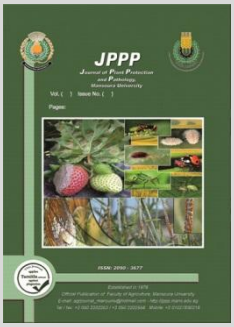
Journal of Plant Protection and Pathology

Journal homepage & Available online at: www.jppp.journals.ekb.eg

Effect of Sowing Dates, Potassium and Nitrogen Fertilization on Some Homopterous Insects Infesting Barley Plants in Sharkia, Governorate

Hegab, M. A. M.[1]*; Sara E. El-Deeb[2] and M. A. M. Hegab[3]

[1]Plant Protection Department, Faculty of Agriculture, Damietta University, Egypt.
[2]Plant Protection Department, Faculty of Agriculture, Moshtohor, Benha University, Al-Qalyubia., Egypt.
[3]Plant Protection Department, Faculty of Agriculture, Zagazig University, Egypt



ABSTRACT

Effect of three sowing dates of barely plants (Beginning of November, Middle of November and End of November) and different rates of potassium and nitrogen fertilizations on population density of some homopterous insects (aphid, leafhopper and planthopper) and crop yield during two successive seasons (2022/23 and 2023/24) was examined. The obtained results could be summarized as follows: a) Sowing dates had a significant effect on the incidence and rate of infestation of barely plants by the aforementioned insects; b) Potassium and nitrogen fertilizations of barely plants influenced on the relative occurrence of the above mentioned insects since the highest mean number of insects occurred with F1treatment (zero potassium sulfate fertilizer),while the lowest mean number was recorded with F4treatment (100 kg. potassium sulfate/fedd.); c) Infestation by aphid, leafhopper and planthopper insects increased almost proportionality as the added amount of nitrogen fertilizer increased; d) Chemical analysis of plant samples showed that there was a reverse relationship between protein and carbohydrate contents and density of the previously insects on all tested potassium fertilized barely plants, while a positive relationship between pH values and insect densities was obtained; and f) the highest yield was obtained when barely plants were early sown on the beginning of November in both seasons.

Keywords: Aphids, Leafhopper, Planthoppers**,** Sowing dates, population density, Chemical analysis

INTRODUCTION

The cereals are members of the grass family (family also known as Gramineae), such as wheat, rice, maize and barley. Their starchy grains are used as a staple food for millions of people globally in both developed and developing countries. The term cereal is not limited to these grains, but also refers to foodstuff prepared from the starchy grains of cereals like flours, breads and pasta. On a worldwide basis, wheat, rice, maize and barely are the most important crops, accounting for over 50% of the world's cereal production. Cereals and cereal products are an important source of energy, carbohydrate, protein, and fiber, as well as containing a range of micronutrients such as vitamin E, some of the B vitamins, magnesium, and zinc (Newman and Newman, 2006; Mohsena-Mansour, 2017; Kalsa *et al*., 2019; Omkar and Tripthi,2020 and El-Kady *et al*., 2022). Crop losses are usually defined as the reduction in either quantity or quality of yield and these may be caused by a biotic and biotic factors, leading to the reduction in crop productivity. Losses can occur at any stage of crop production in the field (Oerke, 2006). Direct yield losses caused by insects and pathogens and both are responsible for 20–40% loss of global agricultural productivity (Sharma *et al*., 2018; Kalsa *et al*., 2019; Omkar and Tripthi,2020). Among several pest species that attacking those plants, the piercing-sucking insects such as aphids, leafhoppers and planthoppers inflict great economic loss either directly by sucking the plant sap or indirectly by carrying and transmitting the plant pathogens. Several researchers have discovered that homopterous insects play an important role as vectors of phytopathogenic diseases (Nielson,1968; Harris and Maramoarsh,1980; Hegab,1980; Hegab,2016 and 2022).The limited data available indicate that arthropods may destroy18–20% of the annual crop production(Ammar and Farrag,1976; El-Nahal *et al*., 1977; Aboul Atta, 1983; Hegab *et al*., 1989; Amer,2016; Sharma *et al*., 2018; Kalsa *et al*., 2019). Agricultural practices in barely fields that might minimize populations of pest species, especially homopterous insects are highly required. Thus, the present study aimed to examine the effect of sowing dates and fertilization on population density of some aforementioned insects and crop yield, as a way to recommend with the appropriate date for barely plantation and the best rates of potassium and nitrogen fertilization in the Integrated Pest Management programs.

MATERIALS AND METHODS

Effect of varying sowing dates on populations of some homopterous species

The present study was conducted in an area about 1500 m^2at Diarb-Nigm district, Sharkia Governorate during two successive seasons (2022/23 and 2023/24) This area was cultivated with the common used barely variety namely Giza 126 in three different sowing dates (beginning of November, middle of November and end of November) during both seasons. The randomized block design with three replicates was used for each sowing date. All the experimental plots received the recommended agricultural practices and no chemical control treatments were applied.

Impact of nitrogen and potassium fertilizations on populations of some homopterous species and crop yield

In addition, the effect of nitrogen and potassium fertilization on population density of some homopterous insect species that attacking barely was also examined. In this

* **Corresponding author.**
E-mail address: mohmoudhegab@du.edu.eg
DOI: 10.21608/jppp.2025.358372.1311

regard, seeds of Giza 126 variety was also planted in the recommended date (middle of November) during 2022/23 and 2023/24 seasons. Each fertilization rate was replicated three times, and the replicates were arranged in completely randomized design. Four rates of potassium sulfate 33 % (zero, 50, 75 and 100 kg. /feddan) were applied with the recommended rates of phosphorus and nitrogen. For nitrogen fertilizations, the above described procedures for potassium fertilizer were followed. Four rates of nitrogen (Urea 46%)(50, 100, 150, and 200 kg./fedd.) with the recommended rates of phosphorus were applied. Plant and sweep-net samples started when the age of the plants reached about one month old and continued at weekly intervals throughout the growing seasons until the harvest time. Weekly samples of plant samples (10 tassels and 20 leaves) were taken from ten plants chosen randomly to record the aphid, leafhopper and planthopper insect populations. Weekly samples by 50 double strokes of sweeping net technique (35 cm diameter and 60 cm. deep) were also taken from both diagonal directions of the experimental area. These samples were placed in paper bags and transferred to the laboratory for inspection using binocular microscope. The total numbers of existing aphid individuals on both surfaces of the leaves and tassels identified based on methods of Habib and El-Kady (1961), Szelegiewiez (1977) and Tawfik (2001), whereas leafhopper and planthopper insect species identified based on those of Heraky (1980), Hegab *et al.* (1987 and 1988).The amounts of yield for each experimental unites were also counted.

