

## **THE EFFECTS OF CERTAIN AGRI CULTURAL PRACTICES ON LEAFHOPPERS, APHIDS AND WHITEFLY INFESTING EGGPLANT AND PEPPER PLANTS**

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### **ABSTRACT**

The present investigation aimed to study the effects of certain agricultural practices (eggplant varieties ,Bonica ,Oneta & Balady and pepper plant varieties ,Orly ,Maor & Marconi )under the effects of different potassium fertilization levels (zero , 50, 100 and 200 kg potassium sulphate /feddan ), the effect of some chemical contents (Total protein ,carbohydrate and pH values) on the population density of different leafhopper , aphid and whitefly insects infesting the aforementioned plant varieties were also tested .The obtained results show pronounced differences in the population density of these insects under test as influenced by eggplant and pepper plant varieties and potassium fertilization rate. Chemical analysis of the used eggplant and pepper plant varieties under different potassium fertilization levels pointed out that the population density of the aforementioned homopterous insects was correlated with the chemical constituents (Total protein ,carbohydrate contents and PH values ) and also with quantity of yield. Therefore, it could be recommended that potassium fertilization along with the most suitable plant variety must be included in the integrated pest management programs.

### **INTRODUCTION**

The homopterous insects (leafhopper, aphid and whitefly)are economic pests of many agricultural crops in Egypt .Solanaeous vegetable plants are infested by these pests which affect the quality and quantity of yield as results of their direct feeding on plant .In addition, these insects are responsible for natural spread of several virus diseases of economic importance vegetable plants ( *Nielson,1968* and *Aboul-Atta,1978*). The fauna of these insects on most field vegetable crops has been studied in Egypt (*Herakly,1970;El Nahal et al ,1977* and *Hegab et al 1989*).Further studies are needed to assess the relation between plant varieties , potassium fertilization level and plant chemical constituents. Therefore, it was necessary to perform the present work for studing the susceptablity of eggplant and pepper varieties under different potassium fertilization levels, along with certain chemical constituent on the population density of leafhopper, aphid and whitefly insects. The effects of tested agricultural practices were all taken in consideration collectively and the quantity of the resulted yields.

### **MATERIAL AND METHODS**

An area of about 3600 m<sup>2</sup> was chosen to carry out this study in Diarb-Nigm district, Sharkia Governorate, the experimental design used in all growing seasons of eggplant and pepper plants was a split plot design with three replications .Treatments were distributed as split plot within replication,each sub plot consisted four ridges (10 meters wide and 5 meters long )The aforementioned solanaeous plants were divided into 18 lines and the space between holes 20-30 cm . The seedling date of eggplant and pepper plants was the 2<sup>nd</sup> half of June in 2004 and 2005 seasons The

normal agricultural practices were followed in due time and all plots were kept free of any insecticide treatments.

In such experiments, the following three eggplant varieties were used (Bonica, Oneta and Balady), while pepper varieties were Orly, Maor and Marconi (sweet pepper).

Four potassium fertilization levels (00, 50, 100 and 200 kg. /feddan) were applied in these experiments in the form of potassium sulphate 48 K<sub>2</sub>O, half of the quantity during preparing the soil and the other quantity at the start of the flowering. Sampling started when the age of the plants reached about 15 – 20 days after seedling and continued at weekly intervals throughout the growing seasons of eggplant and pepper plants (until mid- October, 2004 &2005) . The following two procedures of sampling were used:

1) The use of planting samples, three leaves representing different strata, viz. terminal, middle and basal parts were taken from randomly chosen 10 plants of each variety. These leaves were examined in the laboratory using a binocular microscope and the total number of existing nymphs, aptera, and alate forms of aphids, immature and adult stages of whitefly on both surfaces of the leaves were recorded.

2) The use of sweeping net, 30 cm diameter and 60 cm depth. Each sample consisted of 200 strokes were taken from both diagonal directions of the experimental area. Each sample was kept in a tight closed paper bag and transferred to the laboratory for inspection by binocular microscope and the collected leafhoppers were killed by cyanide, sorted into species and identified according to the work of Nielson (1968) and Hegab et .al. (1989). Counts of captured leafhoppers were done for each sample.

Effects of different potassium fertilization rates, and the chemical constituents of different eggplant and pepper plant varieties on the population density of the aforementioned homopterous insects were statistically analyzed according to split analysis (Little and Hills 1975)

Chemical analysis of the used eggplant and pepper plant varieties were carried out in central laboratory, Faculty of Agriculture, Moshtohour, Banaha Univ. to determine the total protein, carbohydrate Phosphorous, calcium and potassium contents and pH value, , according to Dubois et. al. 1956; Barrowes and Simpson(1962); Jackson, 1970; Bremmer and Mulvaney 1982.

Recorded of Meteorological station at Zagazig regions were taken to represent the conditions (temperature &relative humidity prevailing in the field during the period of this investigation.

## **RESULTS AND DISCUSSION**

### **1. Survey of some homopterous insects on eggplant and pepper plants**

#### **a) Leafhopper insects**

##### **i) Eggplant (*Solanum melongena*).**

The data presented in Table (1) show the incidence of six leafhopper species belonging to family Cicadellidae on eggplant at Diarb-Nigm district, Sharkia Governorate. The collected leafhopper species were arranged descendingly according to their abundance as follows: *Empoasca decipiens*

(Paoli) *E. decedens* (Paoli), *E. lybica* (de Berg.) *Balclutha hortensis* (Lindb), *Cicadulina chinae* (Ghauri) and *C. bipunctella zea* (China).

*E. decipiens* and *E. decedens* were the most dominant leafhopper species on eggplant.

