbohydrate %	PH	P %	K %	Ca %	Average No. *E. decipiens*	Average No *E. decedens*	Average No. of leafhoppers	Yield kg. by plot /
Broad bean	Improved Giza 3	18.4	44.6	5.6	0.8	3.1	3.2	16.5	10.75	27.25	15.8
	Giza714	19.6	47.1	5.3	0.8	3.0	3.1	20	14.31	34.31	13.3
	Giza843	20.9	51.9	5.2	0.7	2.9	3.0	28.62	22.5	51.12	10.1
	Sakha 1	22.2	54.4	5.0	0.6	2.8	2.8	34.68	26.87	61.55	9.6
Pea	Master B	20.8	46.2	6.3	0.9	4.2	3.6	11.28	10.85	22.13	14.7
	Loncolin	22.6	49.8	5.5	0.8	3.4	3.2	14.21	14.14	28.35	12.6
	Preifction	26.5	53.8	5.0	0.7	2.9	2.9	18.28	19.85	38.13	10.5
	Brogres	28.2	56.2	4.8	0.7	2.6	2.7	23.57	25.5	49.07	6.4
Cowpea	Cream 7	21.2	43.2	5.9	1.0	5.6	5.1	14.57	10.5	25.07	17.5
	Qaha 1	23.6	46.4	5.7	0.9	5.4	4.8	15.14	15	30.13	12.4
	Dokki 331	25.9	48.5	5.5	0.9	5.2	4.1	21.42	20.71	42.13	9.1
	Azmerly	26.1	53.8	5.2	0.8	4.8	3.9	26.78	24.5	51.28	7.6
Bean	Bronco	19.8	43.6	6.3	0.9	4.7	3.4	9.38	12.30	21.68	17
	Giza 6	20.2	47.2	5.4	0.8	3.5	3.0	11.46	14.61	26.07	15.5
	Giza3	23.8	51.9	4.9	0.8	3.1	2.8	16.92	19.61	36.53	11.2
	Nerina	27.5	55.2	4.4	0.7	2.9	2.7	20.46	23.61	44.07	8.5

Pea varieties:-

The obtained results showed that Master B and Loncoline varieties were the lowest total protein, carbohydrate contents and the highest pH values and the least susceptible to the leafhoppers insects average number and the highest yield production (Table 3).

Cowpea varieties:

From the obtained results Cream 7 and Qaha 1 varieties were the lowest total protein, carbohydrate contents and the highest pH values and the least susceptible to the leafhoppers insects average number and the highest yield production (Table 3).

Bean varieties:-

The obtained results showed that Bronco and Giza 6 varieties were the lowest total protein, carbohydrate contents and the highest pH values and the least susceptible to the leafhoppers insects average number and the highest yield production (Table 3).

Generarlly, the obtained results showed a positive relationship between protein & carbohydrate contents and average number of the leafhoppers insects on all broad bean varieties ,while a reverse relationship between pH values and insect infestations was also shown. Therefore, it is worth to mention that the leafhopper infestation was correlated with the chemical constituents of the used leguminous plant varieties and also with quantity of yield .These results agreed with the findings of Hashem(2005); Youssef (2006) and Awadalla*et.al.*(2013) who mentioned that homopterous insects infestations was correlated with the chemical contents of the host plant varieties.

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تـأثير بعـض أصـنـاف نباتـات الخضـر البقوليـه كعوائـل نباتيـه علـى الـوفره الموسـميه لحشـرات نطاطـات الأوراق ونطاطات النباتات

حافظ عبد الرحمن القاضى*,عزت فرج الخياط,هاجر سمير صالح عوض الله* و محمود على مرسى حجاب ***

***قسم الحشرات الأقتصاديه- كلية الزراعة – جامعة دمياط**

****قسم وقاية النبات -كلية الزراعة– جامعة بنها**

أجريت الدراسة خلال موسمين متتاليين ٢٠١٤/٢٠١٥, ٢٠١٥ / ٢٠١٦ بهدف حصر أنواع نطاطات الأوراق ونطاطات النباتات ودراسة الوفرة الموسمية للأنواع السائدة التي تصيب بعض النباتات البقولية (البسلة، الفول البلدي , اللوبيا و الفاصوليا), وتأثير الأصناف المختلفة على الوفره الموسمية لتلك الحشرات على النباتات المنزرعة في منطقة ديرب نجم بمحافظة الشرقية باستخدام شبكه جمع الحشرات وقد أوضحت النتائج ان أنواع نطاطات الأوراق التي تصيب نباتات البسلة والفول البلدي هى *Empoasca decedens , E.decipiens , Balclutha hortensis Cicadulina chinai* و *نطاطات النباتات S. vibix , Sogatella furcifera* ؛ *E. decipiens ,E. decedens , Nephotettix. apicalis* وقد أوضحت النتائج وجود نطاطات ألأوراق: *C. chinai* بالإضافة إلى النوعين السابقان من نطاطات النباتات *S. furcifera, S . vibix* التى تصيب كلا من اللوبيا و الفاصوليا . وبدراسة الوفرة الموسمية لتلك الأنواع السائدة على النباتات موضع الدراسة وجد أن حشرة*E. decipiens* لها ذروة نشاط واحدة على نباتات البسلة و الفول البلدي فى الأسبوع الرابع من شهر فبراير بينما كانت لها ذروتين نشاط على اللوبيا و الفاصوليا ألأولى في الأسبوع الثانى من يوليو و الثانية فى ألأسبوع الثانى من أغسطس. بينما كان لنطاط الأوراق *E. decedens* ذروة نشاط واحدة على البسلة والفول فى الأسبوع الثاني من شهر مارس بينما سجل له ذروتين نشاط على اللوبيا و الفاصوليا فى الأسبوع الثاني من يوليو وألأسبوع الثانى من أغسطس . وأيضا تم أختبارتأثيرأربعة أصناف من النباتات موضع الدراسة للإصابة بنطاطات الأوراق خلال موسمي الدراسة و تبين من النتائج أن أعلى تعداد من الحشرات على الفول واقلهم انتاجا كان على صنف الفول سخا ١ بينما كان اقلهم تعدادا و أعلى إنتاجا على صنف جيزة ٣محسن. وكان الصنف مستر بى من البسلة اقلهم إصابة بالحشرات وأعلى إنتاجا أما الصنف بروجريس فكان أكثرهم إصابة و اقلهم انتاجا., أما على اللوبيا فكان الصنف كريم ٧ اقلهم إصابة و أعلى إنتاجا بينما كان الصنف أزميرلى اقلهم أنتاجا و أكثرهم إصابة بالحشرات موضع الدراسة. أما على نباتات الفاصوليا فكان الصنف برونكو أعلى أنتاجا واقل إصابة بالحشرات موضع الدراسة أما الصنف نارينا تواجد عليه أعلى تعداد من تلك الحشرات خلال موسمى الدراسة و كان اقلهم إنتاجا. و لقد أوضح التحليل الكيميائي لبعض مكونات العصارة النباتية للأصناف المختلفة تحت الدراسة أن هناك علاقة موجبة بين نسبة الإصابة بنطاطات الأوراق وكلا من نسبة البروتين الكلى و الكربوهيدرات الكلية و على حين انة توجد علاقة سالبة (عكسية) بين نسبة ألأصابة بنطاطات ألأوراق وقيمة PH للعصارة النباتية وأيضا علاقة ذلك بكمية المحصول للأصناف المختلفة.