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## **Studies on the main leafhoppers and planthoppers on some vegetable crops**

By

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**Thesis**

Submitted in Partial Fulfillment of the Requirements for the Degree of

**Doctor of philosophy**

**In**

Agricultural Sciences  
(Economic Entomology)

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2020

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### 5- Summary

The present experiments were conducted in ZeftaGharbia governorate to study some agricultural practices on the population density of the different leafhoppers and planthoppers attacking certain solanaceous and leguminous vegetable crops during the two successive seasons (2017/18 and 2018/19) to evaluate the effect of the following agricultural practices on the leafhopper and planthopper species.

- Planting dates (eggplant as summer crop vs. faba bean as winter crop).
- The different host plants (solanaceous vegetable summer crops vs. leguminous vegetable winter crops).
- The chemical constituents of cultivated summer vegetable crops.
- The morphological diversity of trichomes in cultivated summer and winter crops.
- The fertilization levels of nitrogen, phosphorus, and potassium.

The obtained results can be summarized as follows:

#### 5.1. Effect of different planting dates

##### 5.1.1. Eggplant as summer vegetable crop

The potato leafhopper *Empoascadecipiens* had the highest peak of abundance on egg plant in the second plantation (June plantation) during the two seasons 2017 and 2018 and presented by 876 and 962 individuals. June plantation attracted the highest average number of *E. decipiens* on eggplant during the two seasons and presented by  $511.4 \pm 55.33$  and  $558.7 \pm 64.09$  individuals followed by May plantation with  $432.4 \pm 72.14$  and  $530.3 \pm 75.74$  individuals, respectively.

The leafhopper *Empoascadecedens* had the highest peak of abundance on eggplant in June plantation (458 individuals) during the first season 2017 and in May plantation (492 individuals) during the second season 2018. June plantation attracted the highest average number of *E. decedens* on eggplant during the two seasons and presented by  $275.8 \pm 28.90$  and  $288.0 \pm 25.49$  individuals followed by May plantation with  $264.0 \pm 35.12$  and  $262.1 \pm 37.21$  individuals, respectively.

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## Summary

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The leafhopper *Cicadulinachinai* had the highest peak of abundance on eggplant in May plantation during the two seasons 2017 and 2018 and presented by 318 and 328 individuals, respectively. July plantation hosted the highest average number of *C. chinaion* eggplant followed by May plantation during the first season 2017 and presented by  $136.8 \pm 24.51$  and  $123.4 \pm 25.12$  individuals, respectively. Meanwhile, during the second season 2018, May plantation attracted the highest average number of the insect pest followed by June plantation and presented by  $130.9 \pm 26.21$  and  $114.7 \pm 19.20$  individuals, respectively.

The leafhopper *Balchluthahortensis* had the highest peak of abundance on eggplant in May plantation during the two seasons 2017 and 2018 and presented by 164 and 163 individuals, respectively. Moreover, May plantation hosted the highest average number of *B. hortensison* eggplant during the two seasons and presented by  $75.1 \pm 12.46$  and  $84.9 \pm 11.93$  individuals followed by June plantation with  $64.4 \pm 9.10$  and  $66.3 \pm 11.25$  individuals, respectively.

The planthopper *Sogatellafurcifera* had the highest peak of abundance on eggplant in May plantation during the two seasons 2017 and 2018 and presented by 421 and 422 individuals, respectively. During the first season, July plantation attracted the highest average number of *S. furcifera* on eggplant ( $230.2 \pm 23.63$  individuals) followed by May plantation ( $192.6 \pm 37.82$  individuals). While, during the second season 2018, May plantation attracted the highest average number of the insect pest ( $213.4 \pm 31.24$  individuals) followed June plantation ( $96.6 \pm 16.99$  individuals).

Statistical analysis revealed that there were significant differences for each leafhopper and planthopper species among different eggplant plantation dates during the two seasons.

### **5.1.2. Faba bean as winter vegetable crop**

The potato leafhopper *Empoascadeciapiens* had the highest peak of abundance on faba bean in the third plantation (first November plantation) with 196 individuals during the first season 2017/18, while it was recorded in the second plantation

## Summary

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(mid-October plantation) with 179 individuals during the second season 2018/19. Third plantation (first November plantation) attracted the highest average number of *E. decipiens* on faba bean during the two seasons and presented by  $94.8 \pm 11.47$  individuals followed by first October plantation with  $71.7 \pm 7.63$  and  $79.8 \pm 8.89$  individuals, respectively.

The leafhopper *Empoascadecedens* had the highest peak of abundance on faba bean in the third plantation with 176 individuals during the first season 2017/18, while it was recorded in the first plantation with 222 individuals during the second season 2018/19. First plantation attracted the highest average number of *E. decedens* on faba bean during the two seasons and presented by  $91.0 \pm 11.96$  individuals and  $120.4 \pm 13.93$  individuals, respectively.

The leafhopper *Cicadulinachinai* had the highest peak of abundance on faba bean in the third plantation with 176 individuals during the first plantation with 133 individuals during the first season 2017/18, while it was recorded in the third plantation with 145 individuals during the second season 2018/19. Third plantation hosted the highest average number of *C. chinai* on faba bean during the two seasons and presented by  $66.4 \pm 7.12$  and  $53.8 \pm 9.20$  individuals, respectively.

The leafhopper *Balcluthahortensis* had the highest peak of abundance on faba bean in the second plantation with 78 individuals during the first season 2017/18, while it was recorded in the first plantation with 91 individuals during the second season 2018/19. First plantation attracted the highest average number of *B. hortensis* on faba bean during the two seasons and presented by  $31.5 \pm 5.07$  and  $37.1 \pm 5.41$  individuals, respectively.