**ii) Pepper plants (*Capsicum frutescens*).**

The following five leafhopper species were collected from pepper plants during 2004 and 2005 seasons *E. decipiens* *E. decedens* ,*B. hortensis* , *C. chinae* and *Nephotettix apicalis* (Matsch). *E. decipiens* and *E. decedens* were apparently the most abundant leafhopper species .Whereas, the rest species were found in low numbers during 2004 & 2005 seasons. These results agree with the findings of Herakly (1970 & 1980) and Hegab *et.al.*(1989) and disagreed with those obtained by Hemeida (1981) who mentioned that only *E. decipiens* infested solanaceous vegetable plants at Giza region.

**b) Aphid insects.**

Survey study on eggplant and pepper plants in Diarb-Nigm, district, Sharkia Governorate revealed the presence of aphid species *Myzus persicae* (Sulz) and *Aphis gossypii* (Glover).As shown in Table (1) *Myzus persicae* proved to be the most dominant aphid species on eggplant and pepper plants during 2004 and 2005 seasons. followed by *A. gossypii* infested eggplant and pepper plants by large numbers during 2004 and 2005 seasons.

**c) Whitefly *Bemisia tabaci* (Genn).**

The total number of the immature and adult stages of *B. tabaci* infesting eggplant and pepper plants during 2004 and 2005 seasons are shown in Table (1).

**Table (1):Total number of leafhoppers, aphid and whitefly species collected from eggplant and pepper plants varieties in Diarb-Nigm district, Sharkia Governorate .during 2004 and 2005 seasons.**

Insects species	seasons	Total number of insects						
		Eggplant varieties			Pepper varieties			
		Bonica	Oneta	Balady	Orly	Maor	Marconi	
<i>E. decipiens</i>	2004	1919	2451	2757	1281	1582	1675	
	2005	2029	3117	3685	1980	2529	2820	
<i>E. decedens</i>	2004	997	1221	1560	984	1227	5815	
	2005	1510	1903	2225	1762	2470	3013	
<i>E. lybica</i>	2004	200	280	350	-	-	-	
	2005	260	310	380	-	-	-	
<i>B. hortensis</i>	2004	157	171	200	80	110	170	
	2005	172	189	230	92	127	191	
<i>C. chinae</i>	2004	112	123	132	71	82	89	
	2005	122	171	190	86	90	99	
<i>C. bipunctella zea</i>	2004	57	65	80	-	-	-	
	2005	71	82	91	-	-	-	
<i>N. apicalis</i>	2004	-	-	-	56	69	82	
	2005	-	-	-	63	78	89	
<i>M. persicae</i>	2004	1995	2731	6646	5866	6907	7831	
	2005	3537	5059	8302	8278	10822	12252	
<i>A. gossypii</i>	2004	1429	2097	2797	2476	3144	3468	
	2005	2437	3163	3753	4636	5736	6334	
<i>B. tabaci</i>	Adult	2004	3039	3799	7045	3439	4708	5292
		2005	5392	6564	9427	4503	6627	6868
	Immature stages	2004	12837	17975	20599	4498	6070	6771
		2005	17323	20713	24490	7281	8250	8682

## 2. Seasonal abundance of the dominant homopterous insects on eggplant and pepper plants.

### a) Leafhopper insects; *Empoasca decipiens* (Paoli) and *E. decedens* (Paoli)

These leafhopper insects were the most abundant species on eggplant and pepper plants during 2004 and 2005 seasons. The weekly numbers of *E. decipiens* and *E. decedens* collected from eggplant and pepper plants in 2004 and 2005 seasons are recorded in Tables (2&3). Two peaks were recorded for the aforementioned species during 2004 and 2005 seasons on both eggplant and pepper plants. The first one occurred at 3<sup>rd</sup> week of August with a total number of 71&80 insect/sample (for *E. decipiens* and 34&49 insects/sample (for *E. decedens*) on eggplant, while on pepper plants it was 38&63 insects/sample (for *E. decipiens* and 38&65 insects/sample (*E. decedens*) at a mean temperature of 29.71 C° & 30.88C° with 65.5% and 66.86 % RH. for the two seasons, respectively. The second peak was noticed in 3<sup>rd</sup> week of September on both eggplant and pepper plants with a total number of 57&70 insects/sample (for *E. decipiens* and 29&40 insects/sample (*E. decedens*) on eggplant, while on pepper plants it was 32&44 insects/sample (for *E. decipiens* and 27 &47 insects/sample (for *E. decedens*) at a mean temperature of 27.31 C° & 29.13C° with 62.43 % and 64.00 % RH. during the two seasons, respectively.

### b) Aphid species; *Myzus persicae* (Sulz) and *Aphis gossypii* (Glover)

The seasonal population abundance of *M. persicae* and *A. gossypii* on eggplant and pepper plants are shown in Tables (2&3). One peak was noticed for *M. persicae* and *A. gossypii* on eggplant and pepper plants at the 3<sup>rd</sup> week of August with a total number of 151&198 insects/sample (for *M. persicae*) and 73&86 insects/sample (for *A. gossypii*) (on eggplant), while 153 &212 insects/sample (for *M. persicae*) and 85& 155 insects/sample (for *A. gossypii*) on pepper plants at a mean temperature of 29.71C° & 30.88C° with 65.5% and 66.86 % RH. for the two seasons, respectively.

### c) Whitefly *Bemisia tabaci* (Genn)

Numbers of *B. tabaci* (immature and adult stage) specimens collected from eggplant and pepper plants during 2004 and 2005 seasons are shown in Tables (2&3).

The obtained results show that the number of *B. tabaci* individuals fluctuated and generally tend to increase throughout the successive samples until reaching the peak of population. Careful view of Tables(2&3) indicate that one peak representing high population density for the immature stages on eggplant and pepper plants was recorded during the 2<sup>nd</sup> week of August with a total number of 453&471 insects/sample (on eggplant plants) and 177&190 insects/sample (on pepper plant) at 30.03C° & 30.21C° with 68.78 %, 66.27 % RH. for the two seasons, respectively. while the adult recorded one peak at end of August with a total number of 169&203 insects/sample (on eggplant plants) and 137&166 insects/ sample (on pepper plants) at 29.45C°, 30.4C° and 67.95% , 65.43% R.H. respectively.