Chemical analysis

In addition, the impact of potassium and nitrogen fertilizations of barely plants on population density of aphid, leafhopper and planthopper insect species along with the yield quantity were also determined**.** Chemical composition of barely plants fertilized using potassium and nitrogen were carried out in Central Laboratory, Faculty of Agriculture, Zagazig University to determine the total protein and carbohydrate contents, pH values, phosphorous, calcium and potassium contents.

Statistical analysis

The effect of sowing dates ,potassium , nitrogen fertilizations and their chemical composition on population density of the major insect species (aphid, leafhoppers and planthoppers) that inhibiting barely plants along with the obtained yield quantities were statistically analyzed according to Little and Hills (1975).

RESULTS AND DISCUSSION

Effect of certain agricultural practices on the population density of the main homopterous attacking barely plants.

Effect of sowing dates:

Aphid species

The present data in Tables 1&2 showed the mean numbers and relative density of aphid species attacked barely (Giza 126 variety) plants at different sowing dates for the two successive growing seasons of 2022/23 and 2023/24 In the first sowing date (Beginning of November) the mean number of all aphid species occurred with 76.86 &101.32 insects/sample and relative density 60.00% & 62.94% during 2022/23 and 2023/24 seasons, respectively. While, in the third sowing date (End of November) the mean number of all aphid species were recorded with a mean number of 149.71& 208.29 insects/sample and relative density 62.35% & 67.17% during 2022/23 and 2023/24 seasons, respectively.

The initial sowing date (beginning of November) was recorded the lowest mean number of the four aphid species, *R. padi*, *R. maidis*, *S. graminum*, *and S.avenae*, with, with 29.77, (23.24%) & 21.77, (16.99%) & 14.88, (11.62%) and 10.44 individuals/sample, (8.15%) respectively in 2022/23 season.

The third sowing date (end of November) during the first season (2022/23) had the greatest mean numbers of the aphid species indicated above, with 48.66, (20.26%) & 41.68, (17.36%) & 31.02, (12.92%) and 28.35 individuals/ sample, (11.81%), respectively. The second sowing date (mid-November) had a moderate population density of aphid insects on barely plants in 2022/23 (Table 1).

Leafhoppers species

The results in Tables 1&2 showed the mean number of leafhopper insects infested barely plants at various sowing dates during the two consecutive seasons 2022/23 and 2023/24.Results also shown that all leafhopper species were found with a mean number of 37.45 and 44.87 individuals/sample and relative density 29.23% and 27.87% in 2022/23 and 2023/24 seasons, respectively.

The largest mean number for the different leafhopper species *Empoasca decedens*, *E. decipiens*, *Balclutha hortensis* and *Cicadulina chinai* were recorded in the third sowing date (End of November) during the first season 2022/23, represented by 19.77, (8.24%) & 18.40, (7.66%) & 15.37 (6.40%) and 15.00 individuals/sample (6.25%), respectively (Table1).While, the fewest mean number for the aforementioned leafhopper species was reported in the first sowing date (Beginning of November) with 11.64, (9.09%) & 9.24, (7.21%) & 8.31, (6.48%) and 8.26 individuals/sample (6.45%), respectively during 2022/23 season (Table1). The second sowing date (mid- November) had a moderate population density of leafhopper insects on barely plants in 2022/23 (Table 1).

Planthopper species

Results were given in Tables (1&2) also shown that all planthopper species were found with a mean number of 13.79 &14.79 individuals/sample and relative density 10.77 % and 9.19 % in 2022/23 and 2023/24 seasons, respectively.

As indicated in Table (1), the maximum mean number for the distinct planthopper species *S. vibix* and *S. furcifera* was appeared on the third sowing date (End of November) of the first season (2022/23) and represented by 11.06 (4.61%) and 10.80 individuals/sample (4.49%) respectively, While, the lowest mean numbers for the planthopper species were reported in the first sowing date (beginning of November) with 7.04, (5.50%) and 6.75 individuals/sample, (5.27%), respectively (Table1). The second sowing date (mid-November) had moderate population density of planthopper insects on barely plants in 2022/23 (Table 1). Similar results were obtained in the second season of study 2023/24 (Table 2).

Statistical analysis found that there were highly significant differences between the different sowing dates for each aphids, leafhoppers and planthopper species.

The conclusion for the results in Tables 1&2 showed that the sowing date in the end of November attacked the greatest mean number of aphid, leafhopper and planthopper insects (149.71 & 208.29), (68.54 & 77.13) and (21.86 & 24.66 individuals /sample for the above mentioned insects) in

2022/23 and 2023/24 seasons, respectively followed by the sowing date in the middle of November (124.43 &144.66), (54.32 & 57.29) and (19.44 & 21.17 individuals/sample for the aforementioned insects) in 2022/23 and 2023/24 seasons, respectively), while the sowing date in the beginning of November was represented the lowest numbers by (76.86 &101.32), (37.45& 44.87) and (13.79 &14.79) individuals/sample for the previously insects) in 2022/23 and 2023/24 seasons, respectively), It is worth to mention that during 2023/24 season, aphid, leafhopper and planthopper insects were recorded the highest mean than 22022/23 season.

As demonstrated in Tables (1 and 2), the yield of barely crop was greatly influenced by changing the sowing dates between the two seasons.The best yields were 18.33 ,19.66 kg./plot in the first sowing date (beginning of November) in the 2022/23 and 2023/24 seasons, respectively. The lowest yields of 16.33 and 17.33 kg./plot were obtained on the third sowing date (end of November), respectively during 2022/23 and 2023/24 seasons.The yield from the other treatments examined was moderate.

The current results are consistent with those obtained by (Hassanein 1994; El-Defrawy *et al*. 2000; El-Gindy 2002; Hashem *et al*. 2011; Abdel-Samad and Al-Habashy 2013; Noura–Elmashaly 2013; Awadalla *et al*.2017; Mohsena-Mansour, 2017; Alaa- Elshyeb 2020; Hegab,2015; Hegab,2022 and El-Kady *et.al*.,2022). They stated that several aphid, leafhopper, and planthopper species were collected from various field and vegetable crops, and that the host plants had a significant impact on the occurrence of piercing-sucking insects.

Table 1. The mean numbers and relative density of the dominant homopterous insects infesting barely plants (Giza 126 variety) at different sowing dates throughout 2022/2023 season.

