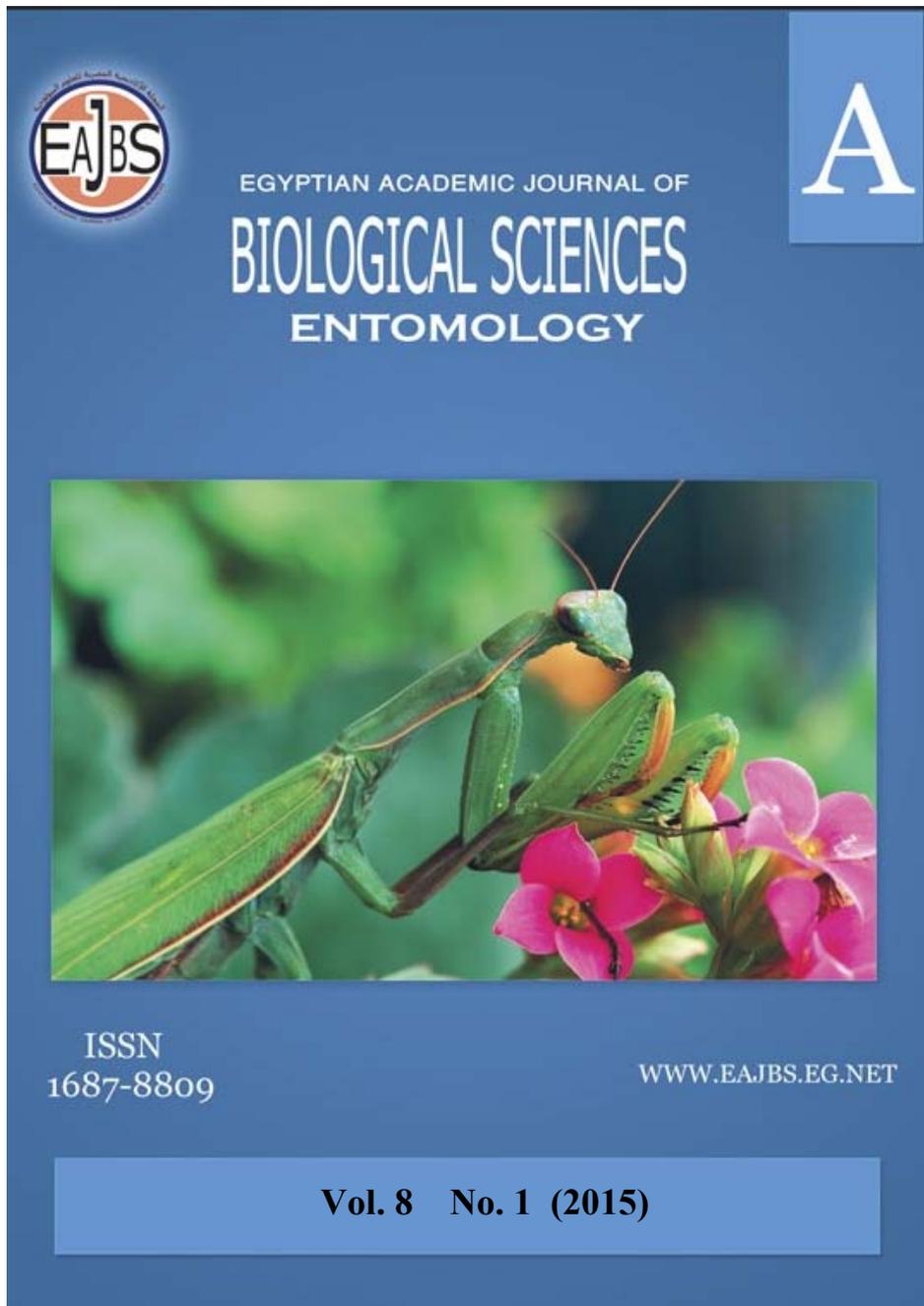


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Influence of agricultural fertilizer practices on certain piercing sucking pests infesting cucumber plants