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**3**

**10534**

**3. Effect of maximum temperature, Minimum temperature and relative humidity on the population density of some dominant homopterous insects (leafhopper, aphid and whitefly) infesting eggplant and pepper plants**

Generally the results in Table (4) indicated that the correlation between the insects population and maximum temperature, minimum temperature and relative humidity was positive insignificant and in other cases negative insignificant according to different records of temperature and relative humidity during various seasons(2004 and 2005) and more explanation can be detected from Table(4) . Similar trends can be noticed in case of partial regression.

**Table(4):partial regression and sample correlation coefficient between maximum temperature ,minimum temperature and relative humidity and the mean number of certain homopterous insects infesting eggplant and pepper plant at Diarb –Nigm district ,Sharkia Governorate Egypt,during 2004 and 2005 seasons.**

Insect species	Simple correlation						Partial regression					
	2004			2005			2004			2005		
	r1	r2	r3	r1	r2	r3	b1	b2	b3	b1	b2	b3
Leafhoppers												
<i>E. decipiens</i>	-0.158	0.337	0.148	-0.176	0.299	-0.209	1.745	3.756	0.329	-2.581	1.733	-0.302
<i>E. decedens</i>												
Aphids												
<i>M. persicae</i>	-0.064	0.394	0.189	-0.094	0.358	0.154	0.282	3.441	0.364	2.197	3.734	0.762
<i>A. gossypii</i>												
Whiteflies												
<i>B. tabaci</i>	-0.499	-0.288	0.395	-0.197	-0.314	-0.215	0.938	0.9513	0.887	0.114	-1.436	2.309

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

b1=partial regression between max.temp.and number of insects

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

b2= partial regression between min.temp.and number of insects

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

b3= partial regression between R.H.and number of insects

**4. Effect of some agricultural practices on the population density of certain homopterous insects infesting eggplant and pepper plants**

**4.1. Plant varieties**

The influence of different plant varieties on the occurrence of certain homopterous insects attacking eggplant and pepper plants under the field conditions at Diarb-Nigm district , Sharkia Governorate were studied during the two successive seasons of 2004 & 2005.

**a)Eggplant.**

**i) Leafhopper insects.**

As shown in Table (5) the number of *E. decipiens* infested the three eggplant plant varieties was statistically significant during 2004 and 2005 seasons. The most susceptible variety was Balady followed Oneta, whereas Bonica variety was the least susceptible recording the respective values 19.14, 17.02 and 13.32 insects/sample in 2004 season and 25.59, 21.64 and 14.09 insects/sample in 2005 season for the three varieties, respectively.

**Table (5): Effect of different eggplant and pepper plants varieties on the population density of leafhopper, aphid and whitefly insects during 2004 and 2005 seasons**

seasons	Mean number of insects /sample	Eggplant varieties			Pepper varieties		
		Bonica	Oneta	Balady	Orly	Maor	Marconi
2004	<i>E decipiens</i>	13.32	17.02	19.14	8.89	10.98	11.63
	<i>E decedens</i>	6.92	8.48	10.83	6.83	8.52	40.38
2005	<i>E decipiens</i>	14.09	21.64	25.59	13.75	17.56	19.58
	<i>E decedens</i>	10.48	13.21	15.45	12.23	17.15	20.92
2004	<i>M persicae</i>	13.85	18.96	46.15	40.73	47.96	54.38
	<i>A gossypii</i>	9.92	14.56	19.42	17.19	21.83	24.08
2005	<i>M persicae</i>	24.56	35.13	57.65	57.48	75.15	85.08
	<i>A gossypii</i>	16.92	21.96	26.06	32.19	39.83	43.98
2004	Adult <i>B. tabaci</i>	21.1	26.38	48.92	23.88	32.69	36.75
	Immature	89.14	124.82	143.05	31.23	42.15	47.02
	total	110.24	151.20	191.97	55.11	74.84	83.77
2005	Adult <i>B. tabaci</i>	37.44	45.58	65.46	31.27	46.02	47.69
	Immature	120.3	143.84	170.07	50.56	57.29	60.29
	total	157.74	189.42	235.53	81.83	103.31	107.98
2004	Yield kg./plot	91.0	85.2	83.85	45.78	40.18	33.69
2005	Yield kg./plot	84.53	80.45	60.05	39.65	36.28	28.58

Results in Table (5) indicated also that *E. decedens* infestation on the three tested eggplant varieties were statistically significant during 2004 and 2005 season. The most susceptible variety was Balady (10.83 & 15.45 insects/sample in 2004 and 2005 seasons), while the least susceptible one was Bonica (6.92 & 10.48 insects/sample in both seasons, respectively).

**ii) Aphid insects..**

Data given in Table (5) revealed also that the differences between mean numbers of *M. persicae* on the three tested eggplant varieties were statistically significant during 2004 and 2005 seasons. The most susceptible varieties were Balady (46.15 & 57.65 insects/samples in both seasons, respectively). While the least susceptible variety was Bonica (13.85 & 24.56) insects/sample.

Significant differences could be obtained between *A. gossypii* infestation of different tested eggplant varieties during 2004 and 2005 seasons, Table (5). The most susceptible variety was Balady (19.42 & 26.06 insects/sample in 2004 and 2005 seasons, respectively). While the least susceptible was Bonica variety recorded 9.92 & 16.92 insects/sample in both seasons, respectively.

**iii) Whitefly**

The mean number of *B. tabaci* infested the three tested eggplant varieties were statistically significant during 2004 & 2005 seasons (table 5). The most susceptible variety was Balady followed by Oneta, whereas Bonica variety was the least susceptible recording 191.97, 151.20 and 110.24 insects/sample in 2004 & 235.53, 189.42 and 157.74 insects/sample in 2005 season.