Sowing dates	1st. sowing date (First of November)		2 nd. sowing date (Mid of November)		3 rd. sowing date (End of November)		F. values
Insect species	Mean numbers	Relative density %	Mean numbers	Relative density %	Mean numbers	Relative density %	
Rhopalosiphum padi	29.77 c	23.24	41.33 b	20.85	48.66 a	20.26	32.64**
R. maidis	21.77 c	16.99	34.4 b	17.38	41.68 a	17.36	28.22**
Schizaphis graminum	14.88 c	11.62	26.22 b	13.23	31.02 a	12.92	26.86**
Sitobion avenae	10.44 c	8.15	22.44 b	11.32	28.35 a	11.81	23.34**
General means of aphid insects / sample	76.86 c	60.00	124.43 b	62.78	149.71 a	62.35	49.32**
Empoasca decedens	11.64 c	9.09	15.44 b	7.79	19.77 a	8.24	21.32 **
E. decipiens	9.24 c	7.21	14.22 b	7.18	18.40 a	7.66	19.84**
Balclutha hortensis	8.31 c	6.48	12.44 b	6.27	15.37 a	6.40	18.24**
Cicadellina chinai	8.26 c	6.45	12.22 b	6.17	15.00 a	6.25	16.72**
General means of leafhoppers insects / sample	37.45 c	29.23	54.32 b	27.41	68.54 a	28.55	38.96**
Sogatella vibix	7.04 c	5.50	10.00 b	5.04	11.06 a	4.61	14.64**
S. furcifera	6.75 c	5.27	9.44 b	4.77	10.80	4.49	13.98**
General means of planthoppers insects / sample	13.79 c	10.77	19.44 b	9.81	21.86 a	9.10	28.24**
yield kg./plot	18.33 a		17.33 b		16.33 c		6.36*

N.B.: F. values were 4.76 and 9.78 at p> 0.05 and p >0.01 ,respectively and the numbers followed by the same letter within a row are not significantly different.

Table 2. The mean numbers and relative density of the dominant homopterous insects infesting barely plants (Giza 126 variety) at different sowing dates throughout 2023/2024 season.

Sowing dates	1st. Sowing date (First of November)		2 nd. Sowing date (Mid. of November)		3 rd. Sowing date (End of November)		F. values
Insect species	Mean numbers	Relative density%	Mean numbers	Relative density%	Mean numbers	Relative density%	
Rhopalosiphum padi	32.66 c	20.30	48.00 b	21.51	61.86 a	19.95	36.34 **
R. maidis	28.35 c	17.61	43.11 b	19.32	54.66 a	17.62	32.56 **
Schizaphis graminum	22.00 c	13.66	28.00 b	12.55	47.77 a	15.41	30.48 **
Sitobion avenae	18.31 c	11.37	25.55 b	11.45	44.00 a	14.19	27.64 **
General means of aphid insects / sample	101.32 c	62.94	144.66 b	64.83	208.29 a	67.17	53.68 **
Empoasca decedens	13.28 c	8.25	16.44 b	7.37	21.82 a	7.04	23.62 **
E. decipiens	11.82 c	7.34	14.55 b	6.52	19.37 a	6.25	21.12 **
Balclutha hortensis	10.04 c	6.24	13.28 b	5.95	18.26 a	5.89	19.38 **
Cicadellina chinai	9.73 c	6.04	13.02 b	5.84	17.68 a	5.70	18.28 **
General means of leafhopper insects / sample	44.87 c	27.87	57.29 b	25.68	77.13 a	24.88	42.48**
Sogatella vibix	7.55 c	4.69	10.77 b	4.83	12.62 a	4.07	16.86 **
S. furcifera	7.24 c	4.50	10.40 b	4.66	12.04 a	3.88	15.62 **
General means of planthopper insects / sample	14.79 c	9.19	21.17 b	9.49	24.66 a	7.95	31.66**
yield kg./plot	19.66 a		18.66 b		17.33 c		6.22*

N.B.: F. values were 4.76 and 9.78 at p> 0.05 and p >0.01 ,respectively and the numbers followed by the same letter within a row are not significantly different.

Effects of potassium and nitrogen fertilizations

a) Effects ofpotassium fertilization

Aphid insects

As shown in Table (3), the greatest mean number of aphid insects *R. padi* , *R. maidis* , *S. graminum* and *S. avenae* during the two successive seasons 2022/23 and 2023/24 occurred on F1(zero potassium sulfate 33%/fedd.) with a mean number of (41.33 & 48.00), (34.44 & 43.11), (26.22 & 28.00) and (22.44 & 25.55 individuals/sample) for previously insects ,respectively in 2022/23 and 2023/24, respectively, followed by F2 (50 kg. potassium sulfate 33 %/fedd.) (37.46 & 41.91), (28.71 & 30.62), (22.88 & 23.84) and (19.33 & 22.13 individuals/sample), respectively), F3 (75 kg. potassium sulfate 33 /fedd.) (32.00 & 33.55), (24.97 & 27.46), (18.97 & 21.20)

and (16.57 & 19.46 individuals/sample) respectively, while the lowest mean numbers of aphid insects were recorded on F4(100 kg. potassium sulfate 33 % /fedd.) with a mean number of (27.33&26.00), (19.95 & 22.84), (14.71 &17.73) and (13.28 & 16.11 individuals/sample) for the above-mentioned aphids, respectively) in 2022/23 and 2023/24 seasons, respectively.

Leafhopper insects

Data given in Table (3), the highest mean number of leafhopper insects *E. decedens, E. decipiens, B. hortensis* and *C. chinai* in the two investigated seasons 2022/23 and 2023/24 were recorded on F1(zero potassium sulfate 33%/fedd.) with a mean number of (15.44 & 16.44), (14.22 & 14.55), (12.44 & 13.28) and (12.22 &13.02 individuals/sample) for above mentioned insects ,respectively in 2022/23 and 2023/24, respectively, followed by F2(50 kg. potassium sulfate 33% /fedd.) (13.28 & 14.04), (11.82 & 12.17), (10.53 & 10.71) and (9.15 & 10.62 individuals/sample) and F3(75 kg. potassium sulfate 33 %/fedd.) (9.82 & 10.93), (8.57 & 9.33), (8.04 & 8.35) and (6.53& 7.82 individuals/sample), respectively, while the lowest mean number of leafhopper insects were recorded on F4 (100 kg. potassium sulfate 33 %/fedd.) with a mean number of (6.93 & 8.08), (5.60 & 6.53), (5.28 & 5.64) and (3.91 & 5.11 individuals/sample) for the previously mentioned leafhoppers, respectively in 2022/23 and 2023/24 seasons, respectively.