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ARTICLE INFO

Article History

Received: 8/4/2015

Accepted: 24/5/2015

Keywords:

Cucumber
Fertilizer
Tetranychus
Urticae
T. cucurbitacearum
Bemisia
Tabaci
Thrip
Tabaci
Pseudococcus obscures

ABSTRACT

This study was carried out during summer and nili Plantations in 2014 in Plant Protection Research Institute Station, Qualiobeya Governorate to sheet the light on the effect of different types and rates of fertilizer treatments on the rates of infestation of cucumber plants, *cucumis sativus* L. by different pests, *Tetranychus urticae* kach, *T. cucurbitacearum* (sayed) (eggs and mobile stages), *Bemisia tabaci* (Gennadius) (eggs, nymphs and pupa), *Thrips tabaci* (Lindquist) (nymphs and adults) and on the resultant fruit crop yields. Data revealed treatments, mycorrhiza and NPK recorded the highest infestation rate by *T. urticae*, *T. cucurbitacearum* and *T. tabaci* in summer and nili plantations. while (N₂+k₂o) fertilizer treatment carried out the lowest infestation rates by *T. urticae*, *T. cucurbitacearum* and *B.tabaci*. On the contrary N₂ fertilizer recorded the highest infestation with whitefly. Orange mealy bugs, *pseudococcus obscures* Essing were firstly recorded on cucumber plants throughout nili plantation only by having the highest infestation on the plants treated with N₂ fertilizer being significant differences with the other treatments except for mycorrhizal treatment. Both treatments, NPK and microelements recorded insignificant the highest weight in fruit crop yields. While mycorrhizal treatment demonstrated the lowest weight of crop yield.

INTRODUCTION

Cucumber, *Cucumis sativus* L. fruit is considered one of the most popular and important vegetables for fresh consumption. During their vegetative growth in Summer and Nili plantations, plants are subjected to be attacked by several major pests which cause severe damage directly or indirectly to the crop production (Bohlen and freidel, 1979; Gameel,2004; Ghallab *et al.*, 2011; and Gameel, 2012). The two spotted spider mite is considered one of the important pests during summer plantation causing various degrees of damage and lately yield losses (Faris *et al.*, 2004). Thrips and whiteflies are not less in their seriousness than spider mite.

The present work was carried out in Plant Protection Research Institute Station, Qualiobeya Governorate during summer and nili seasons in 2014 to evaluate the

effect of different types of fertilizers on the infestation by certain piercing sucking pests on cucumber plants.

MATERIALS AND METHODS

This study revealed the stress of different types of fertilizer treatments on the rate of cucumber infestation by different pests, *Tetranychus urticae* kach, *T. cucurbitacearum* (sayed), *Bemisia tabaci* (Gennadius), *Thrips tabaci* (Lindquist) *Pseudococcus obscures* Essing and on the resultant yield.

Seeds of "zena hybrid" variety of cucumber (*Cucumis sativus* L.) were sown on March, 15th and August, 1st for Summer and Nili seasons respectively. The experimental area was about 125.28 m² divided into 21 equal plots of about 3.6 m² each and having six different fertilizer treatments and control. Each plot with two ridges of 3 meters long and 60 cm. apart. Plots were distributed in a randomized complete block design with three replicate for each treatment. The tested fertilizers were used as follow:

- 1- Urea, 46% N₂ is applied at rate 300 kg/Fadden.
- 2- Calcium superphosphate, 15% p₂o₅ is applied at rate 150kg/Fadden.
- 3- Potassium sulfate, 47% k₂o is applied at rate 100kg/Fadden.
- 4- Mixture of three fertilizers N, P and K are applied at rates 300, 150 and 100 kg/Fadden respectively.
- 5- Microelements solved in water as Folifert [Zn 7.06%; Mn 4.20%; Fe 2.80%; Cu 2.0%; Bo 0.60% & Mo (molibidium) 0.05%].
- 6- Mycorrhizal fungi is applied by their mixture with pieces of the moisten soil and put on each hill in weight 50-75 gm in the planting date with the three previous mentioned fertilizers at their quarter amount each of them.
- 7- Control treatment is applied water only without any fertilizer. Two sprays were applied with microelements treatment by using plastic atomizer, the first, after complete germination and the second spray at the time of plant flowering. The other fertilizers were added to soil around the plant as follow:

