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Influence of Potassium Fertilization Levels on The Population Density of The Leafhopper and Planthopper Species Attacking Eggplant in Gharbia Governorate

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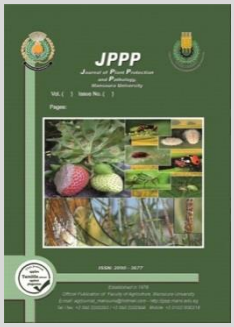

ABSTRACT

The present experiment was conducted in Zefta, Gharbia governorate to examine the influence of fertilization levels on the population density of the different leafhoppers and planthoppers attacking eggplant crop during the two successive seasons (2017and 2018). The potassium fertilization levels of zero kg/fed. to 25, 50, and 75 kg/fed. attracted the highest average number of the leafhopper and planthopper species during the two seasons. The present study indicated that increasing potassium fertilization rates from zero kg/fed. to 25, 50 and 75 kg/fed. led to a decline in the average number of the tested insect pests during the two years with significant differences. The potassium fertilization of 75 kg/fed. attracted the lowest percentage of occurrence of the tested insect pests and presented by 13.6 and 15.3 % during the two seasons 2017 and 2018, respectively.

***Keywords**:* eggplant, leafhoppers, occurrence, planthoppers, potassium .

INTRODUCTION

In Egypt, the solanaceous vegetable crops (i.e., eggplant, tomato and pepper) and the leguminous vegetable crops (i.e., faba bean, fenugreek and lupine) are the most important vegetable crops which used as a human consumption and for the export market (El-Tohamy *et al*. 2006). The piercing-sucking insect pests are attacking these crops and causing a serious damage and economic losses by directly piercing and sucking the plant sap or by transmitting plant viral diseases indirectly (Fereres and Moreno 2009 and Moura *et al*. 2012). Several species of the leafhoppers and planthoppers belonging to family Cicadellidae are common and serious insect pests which both are phytophagous and vector transmitting plant diseases which causing economic damage by feeding the plant stems and leaves in different vegetable crops (Hegab 2015, Bayoumy *et al*. 2017).

The fertilization levels for the solanaceous vegetable crops (i.e. nitrogen, phosphorus, and potassium fertilizers) may influence the insect pest population, crop quality and pest management strategy (El-Tohamy *et al*. 2006, Hashem *et al*. 2009 and Hegab 2015). For example, some investigators have been studied the relationship between nitrogen fertilizer levels and the piercing-sucking insect pests as Abo- Zaid (2011) on kidney bean and Draz *et al*. (2013) on tomato plants. Also, some investigators have been studied the effect of potassium fertilization levels on the piercing-sucking insect pests (Saleh *et al*. 2016 and Awadalla *et al.*, 2017a, b).

Therefore, the objective of the present studies aimed to evaluate the effect of potassium fertilization levels on the leafhopper and planthopper species

MATERIALS AND METHODS

The present experiments were conducted in Zefta Gharbia governorate to study the fertilization levels of potassium on the population density of the different leafhoppers and planthoppers attacking eggplant crop during the two successive seasons (2017and 2018).

The summer vegetable crop eggplant *S. melongena* var. Dai El-Kamer was chosen and transplanted in May plantation. An experimental area ca. 800 m^2 was divided into 16 plots and each plot considered as a replicate with an area of 50 m^2. Three levels of potassium fertilization in the form of potassium 24% K_2O as 25, 50, and 75 kg/fed and check (untreated or zero level) were used. For each level of potassium fertilization and check, four replicates were distributed in a randomized complete block design. Normal agricultural practices without any insecticides were done throughout the whole seasons (2017 and 2018). The population density of the insect pests was investigated by only the seep net method. Then, the collected insect pests were transferred to the laboratory in plastic bags for classification, counting and recording.

The sweep net was made from the muslin cloth (30 cm in diameter and 60 cm in deep). Two rapid strokes of across direction were performed over the plants every two steps, the sweep net was used after the 4th week of planting. Twenty-five double strokes were performed in two diameters at a cross direction in each replicate (100 double strokes for each crop). The collected insects were transferred in plastic bags containing with a piece of cotton saturated with either for anesthetizing the collected insects were transferred to the laboratory for inspection according to Hegab *et al*. (1989).