Planthopper insects

According to data tabulated in Table (3) the lowest mean numbers of planthopper insects *S. vibix* and *S. furcifera* were found on F4(100 kg. potassium sulfate 33 %/fedd.) with a mean number of (6.35 & 6.75) and (5.86 &6.40 individuals /sample) for the previously insects, in 2022/23 and 2023/24 seasons respectively, while the greatest numbers of planthopper insects *S.vibix* and *S. furcifera* were noticed on F1(zero kg. potassium sulfate 33 %/fedd.) (10.00 & 10.77) and (9.44 & 10.40 individuals/sample) for above mentioned insects in 2022/23 and 2023/24. respectively, followed by F2(50 kg. potassium sulfate 33 %/fedd.) (9.33 &10.33) and (8.84 & 9.73 individuals/sample) and F3(75 kg. potassium sulfate 33%/fedd.) (8.04 & 9.22) and (7.66 & 8.26 individuals/sample in 2022/23 and 2023/24 seasons, respectively.

It is worth to mention that the intensity of aphid, leafhopper and planthopper insects infestation in 2022/23 and 2023/24 seasons, measured as a mean number of insects on different levels of potassium fertilized barely plants could be arranged in descending order as follows; F1(zero kg. potassium sulphate 33%/fedd.), F2(50 kg. potassium sulfate 33%/fedd.),F3(75 kg. potassium sulfate 33%/fedd.) and F4(100 kg. potassium sulfate 33%/fedd.) in the two investigated seasons.It was obvious that F4(100kg. potassium sulfate 33%/fedd.) treatment proved to be the least susceptible barely host plant for *the* aforementioned insects infestation, while F1(zero kg. potassium sulfate 33%/fedd.) treatment appeared to be the most susceptible barely plants.

As demonstrated in Table (3) the yield of barely crop was greatly influenced by changing the rates of potassium fertilization during the two seasons.The best yields were 21.66, 22.66 kg./plot in F4(100 kg. potassium sulfate 33%/fedd.) treatment in the 2022/23 and 2023/24 seasons, respectively. The lowest yields of 16.33 and 17.33 kg./plot were obtained in F1(zero kg. potassium sulfate 33%/fedd.) treatment during 2022/23 and 2023/24 seasons , respectively .

Table 3. Effect of different potassium fertilization rates of barely plants (Giza126 variety) on population density of the dominant homopterous insects during and 2022/2023 and 2023/2024 seasons .

Potassium fertilization.	Mean numbers of the main homopterous insects /sample								F.	
Rates	F1(Zero kg.) (Check)		F2 (50 kg.)		F3 (75 kg.)		F4 (100 kg.)		values	
Insect species	2022/ 23	2023/24	2022/23	2023/24	2022/23	2023/24	2022/23	2023/24	2022/ 23	2023/ 24
Rhopalosiphu padi	41.33 a	48.00 a	37.46 b	41.91 b	32.00 c	33.55 c	27.33 d	26.00 d	3136 **	33.24**
R. maidis	34.44 a	43.11 a	28.71 b	30.62 b	24.97 c	27.46 c	19.95 d	22.84 d	29.64 **	30.14**
Schizaphis graminum	26.22 a	28.00 a	22.88 b	23.84 b	18.97 c	21.20 c	14.71 d	17.73 d	23.12 **	26.16**
Sitobion avenae	22.44 a	25.55 a	19.33 b	22.13 b	16.57 c	19.46 c	13.28 d	16.11 d	22.82**	24.38**
General mean of aphid insects /sample	124.43 a	144.66 a	108.38 b	١١٨,٥٠ b	c٩٢,٥١	101.67 c	75.27 d	d٨٢,٦٨	48.64 **	52.42**
Empoasca decedens	15.44 a	16.44 a	13.28 b	14.04 b	9.82 c	10.93 c	6.93 d	8.08 d	20.24 **	22.39**
E. decipiens	14.22 a	14.55 a	11.82 b	12.17 b	8.57 c	9.33 c	5.60 d	6.53d	18.65 **	21.42**
Balclutha hortensis	12.44 a	13.28 a	10.53 b	10.71 b	8.04 c	8.35c	5.28 d	5.64 d	17.95 **	19.32**
Cicadellina chinai	12.22 a	13.02 a	9.15 b	10.62 b	6.53 c	7.82 c	3.91 d	5.11 d	14.28 **	16.68**
General mean of leafhopper insects /sample	54.32 a	57.29 a	44.78 b	47.5٤ b	32.96 c	36.43 c	21.72 d	25.36 d	36.42 **	41.34 **
Sogatella vibix	10.00 a	10.77a	9.33 b	10.33 b	8.04 c	9.22 c	6.35 d	6.75 d	13.98 **	14.24**
S. furcifera	9.44 a	10.40 a	8.84 b	9.73 b	7.66 c	8.26 c	5.86 d	6.40 d	10.96 **	12.84**
General mean of planthopper. insects /sample	19.44 a	21.17 a	18.17 b	20.06 b	15.70 c	17.48 c	12.21	13.15 d	23.65 **	29.42 **
Yield kg./ polt	17.33 d	18.66 d	18.66c	20.33 c	20.33 b	21.66 b	21.66 a	22.66 a	5.94*	6.12*

N.B.: F. values were 4.76 and 9.78 at p> 0.05 and p >0.01 ,respectively and the numbers followed by the same letter within a row are not significantly different.

b) Effects ofnitrogen fertilization

Date presented in Table (4) showed the influences of nitrogen fertilization of barely plants on the population density of aphid, leafhopper and planthopper insects under the field conditions during 2022/23 and 2023/24 seasons, the largest mean number of aforementioned insects occurred on F4 (200 kg. Urea 46%/fedd.) treatment with a mean number of (199.18 & 223.79), (81.71&95.09) and (27.06 & 33.86 individuals/sample) for previously insects in 2022/23 and 2023/24, respectively, followed by F3 (150 kg. Urea 46%/fedd.) (165.22&181.46), (69.76 & 72.51) and (24.21 & 30.64 individuals/sample), respectively), F2 (100 kg. Urea 46%/ fedd.) (124.43 & 144.66), (54.32 & 57.29) and (19.44 & 21.17 individuals/sample), respectively), while, the lowest total number of insects were recorded on F1(50 kg. Urea 46%/fedd.) with a mean number of (100.89 & 116.29), (46.97 & 52.83) and (16.83 & 19.10 individuals/ sample) for the above-mentioned insects, respectively) in 2022/23 and 2023/24 seasons, respectively.