N₂, three times at the plant complete germination, at the age of flowering and before the last harvest. P₂o₅, added two times in the complete germination and flowering stage K₂o, added two times in the flowering stage and before the last harvest. Precautions had been done to prevent contamination among fertilizer treatments. All replicates received the normally recommended agricultural practices and kept free from any insecticides. Fruits were picked up and weighted at the harvest, Five times during the season.

Sampling technique.

Sampling started 30 & 26 days after sowing and were continued for 8 & 9 successive weeks until harvest in summer and nili seasons respectively. 10 leaves from each replicate were randomly picked from three levels of plants, kept in tightly closed paper bags and transferred to the laboratory where the observed pests were counted by the aid of a binocular stereomicroscope. *Tetranychus urticae* kach, *T. cucurbitacearum* sayed (eggs and mobile stages), *Bemisia tabaci* (Gennadius) (eggs, nymphs and pupa), *Thrips tabaci* (Lindquist) (nymphs and adults) and *pseudococcus obscures* Essing were counted as total numbers on upper and lower surface of two quare inches of the leaf.

Statistical analysis.

Statistical analysis for ANOVA was carried out by using SAS 9.3.1 portable. Whereas the means were compared through LSD tests, least significant differences at p: 0.05 level.

RESULTS AND DISCUSSION

Data presented in Tables 1 and 2 show the infestation by five piercing sucking pests on cucumber plants, treated with different types of fertilizers throughout summer and nili seasons in 2014 and demonstrated,

Table 1: The effect of different fertilizers on the infestation of cucumber plants by five piercing sucking pests and on the resultant yield during summer season, 2014.

Treatment	<i>T. urticae</i>		<i>T. cucurbitacearum</i>		<i>Bemisia tabaci</i>			<i>T. tabaci</i>		<i>Pseudococcus obscurus</i>	yield
	Egg	Mobile	Egg	Mobile	Egg	Nymph	Pupa	Nymph	Adult	Nymph	
Mycorrhiza	10.88	8.28	1.60	0.26	4.83	9.01	0.31	11.15	0.25	Didn't record in this season	135.33
N2	5.09	3.21	1.25	0.17	4.99	9.49	0.67	7.44	0.18		415.33
N2+p2o5	7.10	4.59	1.11	0.14	4.57	6.24	0.26	8.20	0.19		434.00
N2+k2o	3.97	4.28	1.12	0.12	3.93	6.80	0.19	16.19	0.30		382.64
NPK	6.87	4.60	1.38	0.20	4.31	7.29	0.40	14.65	0.24		559.99
M. element	5.34	3.28	1.30	0.18	4.20	7.28	0.17	11.24	0.19		541.28
Control	3.56	3.81	0.91	0.11	4.71	5.58	0.17	7.39	0.10		268.31
LSD	2.89	2.22	0.76	0.08	1.48	1.73	0.2	3.18	0.12	-	527.64

Table 2: The effect of different fertilizers on the population density of five piercing sucking pests infesting cucumber plants and on the resultant yield during nili season, 2014.