The obtained data were analysed using one-way ANOVA (CoStata software) and mean values were

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statistically compared using Duncan's Multiple Range Test (Duncan 1955).

RESULTS AND DISCUSSION

With regard to the influence of varying potassium fertilization levels on the mean number of the targeted leafhopper and planthopper species were determined on eggplant during the first season 2017. The obtained results in Table (1) indicated that, the potassium fertilization level of 0 kg/fed. attracted the highest average number of the tested insect pests. on the other hand, by adding 75 kg/fed. led to decrease the average number of the aforementioned insect pests to the lowest average number. It was observed that increase of potassium fertilization levels led to a decline in the mean number of aforementioned insect pests.

In respect to the effect of potassium rates on the average number of the main leafhopper and planthopper species on eggplant during the second season 2018 (Table 2). Also, it can be also noticed that, increasing potassium rates from 0 kg/fed. to 75 kg/fed. caused a significant decrease in the average number of the tested insect pests.

The aim of the current study was to check the relation between K fertilizer levels and the occurrence of the target insect pests. In Fig. (1), it can be observed that, the largest percentage of insect pest occurrences were estimated by 0 kg/fed. K fertilizer rate during the two seasons 2017 and 2018 and presented by 36.8% and 37.2% followed by adding 25 kg. K fertilizer (31.5 and 28.9%, respectively). Meanwhile, the lowest percentage of occurrence was found in 75 kg/fed. K. fertilizer rate during the two seasons and presented by 13.6% and 15.3%, respectively.

Data given in Tables (1 and 2) and Fig. 1 indicated that the leafhopper *E. decipiens* recorded the highest average number for each K fertilizer level and the leafhopper *Balclutha hortensis* attracted the lowest average number by the comparison with the other tested insect pests during the two successive seasons. Statistical analysis revealed that a highly significant differences were obtained for each tested insect pest species during the two seasons. Also, the highest percentage of occurrence for the aforementioned insect pests were decreased by increasing the rates of K. fertilizer from 0 kg/fed. to 75 kg/fed. kg during the two seasons.

Table 1. Effect of different potassium fertilization levels on the average number of the main leafhopper and planthopper species on eggplant during the first season 2017.

Insect species	Nitrogen fertilization levels			
	25 kg	50 kg	75 kg	0 kg (check)
Empoasca decipiens	55.9 ± 6.92 b	36.4 ± 8.70 c	28.4 ± 5.57 d	63.7 ± 10.06 a
Eampoasca decedens	48.2 ± 8.22 b	29.9 ± 6.47 c	22.1 ± 4.13 d	53.9 ± 10.36 a
Cicadulina chinai	37.9 ± 8.03 ab	19.9 ± 4.38 b	12.3 ± 2.18 c	41.2 ± 08.47 a
Balclutha hortensis	13.6 ± 3.26 b	9.4 ± 1.53 c	5.9 ± 1.58 d	24.4 ± 04.73 a
Sogatella futcifera	26.5 ± 6.07 ab	13.1 ± 2.53 b	9.9 ± 2.09 c	29.6 ± 04.22 a

Averages followed by the different letters in different fertilization levels for each insect species are significantly different.

The present results are agreeing with the findings of Youseef (2006) who reported that the highest mean numbers of the leafhopper and planthopper insects on wheat plants occurred in control treatment (i.e. without potassium fertilization), while the lowest population density of these insects were recorded in treatment fertilized with 36 unites of K/fed. Al-Habashy (2008) indicated that the lowest population density of the main piercing-sucking insect pests on wheat plants occurred in treatments with potassium fertilization level of 75 kg/fed. and the highest population density was in treatment without potassium fertilization. Hasham *et al.* (2009) suggested that the effect of using 150 or 200 kg K_2O/fed. raised the vegetative growth, crop yield and quality of broccoli and declined the population density of the leafhopper insects. Moreover, Abou-Zaid (2012) mentioned that increasing potassium fertilization on kidney bean plants from 30 to 70 unites/fed. Led to highly significant decline in the mean numbers of leafhopper species. Meanwhile, Mansour (2017) mentioned that adding potassium fertilization with rate ranged from 25 to 75 kg/fed. led to non-significant decline in the population density of the leafhopper species on wheat plants.