The planthopper *Sogatellafurcifera* had the highest peak of abundance on faba bean in the third plantation during the two seasons 2017/18 and 2018/19 and presented by 213 and 210 individuals, respectively. Also, third plantation attracted the highest average number of *S. furcifera* on faba bean during the two seasons and presented by  $92.3 \pm 18.28$  and  $68.9 \pm 14.53$  individuals, respectively.

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## Summary

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Statistical analysis revealed that there were significant differences for each leafhopper and planthopper species among different faba bean plantations during the two seasons.

### 5.2. Effect of different host plants

#### 5.2.1. Solanaceous crops

The leafhoppers, *Empoascadecipiens* and *Empoascadecedens* preferred eggplant as a host plant followed by tomato and pepper by using the three methods (leaf sample, yellow sticky traps, sweep net) during the two seasons. Meanwhile, *Cicadulinachinai* preferred tomato followed by eggplant and pepper by using the different methods. While, *Balcuthahortensis* preferred pepper followed by eggplant and tomato. On the other hand, the planthoppers, *Sogatellafurcifera* preferred eggplant followed by pepper and tomato.

Statistical analysis revealed that highly significant differences were recorded between the three host plants during the two seasons according to the average number of different leafhoppers and planthoppers by using the three sampling methods. Depending on the percentage of insect pest occurrence, sweep net recorded the highest percentage followed by yellow sticky traps and the lowest percentage of occurrence was recorded by leaf sample method.

The insect population varied among leaf surface morphological characters. The Scanning Electron Microscope pictures revealed that, the trichome type was non-glandular in eggplant and tomato, while in pepper was hairiness. Population density exhibited significantly of trichome length on eggplant, whereas had less significantly on tomato leaves with higher hair density. Peppers, with no trichome had the lowest population of insect.

Depending on the analysis of phytochemical composition of plant leaves, a highly positive correlated leafhopper and plant hoppers with higher ratios was found for the total protein, total nitrogen,  $\alpha$ -esterase,  $\beta$ - esterase and Glutathione S-transferase (GST). However, the population density affected by the total ratio of carbohydrate of eggplant. While, there was a negative correlated between insect

infestation and the contents of phenols, potassium, phosphorus and the plant soap acidity (pH), thus the population was high with low content of these components in eggplant followed by tomato then pepper. This study showed that the development of the host plant resistant to the insect pests is an important strategy of integrated pest management programs and the recognition of morphological and phytochemical characteristics may lead to develop resistance character in acceptable plant genotypes.

### 5.2.2. Leguminous crops

The leafhoppers *Empoasca decipiens*, *E. decedens* and *Cicadulinachinai* recorded the highest average number on the different leguminous crops during the two successive seasons and preferred fenugreek as a host plant followed by faba bean and lupine by using the sweep net method. Meanwhile, the leafhopper *Balclutha hortensis* preferred faba bean followed by fenugreek and lupine during the two seasons. On the other hand, the planthopper *Sogatella furcifera* preferred faba bean followed by lupine and fenugreek.

Statistical analysis revealed that there were significant differences between the three host plants during the two seasons according to the average number of different leafhoppers and planthoppers by using the sweep net method.

The insect population varied among leaf surface morphological characters. The Scanning Electron Microscope pictures revealed that, the insect population varied among leaf surface morphological characters. The Scanning Electron Microscope pictures revealed that, the trichome type was non-glandular in Fenugreek and Lupine, while in Faba bean has no trichomes. Population density exhibited significantly of trichome length on Fenugreek, whereas had less significantly on Faba bean leaves with no trichome. Lupine, with higher hair density had the lowest population density of the leafhoppers and planthoppers species.



### **5.3. Effect of fertilization levels**

#### **5.3.1. Effect of nitrogen fertilization level**

The nitrogen fertilization levels of 250 kg/fed. attracted the highest average number of the leafhopper and planthopper species. The present study suggested that increasing nitrogen fertilization rates from 0 kg/fed. to 150, 200, and 250 kg/fed. caused a significant increase in the average number of the aforementioned insect species.

The nitrogen fertilization rate of 250 kg/fed. attracted the highest percentage of occurrence of the tested insect pests and presented by 40.2 and 38.1% during the two seasons 2017 and 2018, respectively.

#### **5.3.2. Effect of phosphorus fertilization level**

The highest average number of *Empoascadecipiens* recorded with 100 kg/fed. phosphorus fertilization, while the highest average number of *Empoascadecedens* recorded with 200 kg./fed. On the other hand, the leafhopper *Cicadulinachinai* and the planthopper *Sogatellafurcifera* recorded the highest average number with phosphorus fertilization rate of 150 kg/fed. during the two seasons of the study. Meanwhile, the leafhopper *Balcluthahortensis* recorded the highest average number with level of 0 kg/fed. phosphorus fertilization rate during the two seasons.

Statistical analysis for the phosphorus fertilization rates revealed that there were non-significant differences between the average number for each species of these insect pests and the different rates of phosphorus fertilization during the two seasons.

The phosphorus fertilization rate of 0 kg/fed. attracted the highest percentage of occurrence during the first season 2017 followed by 200 kg/fed. and presented by 25.8 and 24.8, respectively. While, during the second season 2018, the phosphorus fertilization rate of 200 kg/fed. attracted the highest percentage of occurrence followed by 0 kg/fed. and presented by 25.8 and 25.2 %, respectively.

#### **5.3.3. Effect of potassium fertilization level**

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 dur-

## Summary

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ing the two seasons. The present studies indicated that increasing potassium fertilization rates from zero kg/fed. to 25, 50 and 75 kg/fed. led to a decrease in the average number of the tested insect pests during the two seasons 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.