It was obvious that in the two seasons of study, F4(200 kg. Urea 46%/feddan) treatment proved to be the highest susceptible barely host plant for the piercing-sucking insects' infestation, while F1(50 kg. Urea 46%/fedd.) treatment appears to be the least susceptible barely plants.

As shown in Table (4) the yield of barely crop was greatly influenced by changing the rates of nitrogen fertilization during the two seasons.The best yields were 21.66, 22.66 kg./plot in F4(200 kg. Urea 46%/fedd.) treatment in the 2022/23 and 2023/24 seasons, respectively. The lowest yields of 16.33 and 17.33 kg./plot were obtained in F1(50 kg. Urea 46%/fedd.) treatment during 2022/23 and 2023/24 seasons, respectively .

Generally, it is obvious that all the tested barely plants were highly infested in the second season than the first one (Tables 1&2), this may be due to the differences in environmental factors e.g. weather factors and natural enemies prevailing in the second season of investigation.The obtained results agreed with the findings of (Salman, 2000; El-Gindy, 2002; Abdel-Samad, 2006; Awadalla *et al*. 2011 and 2014; Hegab,2016 and 2022 and El-Kady *et al*. 2022) they reported that the potassium and nitrogen fertilization of host plants had a great effect on population density of piercing-sucking insects.

Table 4. Effect of different nitrogen fertilization rates of barely plants (Giza 126 variety) on population density of the dominant homopterous insects during 2022/23 and 2023/24 seasons.

Nitrogen fertilization rates	Mean numbers of the main homopterous insects / sample								F. values	
	F1(50kg.)		F2(100 kg.)		F3(150 kg.)		F4(200 kg.)			
Insect species	2022/23	2023/24	2022/23	2023/24	2022/23	2023/24	2022/23	2023/24	2022/23	2023/24
Rhopalosiphum padi	35.30^{d}	39.55^{d}	41.33^{c}	48.00^{c}	55.28^{b}	59.41^{b}	62.75^{a}	67.20^{a}	34.54**	36.34**
R. maidis	28.40^{d}	32.22^{d}	34.44^{c}	43.11^{c}	48.84^{b}	53.15^{b}	55.15^{a}	60.55^{a}	31.24**	33.46**
Schizaphis graminum	21.02^{d}	22.66^{d}	26.22^{c}	28.00^{c}	32.62^{b}	36.84^{b}	44.08^{a}	51.73^{a}	30.16**	32.38**
Sitobion avenae	16.17^{d}	21.86^{d}	22.44^{c}	25.55^{c}	28.48^{b}	81.95^{b}	37.20^{a}	44.31^{a}	26.22**	29.68**
General mean number of aphid insects / sample	100.89^{d}	116.29^{d}	124.43^{c}	144.66^{c}	165.22^{b}	181.46^{b}	199.18^{a}	223.79^{a}	5186 **	56.26 **
Empoasca decedens	12.97^{d}	15.00^{d}	15.44^{c}	16.44^{c}	21.55^{b}	22.13^{b}	24.88^{a}	28.62^{a}	23.68**	24.12**
E . decipiens	12.48^{d}	13.77^{d}	14.22^{c}	14.55^{c}	18.35^{b}	19.28^{b}	21.91^{a}	24.97^{a}	20.12**	23.89**
Balclutha hortensis	10.57^{d}	12.40^{d}	12.44^{c}	13.28^{c}	15.95^{b}	16.84^{b}	18.84^{a}	22.17^{a}	18.38**	21.98**
Cicadulina chinai	9.95^{d}	11.66^{d}	12.22^{c}	13.02^{c}	13.91^{b}	14.26^{b}	16.08^{a}	19.33^{a}	17.48**	20.32**
General mean number of leafhopper insects / sample	46.97^{d}	52.83^{d}	54.32^{c}	57.29^{c}	69.76^{b}	72.51^{b}	81.71^{a}	95.09^{a}	40.32**	45.48 **
Sogatella vibix	8.57^{d}	9.68^{d}	10.00^{c}	10.77^{c}	13.28^{b}	15.42^{b}	15.24^{a}	17.73^{a}	15.54 **	18.26**
S .furcifera	8.26^{d}	9.42^{d}	9.44^{c}	10.40^{c}	10.93^{b}	15.22^{b}	11.82^{a}	16.13^{a}	14.38**	16.84**
General mean number of planthopper insects / sample	16.83^{d}	19.10^{d}	19.44^{c}	21.17^{c}	24.21^{b}	30.64^{b}	27.06^{a}	33.86^{a}	26.28**	34.68 **
yield kg./plot	18.33^{d}	17.66^{d}	19.66^{c}	18.66^{c}	20.66^{b}	20.33^{b}	21.33^{a}	21.66^{a}	5.82*	6.24*

N.B.: F. values were 4.76 and 9.78 at p> 0.05 and p >0.01 ,respectively and the numbers followed by the same letter within a row are not significantly different.

Effects of chemical constituents of the fertilized barely plants on the dominant homopterous insect species:

a)Potassium fertilized plants

Protein , carbohydrate contents and PH values:

Data given in table (5) showed significant effects of different chemical constituents of different potassium fertilized barely plants on the main piercing-sucking insect species were significant during 2023/24 season. The intensity of aphid, leafhopper and planthopper insects infestation measured as a mean numbers of different homopterous insect species could be arranged in descendingly order as follow: F1(zero kg. potassium sulfate 33 %/fedd.) (144.66 & 57.29 and 21.17 insects/sample for the above mentioned insects, respectively), with a total protein 13.25%, carbohydrate 30.64 % and PH 4.86), F2(50 kg. potassium sulfate33%/fedd.) (118.50 & 47.54 and 20.06 insects/sample) respectively,with a total protein 16.18 %, carbohydrate 33.98 % and PH 5.12), F3(75 kg. potassium sulfate 33%/fedd.) (101.67 & 36.43 and 17.48 insects/sample for the previously insects, respectively) with a total protein 17.48 %, carbohydrate 35.70 % and PH 5.38, and F4(100 kg. potassium sulfate 33%/fedd.) (82.68 & 25.36 and 13.15 insects/sample, respectively) with a total protein 18.68 %carbohydrate 37.24 % and PH 5.56 .