### **Mean yield quantity (kg/plot)**

With regard to the influence of eggplant cultivars on eggplant yield, data presented in Table (5) show that Bonica variety yielded the highest mean of 91.0 and 84.53 kg / plot in 2004 and 2005 seasons, respectively followed by Oneta variety with average of 85.2 and 80.45 kg/plot in the two seasons, respectively. While Balady variety yields the lowest value of 83.85 and 60.05 kg /plot in 2004 and 2005 seasons, respectively.

Generally, from the obtained results, it could be concluded that Balady eggplant was more susceptible to leafhopper, aphid and whitefly insect infestation, whereas Bonica variety was the least susceptible cultivars. These results agreed with the findings of Nosser (1996), El- Gindy (2002) and Youssef (2006) who mentioned that varieties of leguminous plants had a great effect on incidence of some homopterous insects.

### **b) Pepper plants**

#### **i) Leafhopper insects.**

As shown from Table (5) the differences between number of *E. decipiens* infested the three pepper plant varieties were statistically significant during 2004 and 2005 seasons. The most susceptible variety was Marconi (sweet pepper) followed Maor, whereas Orly variety was the least susceptible recording the respective values ( 11.63, 10.98 and 8.89 insects/sample) in 2004 season and ( 19.58, 17.56 and 13.75 insects/sample) in 2005 season for the three varieties, respectively.

*E. decedens* infestation on the three tested pepper plant varieties were statistically significant during 2004 and 2005 seasons Table (5). The most susceptible variety was Marconi (40.38 & 20.92 insects/sample) in 2004 and 2005 seasons, while the least susceptible variety was Orly (6.83 & 12.23 insects/sample) in both seasons, respectively.

#### **ii) Aphid insects..**

Data given in Table (5) revealed also that the differences between mean numbers of *M. persicae* on the three tested pepper plant varieties were statistically significant during 2004 and 2005 seasons. The most susceptible varieties were Marconi (54.38 & 85.08) insects/samples in both seasons, respectively. While the least susceptible variety was Orly (40.73 & 57.48) insects/sample.

Significant differences could be obtained between *A. gossypii* infestation of different tested pepper plant varieties during 2004 and 2005 seasons, (Table 5). The most susceptible variety was Marconi (24.08 & 43.98 insects/sample in 2004 and 2005 seasons, respectively). While the least susceptible variety was Orly recorded 17.19 & 32.19 insects/sample in both seasons, respectively.

#### **iii) Whitefly**

As shown from Table (5) the mean number of *B. tabaci* infested the three tested pepper plant varieties was statistically significant during 2004 & 2005 seasons. The most susceptible variety was Marconi followed by Maor, whereas Orly variety was the least susceptible recording the values (83.77, 74.84 and 55.11 insects/sample for the three varieties, respectively in 2004 and 107.98, 103.31 and 81.83 insects/sample, respectively in 2005 season.

**Mean yield quantity (kg/plot)**

With regard to the influence of pepper cultivars on pepper yield , data presented in Table (5) show that Orly variety yielded the highest mean of 45.78 and 39.65kg/ plot in 2004 and 2005 seasons ,respectively followed by Maor variety cultivars yield with mean of 40.18and 36.28 kg/plot in the two seasons ,respectively. While Marconi variety yields the lowest mean of 33.69and 28.58 kg /plot in 2004 and 2005 seasons, respectively.

Generally, from the obtained results, it could be concluded that Marconi pepper plant variety was more susceptible to leafhopper, aphid and whitefly insects infestation ,whereas Orly variety was the least susceptible cultivar. The results agreed with the findings of Nosser (1996) , El- Gindy (2002) and Youssef (2006) who mentioned that varieties of leguminous plants had a great effect on incidence of some homopterous insects.

**4.2. Effect of potassium fertilization.**

Effect of different potassium fertilization levels on the population density of leafhopper, aphid and whitefly insects infesting eggplant and pepper plants was studied and the results are shown in Table (6).

**Table (6): Effect of different potassium fertilization levels on the population density of leafhoppers, aphids and whitefly insects infesting eggplants and pepper plants during 2004 and 2005 seasons**

Host plant		Eggplant				Pepper plants				
Fertilization levels		F1	F2	F3	F4	F1	F2	F3	f4	
Mean number of insect s/sample	2004	<i>E decipiens</i>	20.07	17.76	15.14	13	14.72	11.61	8.78	6.89
		<i>E decedens</i>	11.42	9.47	7.67	6.42	11.69	9.53	7.42	5.67
	2005	<i>E decipiens</i>	25.14	21.79	18.69	16.14	21.5	18.36	15.28	12.67
		<i>E decedens</i>	16.04	13.93	11.86	10.36	21.17	17.89	15.08	12.92
	2004	<i>M persicae</i>	30.92	27.97	24.42	22	56.64	50.36	44.47	39.28
		<i>A gossypii</i>	19.97	16.11	12.36	10.08	26.69	22.81	18.83	15.81
	2005	<i>M persicae</i>	47.92	41.64	36.11	30.78	85.81	76.17	68.42	59.89
		<i>A gossypii</i>	27.56	23.61	19.17	16.25	47.06	41.0	35.69	30.92
	2004	Adult B tabaci	40.17	34.22	29.25	24.89	38.83	33.36	28.22	24.0
		Immature	134.29	123.64	113.86	104.24	48	42.25	37.17	33.11
		total	174.46	157.86	143.11	129.13	86.83	75.61	65.39	57.11
	2005	Adult B tabaci	58.42	51.97	46.44	41.14	49.17	44.67	39.19	33.61
		Immature	158.31	148.67	139.86	132.12	65.4	58.92	52.42	47.22
		total	216.73	200.64	186.30	173.26	114.57	103.59	91.51	80.83
Yield kg/plot	2004	76.6	82.77	90.2	97.17	30.3	36.17	43.41	49.63	
	2005	64.6	70.63	78.43	86.37	27.37	32.3	37.43	42.23	