Treatment	<i>Tetranychus urticae</i>		<i>T. cucurbitacearum</i>		<i>Bemisia tabaci</i>			<i>T. tabaci</i>		<i>Pseudococcus obscurus</i>	yield
	Egg	Mobile	Egg	Mobile	Egg	Nymph	Pupa	Nymph	Adult	Nymph	
Mycorrhiza	1.34	0.60	0.10	0.02	3.78	7.47	0.07	0.62	0.02	3.04	101.50
N2	0.04	0.02	0.02	0.01	4.56	8.12	0.10	0.49	0.02	3.76	311.50
N2+p2o5	0.12	0.08	0.04	0.01	2.41	5.00	0.09	0.90	0.02	2.16	325.50
N2+k2o	0.05	0.17	0.03	0.01	1.58	5.44	0.07	1.66	0.03	0.26	286.98
NPK	0.42	0.20	0.03	0.01	2.41	6.92	0.10	1.62	0.03	1.56	419.99
M. element	0.03	0.06	0.03	0.01	1.88	5.75	0.07	0.86	0.01	2.13	405.96
Control	0.01	0.07	0.00	0.00	1.38	1.99	0.02	0.31	0.00	0.21	201.24
LSD	0.55	0.26	0.09	0.02	1.01	1.52	0.06	0.30	0.02	1.18	395.73

Tetranychus urticae Koch:

Treatment, mycorrhiza recorded the highest infestation by *T. urticae*, eggs and mobile stages with means 10.88 and 8.28/two square inches respectively in summer season, and 1.34 and 0.6/ two square inches resp. in nili season. Hoffmann *et al.* (2009) mentioned, when spider mite, *T. urticae* fed on mycorrhizal plants resulted in increased oviposition rate and female offspring proportion altogether, her enhancing the mite population growth rate. Also, Egas & Sabelis (2001) recorded that the mycorrhizal plants induced volatiles lead to attractive the spider mite *T. urticae* which will improve its life history and fitness on the best quality host plants.

Plants were treated with urea, recorded the lowest infestation by *T. urticae*, with mean 3.21 and 0.02/2 inches² in summer and nili seasons resp. while, NPK, (N₂+P₂O₅) and (N₂+K₂O) treatments recorded the moderate infestations compared with control. El-Khayat *et al.* (2014) mentioned cowpea plants which treated with ammonium sulphate related with low infestation by *T. urticae*, eggs & motels in summer seasons, 2012 & 2013.

T. cucurbitacearum (sayed):

The infestation by *T. cucurbitacearum* took the same trend of infestation by *T. urticae*, whereas, the highest infestation related by cucumber plants treated with mycorrhiza with means 1.60 and 0.26/2 inches² to eggs and mobile stages respectively in summer season and 0.10 and 0.02/2 inches² resp. in nili season. While, plants treated with urea related with the lowest infestation by means 1.25,0.17 and 0.01/2 inches² to eggs and mobile stages in two season resp. Wahba (2011) recorded that

Dokki variety which treated with ammonium sulphate related with lowest infestation by *T. cucurbitacearum* in the two seasons of study.

Whitefly, *Bemisia tabaci* (Gennadius):

Data in Table (1&2) demonstrated the highest infestation by different stages of Whitefly, *Bemisia tabaci* occurred on plants treated with urea with mean counts 4.99, 9.49 and 0.67/2 inches² to eggs, nymphs and pupa respectively in the summer season and 4.56, 8.12 and 0.10/2 inches² resp. in the nili season. Followed by treatment, mycorrhiza which recorded 4.83 and 9.01/2 inches² to eggs and nymphs resp. in the summer plantation and 3.78 and 7.47 /2 inches² resp. in the nili plantation. Treatments, (N₂+P₂O₅), NPK and microelements carried out low infestation by Whitefly, *Bemisia tabaci* while (N₂+K₂O) revealed the lowest infestation throughout summer and nili seasons compared with control. Statistical analysis of data show insignificant differences between treatment for eggs and significant differences with nymphs and pupa except for treatments, mycorrhiza and N₂ were insignificant in the case of nymphal stage.

Alvin and Shaaban Abd-rabo (2009): recorded, that egg, nymph, and adult whitefly counts were generally elevated with increased rates of ammonium sulfate or decreased with increasing rates of potassium sulfate.