It is clear that the population density of previously mentioned insects was negatively related with the total protein and carbohydrate contents and PH values of the different potassium fertilized tested barely plants. It is worth to mention that increasing potassium fertilization lead to increase the total protein in treated plant juice, although increasing total protein the population density of the main piercing –sucking insects decrease, it may be due to that protein is related with some chemical constituents of juice and the soluble protein which the insects obtained decrease , therefore the population density decrease ,in additional to increasing the cell thickness of treated plants by the potassium fertilizer (Hegab,2015 ; El-Kady *et al.* 2022).

Table 5. Effect of chemical constituents of different potassium fertilization rates of barely(Giza126 variety) plants on population density of the dominant homopterous insects in 2023/24 season.

Chemical constituents	Potassium fertilization rates				F. values
	00 kg. (check)	50 kg.	75 kg.	100 kg.	
Carbohydrate %	30.64^{d}	33.98^{c}	35.70^{b}	37.24^{a}	8.24*
Protein %	13.25^{d}	16.18^{c}	17.48^{b}	18.68^{a}	6.98*
PH	4.86^{d}	5.12^{c}	5.38^{b}	5.56^{a}	5.84*
K %	3.12^{a}	2.85^{a}	2.98^{a}	3.18^{a}	3.46
Ca %	1.86^{a}	2.78^{a}	2.96^{a}	3.12^{a}	3.21
P %	0.84^{a}	0.64^{a}	0.52^{a}	0.38^{a}	2.66
General mean number of aphid insects / sample	144.66^{a}	118.50^{b}	101.67^{c}	82.68^{d}	52.42**
General mean number of leafhopper insects / sample	57.29^{a}	47.54^{b}	36.43^{c}	25.36^{d}	41.34**
General mean number of planthopper insects / sample	21.17^{a}	20.06^{b}	17.48^{c}	13.15^{d}	29.42**
yield kg./plot	18.66^{d}	20.33^{c}	21.66^{b}	22.66^{a}	6.12*

These findings are in consistent with those of (Ola-Hegab, 2001; El –Gindy, 2002; Hashem, 2005; Abdel-Samed, 2006; Shalaby *et al.* 2012; Awadalla *et al.* 2013; Awadalla *et al*. 2017;Mansour- Mohsena, 2017and Alaa- Elshyeb, 2020)

they reported that chemical contents of host plants had a great effect on the epidermal cells thickness of the tested potassium fertilized maize plants and the population density of main homopterous insects infestation, (Hegab, 2022) revealed that there were a positive relationship between the different potassium fertilization levels and the epidermal cells thickness, while it was negatively related with the population density of homopterous insects on potassium fertilized plants.

b)Nitrogen fertilized plants

Protein , carbohydrate contents and PH values:

Data given in table (6) showed significant effects of different chemical constituents of the different nitrogen fertilized barely plants on the main piercing-sucking insect species were significant during 2023/24 season, the intensity of aphid, leafhopper and planthopper insects infestation measured as a mean number of insect species could be arranged in descendingly order as follow: F4(200 kg. Urea 46%/ fedd.) treatment with a mean number of 223.70 & 95.09 and 33.86 individuals/sample for previously insects, respectively with a total Protein 17.68% ,carbohydrate 37.20 % and PH 4.34 in 2023/24, followed by F3(150 kg. Urea 46%/ fedd.) (181.46 & 72.51 and 30.64 individuals/sample, respectively) with a total Protein 16.16%, carbohydrate 34.70 % and PH 4.60), F2(100 kg. Urea 46%/ fedd.) (144.66 & 57.29 and 21.17 individuals/sample, respectively) with a total Protein 13.25%, carbohydrate 30.64 % and PH 4.86), while the lowest mean number of insects were recorded on F1(50 kg. Urea 46%/fedd.) with a mean number of (116.29&52.93 and 19.10 individuals/sample for the aforementioned insects, respectively) with a total Protein 12.10%,carbohydrate 28.34 % and PH 5.22) in 2023/24 seasons, respectively.

Table 6. Effect of chemical constituents of different nitrogen fertilization rates of barely (Giza 126 variety) plants on population density of the dominant homopterous insects in 2023/24 season.

Chemical constituents	Nitrogen fertilization rates				F. values
	50 kg.	100 kg.	150 kg.	200 kg.	
Carbohydrate%	28.34 ^{d}	30.64 ^{c}	34.70 ^{b}	37.20 ^{a}	8.36*
Protein%	12.10 ^{d}	13.25 ^{c}	16.16 ^{b}	17.68 ^{a}	6.84*
PH	5.22 ^{a}	4.86 ^{b}	4.60 ^{c}	4.34 ^{d}	5.28*
K %	2.56 ^{a}	3.12 ^{a}	2.83 ^{a}	3.92 ^{a}	3.82
Ca %	1.43 ^{a}	1.86 ^{a}	2.90 ^{a}	3.15 ^{a}	3.24
P %	0.76 ^{a}	0.84 ^{a}	0.44 ^{a}	0.56 ^{a}	2.42
General mean number of aphid insects/sample	116.29^{d}	144.66^{c}	181.46^{b}	223.70^{a}	56.26**
General mean number of leafhopper insects / sample	52.93 ^{d}	57.29 ^{c}	72.51 ^{b}	95.09 ^{a}	45.48**
General mean number of planthopper insects / sample	19.10 ^{d}	21.17 ^{c}	30.64 ^{b}	33.86 ^{a}	34.68**
yield kg./plot	17.66^{d}	18.66 ^{c}	20.33 ^{b}	21.66 ^{a}	6.24 *

N.B.: F. values were 4.76 and 9.78 at p> 0.05 and p >0.01 ,respectively and the numbers followed by the same letter within a row are not significantly different.

It was obvious that in the two seasons of study, F4(200 kg.Urea 46%/Fadden) treatment proved to be the most susceptible host plant for the aforementioned piercing-sucking insects' infestation, while F1(50 kg.Urea 46%/fedd.) treatment appeared to be the least susceptible barely plants. Also, it is clear that the population density of aphid, leafhopper and planthopper insects was positively related with the total Protein and carbohydrate contents, while it was negatively related with PH values of the different nitrogen fertilized tested barely plants.

II)Phosphorous, potassium and calcium:

Statistical analysis of obtained data showed that effect of phosphorous, potassium and calcium percentages in different potassium and nitrogen fertilized barely plants were not significant (Table 5 and6).