F1= zero kg potassium sulphate /feddan

F2= 50kg potassium sulphate/feddan

F3=100 kg potassium sulphate /feddan

F4=200 kg potassium sulphate /feddan

**a)Eggplant**

**i) Leafhoppers**

Results in Table (6) show that the effect of used four levels of potassium fertilization on the population density of leafhopper insects infesting eggplant was statistically significant during the two seasons of study (2004 and 2005)

According to data in Table (6) the highest mean number of leafhopper insects (20.07 & 25.14 insects/sample for *E. decipiens* and 11.42 & 16.04 insects/sample for *E. decedens*) occurred with treatment (zero

potassium fertilization /feddan) during 2004 and 2005 seasons, respectively, while the lowest mean number of leafhopper insects was 13 & 16.14 insects/sample for *E. decipiens* and 6.42 & 10.36 insects/sample for *E. decedens* recorded with treatment (200 kg potassium sulphate /feddan) during two seasons, respectively.

#### **i) Aphids**

Results in Table (6) show also that the effect of used four levels of potassium fertilization on the mean number of aphid insects infesting eggplant was statistically significant during the two seasons of study (2004 and 2005)

The highest mean number of aphid insects (30.92 & 47.92 insects/sample for *M. persicae* and 19.97 & 27.56 insects/sample for *A. gossypii*) was recorded with treatment (zero potassium fertilization /feddan) during 2004 and 2005 seasons, respectively, while the lowest mean number of aphid insects was 22 & 30.78 insects/sample for *M. persicae* and 10.08 & 16.25 insects/sample for *A. gossypii* occurred with treatment (200 kg potassium sulphate /feddan) during the two seasons, respectively.

#### **iii) Whitefly insects**

The effect of the used four levels of potassium fertilization on the mean number of whitefly insects infesting eggplant was statistically significant during the two seasons of study (2004 and 2005) Table ( 6)

According to results given in the same Table highest mean number of whitefly insects (174.46 & 216.73 insects/sample) was recorded with (zero potassium fertilization/feddan)during 2004 and 2005 seasons, respectively, while the lowest mean number of whitefly insects was 129.13 & 173.26 insects/sample occurred with treatment( 200 kg potassium sulphate /feddan )during two seasons, respectively.

#### **b) Pepper plants**

##### **i) Leafhoppers**

The effect of used four levels of potassium fertilization on population density of leafhopper insects infesting pepper plants was statistically significant during the two seasons of study 2004 and 2005, Table (6).

Results in the same table show that the highest mean number of leafhopper insects (14.72 & 21.50 insects/sample for *E. decipiens* and 11.69 & 21.17 insects/sample for *E. decedens*) occurred with treatment (zero potassium fertilization /feddan) during 2004 and 2005 seasons, respectively, while the lowest mean number of leafhopper insects (6.89&12.67 insects/sample for *E. decipiens* and 5.67&12.92 insects/sample for *E. decedens*) was recorded with treatment(200kgpotassium sulphate/feddan )during two seasons, respectively.

##### **i) Aphids**

The mean number of aphid insects infesting pepper plants differs significantly during the two seasons of 2004 and 2005 due to the effect of four treatments of potassium fertilization

According to Table (6)the highest mean number of aphid insects (56.64 & 85.81 insects/sample for *M. persicae* and 26.69 & 47.06 insects/sample for *A. gossypii*) was recorded with treatment ( zero potassium fertilization /feddan) during 2004 and 2005 seasons, respectively, while the

lowest mean number of aphid insects (39.28 & 59.89 insects/sample for *M. persicae* and 15.81 & 30.92 insects/sample for *A. gossypii*) occurred with treatment (200 kg potassium sulphate /feddan) during two seasons, respectively.

**iii) Whitefly**

The effect of used four levels of potassium fertilization on the mean number of whitefly insects infesting pepper plants was statistically significant during the two seasons of 2004 and 2005, Table (6). The highest mean number of whitefly insects (86.83 & 114.57 insects/sample) was recorded with treatment (zero potassium fertilization/feddan) during 2004 and 2005 seasons, respectively, while the lowest mean number of whitefly insects (57.11&80.83 insects/sample) occurred with treatment ( 200 kg potassium sulphate /feddan) during two seasons, respectively.

In general, it could be concluded that the potassium fertilization levels influenced pronouncedly the insect infestation and yield quantity as the results show the highest number of insects recorded with the least level of potassium fertilization treatment (zero kg potassium sulphate/feddan) and lowest quantity of yield, while increasing this level to 200 kg potassium fertilization/feddan reduced the insect infestation and markedly increased the yield quantity. Therefore it could be recommended that fertilization with 200kg potassium fertilization/feddan is very suitable to decrease insect infestation and increasing the resulted yield. These results are in agreement with findings of Davis *et. al.*(1995), Baghour *et. al.* (2001), Hegab , Ola (2001) and Hashem (2005), who all mentioned that the occurrence of aforementioned homopterous insects on wheat, maize and leguminous plants varied greatly according to applied fertilizers.

**5. Relation between certain chemical contents of eggplant and pepper plant varieties and leafhopper, aphid and whitefly insects' infestation**

Samples of different eggplant and pepper plant varieties were chemically analyzed and the obtained results are recorded in Tables (7&8)

**a) Eggplant .**

Data given in Table (7) showed significant effects of different chemical constituent of the three tested eggplant varieties on the leafhopper, aphid and whitefly insects during 2005 season.

