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

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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 (N 2+k 2o) fertilizer treatment curried out the lowest infestation rates by T. urticae, T. cucurbitacearum and B. tabaci. On the contrary N 2 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 N 2 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* (sowed), *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%; Fe2.80%; 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.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>T. urticae</th>
<th>T. cucurbitacearum</th>
<th>Bemisia tabaci</th>
<th>T. tabaci</th>
<th>Pseudococcus obscurus</th>
<th>yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Egg</td>
<td>Mobile</td>
<td>Egg</td>
<td>Mobile</td>
<td>Nymph</td>
<td>Pupa</td>
</tr>
<tr>
<td>Mycorrhiza</td>
<td>10.88</td>
<td>8.28</td>
<td>1.60</td>
<td>0.26</td>
<td>4.83</td>
<td>9.01</td>
</tr>
<tr>
<td>N2</td>
<td>5.09</td>
<td>3.21</td>
<td>1.25</td>
<td>0.17</td>
<td>4.99</td>
<td>9.49</td>
</tr>
<tr>
<td>N2+P2O5</td>
<td>7.10</td>
<td>4.59</td>
<td>1.11</td>
<td>0.14</td>
<td>4.57</td>
<td>6.24</td>
</tr>
<tr>
<td>N2+K2O</td>
<td>3.97</td>
<td>4.28</td>
<td>1.12</td>
<td>0.12</td>
<td>3.93</td>
<td>6.80</td>
</tr>
<tr>
<td>NPK</td>
<td>6.87</td>
<td>4.60</td>
<td>1.38</td>
<td>0.20</td>
<td>4.31</td>
<td>7.29</td>
</tr>
<tr>
<td>M. element</td>
<td>5.34</td>
<td>3.28</td>
<td>1.30</td>
<td>0.18</td>
<td>4.20</td>
<td>7.28</td>
</tr>
<tr>
<td>Control</td>
<td>3.56</td>
<td>3.81</td>
<td>0.91</td>
<td>0.11</td>
<td>4.71</td>
<td>5.58</td>
</tr>
<tr>
<td>LSD</td>
<td>2.89</td>
<td>2.22</td>
<td>0.76</td>
<td>0.08</td>
<td>1.48</td>
<td>1.73</td>
</tr>
</tbody>
</table>

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 inches$^2$ to eggs, nymphs and pupa respectively in the summer season and 4.56, 8.12 and 0.10/2 inches$^2$ resp. in the nili season. Followed by treatment, mycorrhiza which recorded 4.83 and 9.01/2 inches$^2$ to eggs and nymphs resp. in the summer plantation and 3.78 and 7.47 /2 inches$^2$ resp. in the nili plantation. Treatments, (N$_2$+P$_{2}$O$_5$), NPK and microelements carried out low infestation by Whitefly, *Bemisia tabaci* while (N$_2$+K$_2$O) 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 N$_2$ 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. (N$_2$+K$_2$O) and NPK treatments carried out the highest significant infestation by *T. tabaci*, with means 16.19 and 14.65 nymphs/2 inches$^2$ resp. and 0.30 and 0.24 adults/2 inches$^2$ to the same previous treatments resp. compared with control in the summer plantation. Also the same trend in the nili plantation, (N$_2$+K$_2$O) and NPK treatments recorded significantly highest infestation to nymphs with means 1.66 and 1.62/2 inches$^2$ resp. and 0.03 adults/2 inches$^2$ compared with control. On the contrary, urea treatment recorded insignificantly lowest infestation by means 7.44 and 0.18/2 inches$^2$to nymphs and adults stages resp. in summer plantation and 0.49 and 0.02/2 inches$^2$ to the same stages resp. compared with control in nili plantation.

These data agree Mona *et al.* (2014), thed 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 refered that the lowest means population of thrips was observed at lower dose of N$_2$.

**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 inches$^2$ resp. compared with control. On the other hand, (N$_2$+K$_2$O) treatment revealed insignificantly lower infestation by mean count 0.26 nymphs/2 inches$^2$ 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, N$_2$, (N$_2$+P$_{2}$O$_5$) and (N$_2$+K$_2$O) demonstrated the intermediate weight of fruits with means
Influence of agricultural fertilizer practices on certain Piercing sucking pests infesting

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


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ARABIC SUMMERY

تأثير عمليات التسميد الزراعية على بعض الافات النباتية الماصية التي تسبب نباتات الخيار

باحث بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزه

أظهرت هذه الدراسة خلال الموسمين الصيفي والنيلى لعام 2014 بمختبر بحوث وقاية النباتات بمحافظة القليوبية، القاء الضوء على تأثير مختلف المسميات وعوامل التسميد على معدل أصابة نباتات الخيار (بيض Tetranychus urticae , T. cucurbitacearum واطوار متعددة ) النباتات البيضاء (بيض ، حوريات ، عذارى) التربس Thrips tabaci (حوريات وحشرات كاملا) وعلى ثمار الحصول الناتج.

أظهرت النتائج أن المعاملات، الميكورهيزا و NPK سجلت أعلى معدل أصابة ب T. cucurbitacearum and Thrips tabaci وأقل معدل أصابة على Tetranychus urticae, Thrips tabaci وBemisia tabaci

Pseudococcus سجل أعلى أصابة بالنباتات البيضاء في المحصول النهائي. كائن أول تسجيل لها على نباتات الخيار خلال العروتين النيلية فقط ويأتي أعلى أصابة على النباتات المعالمة N2K2O S. P. وعلاقته مع معنوية مع المعاملات الأخرى بأساليب معاملة الميكورهيزا. سجلت كلتا المعاملات NPK العناصر الصغرى بعد معنوية أقل وزن من الحصول الناجح بينما أعلى معدل المعاملة الميكورهيزا أقل وزن من المحصول.