These findings are in consistent with those of (Ola-Hegab, 2001; El –Gindy, 2002; Hashem, 2005; Abdel-Samed, 2006; Shalaby *et al.* 2012; Awadalla *et al.* 2013; Hegab, 2015; Awadalla *et al*. 2017; Mansour- Mohsena 2017; Alaa- Elshyeb 2020 and El-Kady *et al.* 2022). they reported that chemical contents of host plants had a great effect on the epidermal cells thickness of the tested potassium fertilized maize plants and the population density of main homopterous insects infestation (Hegab, 2022)revealed that there were a positive relationship between the different potassium fertilization levels and the epidermal cells thickness, while it was negatively related with the population density of homopterous insects on potassium fertilized maize plants.

REFERENCES

Abd- Elsamed, A.A. and A.Z. AL-Habshy (2013): Population dynamics of certain Homopterous insects infecting broad plants in Sharkia governorate, Egypt. Zagazig J. Agric. Res.Vol.40 No. (5).

Abdel-Samad, A. A. (2006): Studies on some homopterous insect vectors of plant diseases. Ph.D. Thesis, Fac. of Agric. Zagazig Univ.

Aboul-Atta, A. E., (1983): Auchenorrhyncha insects of certain graminecous crops and the occurrence of leafhoppers -borne disease in. Ph.D. Thesis, Fac. of Agric. Cairo Univ.

Alaa- Elshyeb, A. A. (2020): Studies on the main leafhoppers and planthoppers on some vegetable crops. Ph.D. Thesis, Fac. of Agric. Mansoura Univ.

Amer, S. A. (2016): Ecological studies on aphid species infesting main cereal crops. Annals of Agric. Science, Moshtohor, Benha Univ., 54 (1), 129-138.

Ammar, E. D and S. M. Farrag (1976): Preliminary survey and relative abundance of leafhoppers and planthoppers (Auchenorrhyncha: Homoptera) in Giza region using a specially modified light trap. Bull. Soc. Ent. Egypt 60, 297- 303.

Awadalla,S. S.; F.E.Abdallah and N. R. E. Mashaly(2013): Influence of some varieties on the main insect pests attacking faba bean plants. J. Plant Prot. and Path. Mansoura Univ.4 (6):581-589.

Awadalla, S. S.; S. B. Beleh, and M. R. K Mansour (2017): Influence of the different wheat varieties on the population density of the main aphid species in kafr El-Sheikh region. J. Plant Prot. and Path., Mansoura Univ. 8(2): 83-86.

Awadalla, S. S; L. M. Shanab; M. E. EL-Naggar and S. M. Abo-Zeid (2011): Influence of different varieties and planting dates on the main pests infesting kidney beans. J. Plant Prot. and Path., Mansoura Univ.2(4): 519-531.

Awadalla,S. S.; F. E. Abdallah and N. R. F. Mashaly (2014): Population density of main insect pests attacking Faba bean plants as influenced by sowing dates. Glob. J. Agric. food Safety Sci.1(2):169-177.

El.Kady, H. A.; S. S. Awadalla; T. E. Atta and M. A. M.Hegab (2022): Effect of different maize plant varieties on the main piercing-sucking insect pests attacking maize plants. Damietta J. Agric. Sci. 1(II): 35-42 .

El-Defrawy, G. M.; A. K. Emam; I. A., Marzouk and L. Rizkalla (2000): Population dynamics and seasonal distribution of *A. craccivora* Koch and associated natural enemies in relation to virus disease incidence in faba bean fields. Egyptian., J. of Agric. Res. 78: (2) 627-641.

EL-Gindy, M.A. (2002): Studies on certain homopterous insect vectors of plant pathogenic diseases. Ph.D. Thesis, Fac. of Agric. Zagazig Univ.

EL-Nahal, A. K. M.; E. D. Ammar and M. M. El –Bolok (1977): Survey and population density of leafhoppers, planthoppers and grasshoppers (Homoptera .Auchenorrhyncha) on field and vegetable crops at Giza. Bull. Soc. Ent. Egypt 61, 99-108.

Habib, A. and A. E. El-Kady (1961): The aphididae of Egypt. Bull. Soc. Ent. Egypt 45, 1-137.

Harris, K.F. and K. Maramoroash (1980): Vectors of plant pathogens. Academic Press, New York, London, Toronto, San Francisco, pp.467.

Hashem, M. S. (2005): Studies on certain piercing-sucking insects infesting some vegetable crops. Ph.D. Thesis, Fac. of Agric. Moshtohor, Benha Univ.

Hassanein, S. S. M. (1994): Effect of wheat varieties and foliar fertilization on incidence of corn leaf aphid, *Rhopalosiphum maidis*. Zagazig J. Agric. Res.Vol.21 No. (5).

Hegab, A. M. (1980): Potential leafhopper insect vectors of phytopathogenic agents in Hungarian fruit plantations. Ph.D. Thesis, Ent., Hungarian Acad. of Science.

Hegab, A. M.; I. M. Kelany and M. M. El - Maghraby (1987): Survey of leafhoppers and planthoppers infesting maize plants by using three techniques in newly reclaimed sandy areas at Salhia district, Egypt. Minia, J. Agric. Rec. & Dev. 9(2):945- 953.

Hegab, A. M.; I. M. kelany and A. E. Ibrahim (1988): Seasonal fluctuations and survey of certain leafhoppers fauna in stone fruit orchards in Egypt. Fayoum, J. Agric. Rec. & Dev. 2(1): 529-544.

Hegab, A. M.; M. M. Helaly and S. S. Hassanein (1989): Survey and seasonal abundance of leafhoppers species (Homoptera: Cicadellidae) infesting certain cruciferous and cucurbitaceous vegetable plants in newly reclaimed sandy areas at Salhia district, Zagazig Egypt. J. Agric. Res. 16(1): 111-121.

Hegab, M. A. M. (2015): Studies on certain piercing-sucking insects as vectors of phytopathogenic agents in Sharkia Governorate. Ph.D. Thesis, Fac. of Agric. Zagazig Univ.

Hegab, M. A. M. (2016): Studies on some piercing-sucking insect vectors of phytopathogenic diseases infesting certain leguminous plants. M.Sc. Thesis, Fac. of Agric. Damietta Univ.

Hegab, M. A. M. (2022): Ecological studies on the main piercing-sucking insect pests attacking wheat and maize crops. Ph.D. Thesis, Fac. of Agric. Damietta Univ.

Herakly, F. M. (1980): Studies on jassids in Egypt and their control (Homoptera :Cicadellidae). Ph.D. Thesis, Fac. of Agric. Ain Shams Univ.