**i) Total protein, Carbohydrate contents "C.C." and PH value:**

In case of Balady variety the mean number of leafhopper, aphid and whitefly insects was 49.86 , 101.91 and 259.96 insects/sample, respectively, in treatment (zero potassium fertilization level ) with 1.03% total protein, 3.19% C.C. & 5.47 pH and it decreased to 43.75, 38 & 32.5 insects /sample (for leafhoppers), 89.16, 77.42 & 60.34 insects /sample (for aphids) and 243.06, 226.92 & 212.18 insects /sample (for whitefly) by increasing the protein contents to (1.42%, 1.51% and 1.89%), C.C ( 3.26%, 3.72% and 4.35%) and pH (5.8, 5.9 and 6.5) for the treatments with 50kg , 100kg and 200kg potassium sulphate /feddan, respectively.

In case of Oneta variety the mean number of the leafhopper, aphid and whitefly insects was 42.57, 71.5 and 212.24 insects/sample, respectively in treatment with 1.01% total protein , 2.92% C.C. and 5.6 pH and it

decreased to 36.93,31.86&28.08 insects /sample (for leafhoppers)and it was 61.59,51.66 &43.58 insects /sample (for aphids); 195.56,181.01&168.88 insects /sample for(whitefly ) by increasing the protein contents to (1.29%,1.48% and 1.52%), C.C( 3.02%,3.2% and 3.52%) and pH(6.0,6.5 and 6.8)for the treatments 50kg , 100kg and 200kg potassium sulphate /feddan, respectively..

In case of Bonica variety the mean number of leafhopper, aphid and whitefly insects was 30.22,53.0and 177.94 insects/sample, respectively in treatment with1.06 % total protein , 3.75%C.C. and 6 pH and it decreased to 26.43,21.79&18.93insects/sample(for leafhoppers), 45,36.75&31.17 insects/sample(for aphids)and163.29,150.97&138.71insects /sample (for whitefly) by increasing the protein contents to(1.69%,1.9% and 1.93%), C.C( 3.82%,3.98%and 4.65%) and increasing the pH 6.3to 7.1 and 7.6for the treatments 50kg , 100kg and 200kg potassium sulphate /feddan, respectively.

#### **b)Pepper**

Results in Table (8) showed significant effects of different chemical constituents of the three tested pepper varieties on the population density of the leafhopper, aphid and whitefly insects during 2005 season.

#### **i)Total protein, Carbohydrate Contents "C.C." and PH value:**

In case of Marconi variety the mean number of leafhopper, aphid and whitefly insects was 50.58, 154.42and 125.09 insects/sample respectively, in treatment (zero potassium fertilization level ) with 1.52% total protein ,2.55%C.C.& 5.8 pH and it decreased to 43.42,37.0&31.0 insects/sample(for leafhoppers), 135.75,120.92&105.17insects/sample(for aphids) and 115.84,101.5&89.5insects /sample (for whitefly) by increasing the protein contents to (1.71%,1.82% and 2.2%), C.C( 3.0%,3.5% and 4.54%) and pH(6.4,6.9and 7.5)for the treatments with 50kg ,100kg and 200 kg potassium sulphate /feddan, respectively.

In case of Maor variety the mean number of the leafhopper, aphid and whitefly insects was 43.0,133.66 and 118.92 insects/sample respectively in treatment with 1.6% total protein , 2.69%C.C. and 6.0 pH and it decreased to 36.84,31.42&27.42 insects /sample(for leafhoppers), 120.09,109.34&96.84 insects/sample (for aphids) and107.84,93.75&83.75insects /sample (for whitefly) by increasing the protein contents to (1.89%,2.05% and 2.4%), C.C( 3.28%,3.91% and4.72%) and pH(6.7,7.2 and 7.82)for the treatments 50kg , 100 kg and 200 kg potassium sulphate /feddan, respectively.

In case of Orly variety the mean number of leafhopper, aphid and whitefly insects was 34.41, 130.5and 100.66 insects/sample, respectively in treatment with 1.62 % total protein , 2.89%C.C. and 6 pH and it decreased to28.5,22.66&18.34insects/sample (for leafhoppers),95.67,82.09&70.41 insects/sample(for aphids)and87.09,75.34&64.5insects /sample( for whitefly) by increasing the protein contents to (1.8%,1.9% and 2.61%), C.C( 3.5%,3.92%and 5.0%) and pH(6.5,7.4 and 7.92)for the treatments 50kg , 100kg and 200kg potassium sulphate /feddan, respectively.

These results go with those recorded by El.Gindy (2002), Hashem (2005) and Youseef (2006) who pointed out that the chemical constituents of some leguminous plant varieties affected the population density of the leafhopper , aphid and whitefly insects .

**Hegab, Ola I. M.**

**7**

**10542**



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## تأثير بعض العمليات الزراعية على نشاطات الأوراق و المن والذبابة البيضاء التي تصيب نباتات الباذنجان والفلفل

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أجريت هذه الدراسة لتقييم تأثير بعض العمليات الزراعية على حشرات نشاطات الأوراق والمن والذبابة البيضاء التي تصيب نباتات الباذنجان والفلفل وذلك باستخدام ثلاثة أصناف من الباذنجان (البلدي، أونيتا، بونيكا) وكذلك ثلاثة أصناف من الفلفل (ماركوني، ماور أورلي) واستخدمت أربع مستويات من التسميد البوتاسي (صفر، 50، 100، 200 كجم سلفات بوتاسيوم 48%/الفدان) وذلك خلال موسم 2004، 2005 في منطقة ديرب نجم بمحافظة الشرقية وتم تقدير كمية المحصول وعلاقته بالتسميد البوتاسي والتركييب الكيماوي وتعداد الحشرات وقد أوضحت النتائج ما يلي:

أولاً:- 1- نشاطات الأوراق:

قد تم تسجيل 6 أنواع على الباذنجان وهي *Empoasca decedens* (Paoli), *E. decipiens* و *Cicadulina chinai* (Ghauri), *C. bipunctella* و *E. lybica* (de Berg) و *Balclutha hortensis* (Lindb) و *zea* (China).