Table 2. Effect of different potassium fertilization levels on the average number of the main leafhopper and planthopper species on eggplant during the first season 2018.

Insect species	Nitrogen fertilization levels			
	25 kg	50 kg	75 kg	0 kg (check)
Empoasca decipiens	55.3 ± 10.35 b	42.8 ± 8.02 c	33.2 ± 5.90 d	66.8 ± 13.16 a
Eampoasca decedens	44.1 ± 07.12 b	27.4 ± 6.45 c	25.0 ± 4.21 c	54.9 ± 9.57 a
Cicadulina chinai	34.4 ± 07.01 b	18.4 ± 4.11 c	15.6 ± 3.35 c	40.4 ± 6.84 a
Balclutha hortensis	11.6 ± 02.84 b	7.3 ± 1.72 c	6.9 ± 1.74 c	23.8 ± 5.23 a
Sogatella futicifera	21.6 ± 04.64 b	11.7 ± 1.09 c	7.7 ± 1.62 d	28.7 ± 5.18 a

Averages followed by the different letters in different fertilization levels for each insect species are significantly different.

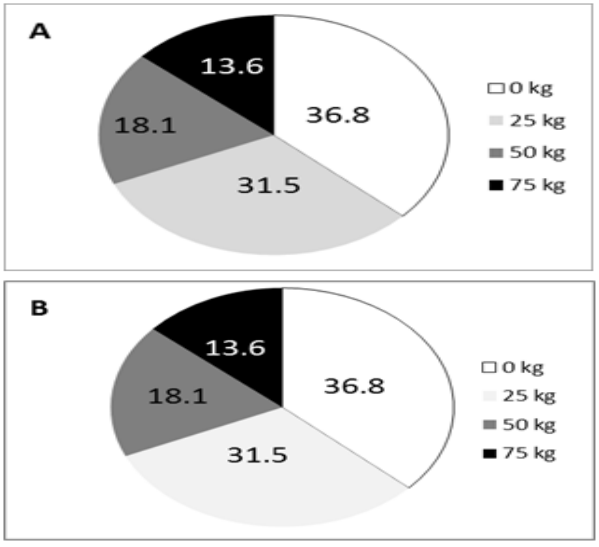

Fig. 1. The occurrence percentage for the main leafhopper and planthopper species according to different rates of K. fertilization during the first season 2017 (A) and the second season 2018 (B).

REFERENCES

Abo-Zaid, S. M. (2012). Studies on the main insects and mites imfesting kidney beans, Phaseolus vulgaris L PhD Thesis, Fac. Agric., Mansoura Univ., 195 pp..

Al-Habshy, Aml Z. N.; Abd-Elsamed, A. A; and Amer, S. A. M. (2019). Susceptibility of some broad bean plant varieties to the infestation by certain piercing sucking insects, Egypt. J. Plant Protection and Pathology, Mansoura Univ., Vol 10 (9):443-449.

Awadalla, S. S; Tamana, A. A. and Aboria, A. A. (2017a). Influence of planting dates on the population density of the main insect pests on onion crop in Kafr El-Shekh region. J. Plant Prot. and Path., Mansoura Univ. 8 (8):393-395.

Awadella, S.S.; Beleh, S.B. And Mohsena, R. K. Mansour (2017b). Influence of nitrogen and potassium fertilization levels on the population density of the bird cherry-oat aphid, *Rhopalosihum padi* linnacus (Homoptera: aphididae). J. Plant Prot. And Path. Mansoura Univ. 8 (2); 87-89.