Kalsa, K. K.; B. Subramanyam; G. Demissie; A. F. Worku and N. G. Habtu (2019): Major insect pests and their associated losses in quantity and quality of farm-stored wheat seed. Ethiop J. Agric. Sci. (29) pp.71–82

Little, T. M. and F. J. Hills (1975): Statistical methods in Agricultural Research MCD Book Store Univ. of California, Davis pp.242

Khedr, L. A.; M. A. El- Tantawy; M. M. Amir and A. A. El-Feshawy (2013): Effect of nitrogen fertilizers on some biological aspects of the cotton aphid, *Aphis gossypii* Glover infecting okra seedlings under semi-field conditions. Zagazig J. Agric. Res.Vol.40 No. (3).

Mohsena-Mansour, R. K. (2017): Influence of some agriculture practices on the main insect pests attacking wheat crop and their natural enemies. Ph.D Thesis, Fac. of Agric. Mansoura Univ.

Hashem, M. S.; A. A. Abdel-Samed and A. A. Abd-Allah (2011): Effect of certain agricultural practices on infesting of broccoli plants with certain homopterous insect in Sharkia governorate, Egypt. Zagazig J. Agric. Res.Vol.38 No. (1).

Newman, C. W. and R. K. Newman (2006): A brief history of barley foods. Cereal foods world, 51(1): 4-7.

Nielson, M.W. (1968): The leafhopper vectors of phytopathogenic viruses (Homoptera : Cicadellidae) taxonomy, biology and virus transmission. Agric. Res. Ser. M.S. Dept. Age. 89. pp. 386.

Nora- EL-Mashaly, R. A. (2013): Influence of some agricultural practices on the main insect pests attacking Faba bean and their natural enemies. Ph.D. Thesis, Fac. of Agric Mansoura Univ.

Oerke, E. C. (2006): Crop losses to pests. J. Agric. Sci. 144:31–43.

Ola- Hegab, I. M. (2001):Studies on some insect vectors of plant pathogenic agents. Ph.D. Thesis, Fac. of Agric. Zagazig Univ.

Omkar, O. and A. K. Tripathi, (2020) : Sucking pests of cereals. Sucking pests of crops, pp. 3-53. ttps://link.springer.com.

Salman A.M.A. (2000): Effect of onion sowing dates on onion thrips, *Thrips tabaci* (lind) infestation in upper Egypt. Zagazig J. Agric. Res.Vol.27 No. (3).

Shalaby, H. H.; E.M. Mousa and S. A. EL-Gawwad (2012): Population fluctuations of some insect pests infesting broad bean plantations in relation to certain ecological factors. J. Plant Prot. and Path, Mansoura Univ. 3(9): 935-942.

Sharma, K. R.;S. V. Raju and D. K. Jaiswal (2018): Influence of environmental effect on the population dynamics of brown plant hopper, *Nilaparvata lugens* (Stal) and White-Backed planthopper, *Sogatella furcifera* (Hovarth) in Varanasi region. J. Ent. Res 42(3):339–342

Szelegiewiez, H. (1977): Leveltetvek Aphidine. Mezogazedasagi kiado, Budapest.

Tawfik, M. S. (2001): Ecological studies on aphids. M. Sc. Thesis, Fac. Agric. Alex. Univ.

تأثير مواعيد الزراعة والتسميد البوتاسي والنيتروجينى على أصابة بعض الحشرات المتشابهة الأجنحة لنباتات الشعير فى محافظة الشرقية

محمود على مرسى حجاب[١] ، سارة عيد الديب [٢] و محمد على مرسى حجاب[٣]

[١]قسم وقاية النبات -كلية الزراعة – جامعة دمياط
[٢]قسم وقاية النبات – كلية الزراعة بمشتهر – جامعة بنها
[٣]قسم وقاية النبات – كلية الزراعة -جامعة الزقازيق

الملخص

أجريت هذه الدراسة بهدف حصر أنواع الحشرات المتشابهة الأجنحة (حشرات المن ونطاطات الأوراق ونطاطات النباتات) وكذلك تأثير كلا من مواعيد الزراعة المختلفة لنباتات الشعير و التسميد البوتاسى والنيتروجينى على كثافة المجموع لتلك الحشرات في منطقة ديرب نجم - محافظة الشرقية باستخدام شبكه جمع الحشرات والعينات النباتية خلال موسمين متتاليين ٢٠٢٢/٢٣ , ٢٤/ ٢٠٢٣ ,وقد أوضحت النتائج: ان أنواع حشرات المن التى تصيب نباتات الشعير وفقا لكثافة التعداد تنازلياهى: *Rhopalosiphum padi, R. maidis, Schizaphis graminum,Sitobion avenae* وان نطاطات الأوراق التى تصيب نباتات الشعيروفقا لكثافة التعداد تنازلياهى: *Empoasca decedens , E. decipiens , Balclutha hortensis, Cicadulina china* وأن نطاطات النباتات *Sogatella furcifera* , *S. vibix* تم تسجيلهما على نباتات الشعير, وقد أوضحت النتائج أن أعلى تعداد من الحشرات قد تم تسجيلة على نباتات الشعير التى زرعت فى نهاية نوفمبروكانت أقلهم أنتاجا, بينما كان أقلهم تعدادا وأعلى إنتاجا تلك التى زرعت فى بداية نوفمبرخلال موسمى الدراسة,وان النباتات التى لم يتم تسميدها بالبوتاسيم (صفر كجم سلفات بوتاسيوم ٣٣٪) قد سجلت أعلى تعداد للمجموع ,على حين ان النباتات التى سمدت بمعدل ١٠٠ كجم سلفات بوتاسيوم ٣٣ %قد سجلت أقل تعداد للمجموع , كما اظهرت النتائج انه توجد علاقة موجبة بين معدلات التسميد النيتروجينى وتعداد الحشرات متشابهة الأجنحة السابق ذكرها ولقد أوضح التحليل الكيميائي لبعض مكونات العصارة النباتية للنباتات التى عوملت بالتسميد البوتاسي ان هناك علاقة سالبة بين نسبة الإصابة بالمن ونطاطات الأوراق ونطاطات النباتات وكلا من نسبة البروتين الكلى والكربوهيدرات الكلية ,على حين أن تلك العلاقة كانت موجبة فى حالة التسميد النيتروجينى ,وانه توجد علاقة سالبه بين قيمه pH ونسبه الإصابه بالحشرات السابق ذكرها فى حالة التسميد البوتاسي والنيتروجيني.