قد تم تسجيل 5 أنواع على الفلفل وهي *Empoasca decedens* (Paoli), *E. decipiens* (Paoli) و *apicalis* (Matsch). وقد كان كل من *E. decipiens*, *E. decedens* هما النوعان السائدان على كل من الباذنجان والفلفل وقد سجل تعداد كل منهما ذروتين الأولى في الأسبوع الثالث من أغسطس والثانية في الأسبوع الثالث من سبتمبر في موسمي الدراسة.

2- تواجد نوعين من حشرات المن على كل من اصناف الباذنجان و الفلفل محل الدراسة و هما *Aphis gossypii* (Glover), *Myzus persicae* (Sulzer) وقد سجل كثافة المجموع لكل منهما ذروة عديدة واحدة في الأسبوع الثالث من أغسطس في كلا من موسمي الدراسة.

3- ذبابة القطن البيضاء

وقد سجل تعداد الأطوار الكاملة لتلك الحشرة ذروة عديدة واحدة في نهاية أغسطس بينما سجل ذروة التعداد للأطوار غير الكاملة في الأسبوع الثاني من أغسطس في كلا من موسمي الدراسة.

ثانياً:- أوضحت النتائج تأثير كل من درجة الحرارة العظمى والصغرى وكذلك الرطوبة النسبية على تعداد الحشرات وكانت درجات الحرارة ذات تأثير اعلى من الرطوبة النسبية.

ثالثاً: أوضحت النتائج صنف الباذنجان بلدي هو أكثر أصناف الباذنجان حساسية وكان الصنف بونيكا أقل الأصناف حساسية. وفي حالة الفلفل كان الصنف ماركوني هو أكثر الأصناف حساسية وكان الصنف أورلي أقل الأصناف حساسية.

رابعاً:- وقد وجد أن التسميد البوتاسي يلعب دوراً هاماً يؤثر تأثيراً معنوياً على كثافة المجموع لحشرات (نشاطات الأوراق و المن والذبابة البيضاء) حيث أنه ثبت من التجربة أن إضافة التسميد البوتاسي بمعدلات مختلفة (صفر، 50، 100، 200 كجم سلفات بوتاسيوم/فدان) إلى النباتات تحت الدراسة كان له تأثير كبير في زيادة بعض المكونات الكيماوية داخل النبات مثل البروتين والكاربوهيدرات وارتفاع رقم الحموضة والذي ترتب عليه انخفاض معنوي في تعداد الحشرات تحت الدراسة وزيادة كمية المحصول.

لذلك يوصى بالاهتمام بالتسميد البوتاسي مع اختيار الأصناف المناسبة ووضعها ضمن برنامج مكافحة المتكاملة لتلك اللافات.



Table (2): Total numbers of leafhopper, aphid and whitefly insects infesting eggplant at Diarb-Nigm district, Sharkia Governorate, Egypt, during 2004 and 2005 seasons.

Date of inspection (weekly)	leafhoppers				aphids				Whitefly ( <i>B tabaci</i> )				Weather factors			
	<i>E. decipiens</i>		<i>E. decedens</i>		<i>M. persicae</i>		<i>A. gossypii</i>		Adult stage		Immature stages		Mean temp. C°		Mean RH%	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
July 1	0	0	0	0	0	0	0	0	0	0	0	0	29.96	31.44	67.86	65
2	0	0	2	0	1	0	0	0	4	5	0	0	30.29	30.36	71	65.71
3	4	4	8	4	2	2	6	4	6	16	12	6	28.34	30.36	66.57	67.71
4	6	11	13	19	23	23	18	20	13	22	106	172	29.72	29.93	67.9	67.00
August 1	14	21	17	31	51	62	29	32	61	32	350	386	27.83	30.21	68.72	67.57
2	31	53	20	42	95	122	41	51	77	85	453	471	30.03	30.21	68.78	66.27
3	71	80	34	49	151	198	73	86	82	148	330	390	29.71	30.88	65.5	66.86
4	50	58	16	14	105	177	52	78	169	203	257	300	29.45	30.4	67.95	65.43
Sept 1	28	33	9	19	85	124	40	56	115	172	233	268	30.17	28.00	68.29	62.57
2	36	50	25	29	57	71	30	40	92	118	164	208	27.09	29.86	63.93	64.28
3	57	70	29	40	38	31	19	21	60	72	153	184	27.31	29.13	62.43	64.00
4	17	27	2	11	19	16	7	9	26	36	88	108	28.53	28.7	61.22	61.55
Oct. 1	9	17	0	6	-	-	-	-	-	-	58	63	26.99	27.08	55.57	60.43
2	1	8	0	2	-	-	-	-	-	-	22	23	24.26	28.52	57.57	66.71
Total	324	432	175	266	627	826	315	397	705	909	2226	2579				

Table (3): Total numbers of leafhopper ,aphid and whitefly insects infesting pepper plants at Diarb-Nigm district , Sharkia Governorate, Egypt during 2004 and 2005 seasons.