***Thrips tabaci* (Lindquist):**

T. tabaci, nymphs and adults were influenced by application of fertilizer treatments. (N₂+K₂O) and NPK treatments carried out the highest significant infestation by *T. tabaci*, with means 16.19 and 14.65 nymphs/2 inches² resp. and 0.30 and 0.24 adults/2 inches² to the same previous treatments resp. compared with control in the summer plantation. Also the same trend in the nili plantation, (N₂+K₂O) and NPK treatments recorded significantly highest infestation to nymphs with means 1.66 and 1.62/2 inches² resp. and 0.03 adults/2 inches² compared with control. On the contrary, urea treatment recorded insignificantly lowest infestation by means 7.44 and 0.18/2 inches² to nymphs and adults stages resp. in summer plantation and 0.49 and 0.02/2 inches² to the same stages resp. compared with control in nili plantation.

These data agree Mona *et al.* (2014), they indicated common bean plants, when treated with potassium sulphate and NPK related with high infestation of *T. tabaci* in the second year of study. Also, Ukey *et al.* (2001), they referred that the lowest means population of thrips was observed at lower dose of N₂.

Orange mealy bugs, *Pseudococcus obscurus* Essing:

This insect pest didn't record in summer season. In nili season, *P. obscurus* nymphs were the most infestation on cucumber plants treated with urea and mycorrhiza being significantly with means 3.76 and 3.04 nymphs/2 inches² resp. compared with control. On the other hand, (N₂+K₂O) treatment revealed insignificantly lower infestation by mean count 0.26 nymphs/2 inches² compared with control. While the remaining other fertilizer treatments showed intermediate infestation being significantly compared with control.

Relationship between types of fertilizers and resultant yield:

Data presented in Table (1&2) show the means of cucumber fruit crop yields of different types of fertilizer treatments in summer and nili seasons and revealed, treatments, NPK and M. elements were the highest yield of fruits with means 559.99 and 541.28 kg/f. respectively in the summer season and 419.99 and 405.96kg/f. respectively in the nili season compared with control. On the other hand mycorrhizal treatment recorded the lowest weight of fruits with means 135.33 and 101.50 kg/f. in summer and nili seasons respectively. While the remaining treatments, N₂, (N₂+P₂O₅) and (N₂+K₂O) demonstrated the intermediate weight of fruits with means

415.33,434.00 and 382.64kg/f. resp. in the summer season and 311.50, 325.50 and 286.98kg/f. resp. in the nili season.

Statistical analysis of data showed insignificant differences between treatments throughout the summer and nili seasons. This results indicated by Huber (1989).

CONCLUSION

In this study, mycorrhizal treatment related with high level of infestation by different piercing sucking pests which led to reduce the fruit crop yields at the pests but it was related by heavy weight of fruit crop yields, this was due to the phenomena of tolerance. Similar report by Baidoo and Mochiah (2011) which state that NPK contains nitrogen which promotes better growth of plants. On the other hand, attacking by sucking pests were increased.