Bayoumy, M. H.; Awadalla, S. S.; El-Gendy, M. A. and El-Lawatay, Nagwan E. (2017). Comparative morphology and chemical composition of plant leaf and their relation with population density of certain piercing- sucking insect pests. J. Plant Prot. and Path., Mansoura Univ. 8 (2): 31-37.

Draz, A. A. K.; Darwish, A. E. A. and Tabikha, M. M. R. (2013). Effect of different rates of Nitrogen fertilizer on infestation level with piercing sucking pests of tomato crop, *Lycopersicon esculentum* L.J. Agric. Env. Sci. Dam. Univ., Egypt. 12 (3): 20- 32.

El-Tohamy, W. A.; Ghoname, A. A. And Abou-Hussein, S. D. (2006). Improvement of pepper growth and productivity in sandy soil by different fertilization treatments under protected cultivation. J. Appl. Sci. Res. 2 (1): 8-12.

Fereres, A.; Moreno, Aranzazu (2009). Behavioural aspects influencing plant virus transmission by homopteran insects. Virus Research 141(2): 158-168 ·

Hashem, M. S.; Abd-Elsamed, A. A. and Saleh, A. A. A. (2009). Monitoring and seasonal abundances of the leafhoppers; *Empoasca decipiens* (Paoli), *Empoasca decedens* (Paoli) and their associated predators on some leguminous vegetable crops in Egypt. Egyptian Journal of Biological Pest Control 19(2): 105-114.

Hashem, M. S.; Abd-Elsamed, A.A. and Saleh, A. A. A. (2009). Effect of certain homopterous insects infesting broccoli Plants and their associated predators' insects at Sharkia Governorate. J. Agric. Sci. Monsoura Univ. 34: 10715-10733.

Hegab, A. M.; El-zahairy, M. M. and Helaly, M. M. (1989). Survey and seasonal abundance of leafhoppers infesting certain solanaceous vegetable plants in new reclaimed sandy area at Salhia district, Egypt. Zagazig, J. Agric. Res. l6(2): 367-381.

Hegab, M. A. M. S. (2015). Studies on certaine piercing-sucking insect as vectors of phytopathogenic diseases in Sharkia governorate. PhD Thesis, Fac. Agric., Zagazig Univ., 294pp.

Mansour, M.R.K. (2017). Influence of some agricultural practices on the main insect pests attacking wheat crop and their natural enemies. PhD Thesis, Fac. Agric., Mansoura Univ. 169pp.

Moura, M. F., J. M. Marubayashi, T. Mituti, R. Gioria, R. F. Kobori, M. A. Pavan and R. Krause-Sakate (2012). Comparative analysis of coding region for the coat protein pof PepYMV and PVY isolates collected in sweet pepper. Summa Phytopathol. 38(1): 93-96.

Saleh, A. A.; EL-Gohary, L. R.; Hamed, M. A. and Baz, I. R. (2016). Effect of Nitrogen fertilization doses of cotton crop insects and their certain associated predators. J. Plant Prot. And Path., Mansoura Univ. 7(3): 183-191.

Youssef, A. A. A. (2006). Studies on some homopterous insect vectors plant disease. Ph. D Thesis, Fac. of Agric Zagazig Univ.

تأثير مستويات التسميد البوتاسي علي الكثافة العددية نطاطات الأوراق ونطاطات النباتات التي تهاجم محصول الباذنجان في محافظة الغربية

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أجريت الدراسة الحالية في مدينة زفتي بمحافظة الغربية لدراسة تأثير مستويات التسميد البوتاسي علي الكثافة العددية للنطاطات الأوراق ونطاطات النباتات التي تهاجم محصول الباذنجان خلال موسمين متتالين وهما 2017 و 2018. مستويات التسميد البوتاسي من صفر و 25 و 50 و 75 كجم/للفدان أدت إلي انخفاض في متوسط إعداد الحشرات تحت الدراسة خلال موسمي الدراسة مع وجود اختلافات معنوية. مستوي التسميد البوتاسي بمعدل 75 كجم للفدان جذب اقل نسب من الحشرات المستهدفة والتي تمثلت ب 13.6 و 15.3 % خلال موسم الدراسة الأول والثاني علي التوالي.