Date of inspection (weekly)	leafhoppers				Aphids				Whitefly ( <i>B tabaci</i> )				Weather factors			
	<i>E decipiens</i>		<i>E decedens</i>		<i>M. persicae</i>		<i>A. gossypii</i>		Adult stage		Immature stages		Mean temp. C°		Mean RH%	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
July 1	0	0	0	0	0	0	0	0	0	0	0	0	29.96	31.44	67.86	65.0
2	0	0	0	0	0	14	0	0	0	0	0	0	30.29	30.36	71.00	65.71
3	3	4	2	3	3	42	4	6	2	2	0	4	28.34	30.36	66.57	67.71
4	11	19	6	18	29	93	17	30	8	9	13	29	29.72	29.93	67.90	67.00
August 1	20	28	14	31	79	115	31	61	27	31	47	88	27.83	30.21	68.72	67.57
2	28	42	21	43	126	171	56	106	52	63	177	190	30.03	30.21	68.78	66.27
3	38	63	38	65	153	212	85	155	70	99	153	154	29.71	30.88	65.5	66.86
4	25	37	17	37	132	185	64	122	137	166	107	118	29.45	30.4	67.95	65.43
Sept.1	17	20	13	22	95	145	49	83	123	136	75	124	30.17	28.00	68.29	62.57
2	21	27	21	29	80	112	35	48	77	105	60	78	27.09	29.86	63.93	64.28
3	32	44	27	47	48	77	23	28	35	73	37	53	27.31	29.13	62.43	64.00
4	6	14	8	14	19	33	8	15	17	37	5	16	28.53	28.7	61.22	61.55
<b>Total</b>	201	298	167	309	764	1199	372	654	548	1269	674	854				

6

Table (7):Effect of potassium fertilization on some chemical constituents (Total protein %,carbohydrate %, pH value Ca%, P% and K% ) of three eggplant varieties and its relation with certain homopterous insects infestation during 2005 season

Plant variety	"k" Fertilization levels	P.C	C.C	PH	Ca%	P%	K%	Leafhoppers		Total	Aphids		Total	Whitefly ( <i>b. tabaci</i> )		Total
								<i>E. decedens</i>	<i>E. decipiens</i>		<i>M. persicae</i>	<i>A. gossypii</i>		Adult stage	Immature stage	
								Bonica	zero		1.06	3.75		6.0	1.06	
	50	1.69	3.82	6.3	1.25	0.10	2.12	11.14	15.29	26.43	26.42	18.58	45	39.58	123.71	163.29
	100	1.9	3.98	7.1	1.29	0.15	2.25	9.36	12.43	21.79	21.75	15	36.75	34.83	116.14	150.97
	200	1.93	4.65	7.6	1.45	0.15	3.00	8.5	10.43	18.93	18.67	12.5	31.17	30	108.71	138.71
Oneta	zero	1.01	2.92	5.6	1.31	0.091	1.9	16.21	26.36	42.57	43.5	28	71.5	54.17	158.07	212.24
	50	1.29	3.02	6.0	1.22	0.089	2.4	13.93	23	36.93	37.67	23.92	61.59	47.92	147.64	195.56
	100	1.48	3.2	6.5	1.26	0.091	2.51	11.93	19.93	31.86	32.08	19.58	51.66	42.58	138.43	181.01
	200	1.52	3.52	6.8	1.28	0.094	2.91	10.79	17.29	28.08	27.25	16.33	43.58	37.67	131.21	168.88
Balady	zero	1.03	3.19	5.47	1.0	0.094	1.80	19	30.86	49.86	68.83	33.08	101.91	75.75	184.21	259.96
	50	1.42	3.26	5.8	1.04	0.080	2.3	16.71	27.04	43.75	60.83	28.33	89.16	68.42	174.64	243.06
	100	1.51	3.72	5.9	1.04	0.081	2.5	14.29	23.71	38	54.5	22.92	77.42	61.92	165	226.92
	200	1.89	4.35	6.5	1.07	0.092	2.9	11.79	20.71	32.5	40.42	19.92	60.34	55.75	156.43	212.18
	F	**	**	**	N.S	N.S	**									

PC. Protein content C.C. = carbohydrate content

**Table(8): Effect of potassium fertilization on total protein %, carbohydrate %, , PH values, Ca% P% and K% of pepper plant varieties and its relation with certain homopterous insects infestation during 2005 seasons**

Plant variety	"k" Fertilization levels	P.C.	C.C.	PH	Ca%	P%	K%	Leafhoppers		Total	Aphids		Total	Whitefly ( <i>b. tabaci</i> )		Total
								<i>E. decedens</i>	<i>E. decipiens</i>		<i>M.persicae</i>	<i>A.gossypii</i>		Adult stage	immature stage	
								Orly	zero		1.62	2.89		6.0	1.0	
50	1.8	3.5	6.5	1.04	0.35	3.9	13.33		15.17	28.5	61.5	34.17	95.67	33.67	53.42	87.09
100	1.9	3.92	7.4	1.25	0.4	4.2	10.58		12.08	22.66	52.67	29.42	82.09	28.17	47.17	75.34
200	2.61	5.0	7.92	1.3	0.4	4.9	8.67		9.67	18.34	45.08	25.33	70.41	22.92	41.58	64.5
Maor	zero	1.6	2.69	6.0	1.6	.032	3.7	21.42	21.58	43.0	86.83	46.83	133.66	53.25	65.67	118.92
	50	1.89	3.28	6.7	1.35	0.4	4.0	18.08	18.75	36.84	78.17	41.92	120.09	47.92	59.92	107.84
	100	2.05	3.91	7.2	1.5	0.42	4.08	15.42	16	31.42	71.62	37.67	109.34	39.33	54.42	93.75
	200	2.4	4.72	7.82	1.59	0.42	5.0	13.67	13.75	27.42	63.92	32.92	96.84	34.58	49.17	83.75
Markoni	zero	1.52	2.55	5.8	1.5	0.31	3.53	25.75	24.83	50.58	99.92	54.5	154.42	53.92	71.17	125.09
	50	1.71	3.0	6.4	1.4	0.34	4.2	22.25	21.17	43.42	88.83	46.92	135.75	52.42	63.42	115.84
	100	1.82	3.5	6.9	1.45	0.4	4.7	19.25	17.75	37.0	80.92	40	120.92	45.83	55.67	101.5
	200	2.2	4.54	7.5	1.52	0.39	4.9	16.42	14.58	31.0	70.67	34.5	105.17	38.58	50.92	89.5
	F	**	**	**	N.S	N.S	**									

P.C. Protein content      C.C. = carbohydrate content