REFERENCE

- Alvin, M. Simmons and Shaaban Abd-Rabou (2009): Population of the Sweet potato Whitefly in Response to Different Rates of Three Sulfur-Containing Fertilizers on Ten Vegetable Crops. *International Journal of Vegetable Science*, 15:57–70
- Bohlen, E. and Freidel, J. W. (1979): Crash programmer-plant protection New Valley Egypt. Consultancy Mission. 14.02. 1979. German Agency for technical co. operation (G T Z), 56 pp
- Egas, M. and Sabelis, M.W. (2001): Adaptive learning of host preference in a herbivorous arthropod. *Ecology Letters* 4: 190-195.
- El_ Khayat, E. F.; El-Lakwah, F. A.; Rady, G. H. H.; Mona, M. A. Ghallab and Wahba B. S. (2014): Effect of certain agricultural practices on some piercing sucking pests attacking cowpea plants. *Minufiya J. Agric. Res.* 39.1(2) 309
- Faris, F. S.; Habashi, N. H. and Iskandar, A. KH. (2004): Relationship between infestation with different stages of the spider mite *Tetranychus urticae* kach and yield physical characters. *J. Agric. Mansoura Univ.* 29 (6): 3567- 3579.
- Gameel, S. M. M. (2004): Eco. Biological studies on the black melon bug, *corridius* (Aspongopus) *viduatus* F. (Hemiptera: Pentatomidae) in the New Valley. Ph. D. thesis, of Agric., Assiut Univ. 209 pp.
- Gameel, S. M. M. (2012): Observations on some cucumbit fruit flies at the New Valley – Egypt. *J. Agric. Res.*, 90: 897-910
- Ghallab M. M., Habashi N. H., Iskander A. Kh. And Risk M. A. (2011): Sensitivity of four cucumber cultivars to some piercing sap sucking pests infestation and their impact on yield. *Egypt J. Agric. Res.*, 89: 1363-1371.
- Hoffmann, D.; Vierheilig, H.; Riegler, P. and Schausberger, P.(2009): Arbuscular mycorrhizal symbiosis increases host plant acceptance and population growth rates of the two-spotted spider mite *Tetranychus urticae*. *Oecologia*, 158: 663-671.
- Huber, D.M. (1989): The roles of nutrition in the take all disease of wheat and other small grains in soil borne plant Pathogens Management of diseases with macro-andmicro-elements. The American Psychopathological Society St. Paul Minnesota, USA, APS: 46 – 75
- Baidoo, P.K. and Mochiah, M.B. (2011): The incidence of nutrient application on the pests and natural enemies of the pests of okra *Abelmoschus esculentu* (L.) (Moench.) *J. appl. Biosci.* 41: 2765 – 2771
- Mona, M. Ghallab; Marguerite, A. Rizk; Wahba, B.S. and Zaki A.Y (2014): Impact

- of different types of fertilizers to reduce the population density of the sap sucking pests to bean plant Egypt. Acad. J. Biolog. Sci., 7(2): 1 – 8
- Ukey, S. P.; Sarode, S. V.; Naitam, N. R. and Patil, M. J. (2001). Influence of fertilizers on thrips and mites of chili (*Capsicum annum* L.) pest management in Horticultural Ecosystem 7 (1): 72 -78
- WAHBA, B.S (2011): Studies on pests which found on bean and cowpea plants Ph. D. thesis, Faculty of Agric., Benha Univ. 381 pp.

ARABIC SUMMERY

تأثير عمليات التسميد الزراعية على بعض الافات الثاقبة الماصة التي تصيب نباتات الخيار

باسم صبرى وهبة

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة

أظهرت هذه الدراسة خلال الموسمين الصيفى والنيلى لعام ٢٠١٤ بمحطة معهد بحوث وقاية النباتات بمحافظة القليوبية، القاء الضوء على تأثير مختلف انماط ومعدلات التسميد على معدل أصابة نباتات الخيار بالافات المختلفة، العنكبوت الاحمر بنوعية *T. cucurbitacearum* , *Tetranychus urticae* (بيض) واطوار متحركة)، الذبابة البيضاء *Bemisia tabaci* (بيض، حوريات، عذارى) الترس *Thrips tabaci* (حوريات وحشرات كاملة) وعلى ثمار الحصول الناتج.

أظهرت النتائج ان المعاملات، الميكورهيذا و NPK سجلت اعلى معدل أصابة ب *Tetranychus urticae* , *T. cucurbitacearum* and *Thrips tabaci* فى العروتين الصيفى، النيلى. بينما أظهر تسميد (N₂+K₂O) أقل معدل أصابة *Tetranychus urticae* , *T. cucurbitacearum* and *Bemisia tabaci* وعلى نقيض، تسميد اليوريا N₂ سجل أعلى أصابة بالذبابة البيضاء. بق الموالح الدقيقى *Pseudococcus obscures* كان اول تسجيل لها على نباتات الخيار خلال العروة النيلى فقط وبأعلى أصابة على النباتات المعاملة بتسميد اليوريا N₂ وباختلافات معنوية مع المعاملات الاخرى باستثناء معاملة الميكورهيذا. سجلت كلتا المعاملتين NPK و العناصر الصغرى بعدم معنوية اعلى وزن من الحصول الناتج بينما أظهرت معاملة الميكورهيذا اقل وزن من المحصول.