ECOLOGICAL STUDIES ON SOME INSECT PESTS ATTACKING TOMATO PLANTS AND ITS ASSOCIATED PREDATORS IN SOHAG REGION.

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5. Summary

Tomato (*Lycopersicom esculantum* mill) is considered as one of the most important vegetable crops in Egypt (450.000 feddan/ year) the most important problem facing the Egyptian tomato growers is insect pests attacking this crop.

The present studies were conducted in Sohag region during two successive seasons of 2018/2019and 2019/2020 to investigate the insect pests associated with tomato plants. The insect pests attacking tomato, the population densities of the main insect pests and their associated predators were studied. The effect of certain climatic factors and the associated predators on the population densities of the main insect pests attacking tomato plants were determined by simple correlation. The susceptibility of certain tomato hybrids to infestation by main insect pests was studies. Finally, in laboratory studies the host preferences of *Tuta absoluta* larvae on certain tomato hybrids leaves and fruits were studies. The results obtained can summarize in the following points:

5.1. Population fluctuation of main insect pests infesting tomato plants and its associated predators:

The present study was conducted to investigate the population fluctuations of the main insect pests infesting tomato plants, in winter plantations in Sohag region during the two successive seasons of 2018/2019 and 2019/2020. Also, the population fluctuation of the associated predators was studied.

5.1.1. Cotton whitefly, *Bemisia tabaci*:

Bemisia tabaci had three peaks on the tomato hybrids, the first peak was during the fourth week of October, and the second one was in the third week of October, where the last peak was in the second week of November. For the nymph had two peaks in the first season and one peak in the second season. The first peak was during the third week of October, the second peak was during

third week of November 2018\2019. Wherever the first peak during the first week of November, 2019\2020.

5.1.2. Tomato leafminer, *Tuta absoluta*:

5.1.2.1. Adults:

The results showed that the male number of *T. absoluta* captured in winter plantation started from the first week of inspection in8th September in the two seasons of 2018/2019 and 2019/2020, with mean numbers of 15.33 and 18.00males/ traps, respectively. The population increased and gave 8and 13 peaks in the two seasons, respectively.

5.1.2.2. Larvae:

5.1.2.2.1. On leaves, the results showed that the *T. absoluta* infestation started by15th September in both of seasons 2018/2019 and 2019/2020, with mean numbers of 0.3 and 1.3 larvae/ 10 leaves, respectively. The population increased and gave four peaks in the first year and two peaks in the second year of the study. After that the numbers decreased gradually to disappear form26th January to the end of both seasons.

5.1.2.2.2. On fruits, the results showed that the *T. absoluta* infestation started by 17th November in both of seasons 2018/2019 and 2019/2020, with mean numbers of 0.3 and 0.3 larvae/ 10 fruits, respectively. The population increased and gave four peaks in the first year and three peaks in the second year of the study.

5.1.3. Faba bean leafminer, *Liriomyza trifolii*:

The results showed that the leafminer started to attack plants in winter plantation, from the first week of inspection, in 15/ September where seedlings severed average numbers of 4.5 mines/10 leaves and 2.5 mines/10 leaves in both seasons of the study. The number of mines fluctuated, formed three peaks and two peaks in both seasons, respectively. Then the larvae disappeared suddenly

from 5th and 12th January in both seasons 2018/2019 and 2019/2020 respectively, to the end of the two seasons.

5.1.4. Tomato fruit worm, *Helicoverpa armigera*:

The larvae occurrence was observed after fruit sitting in 10th November with 2.8 and 4.3 larvae/ 10 fruits in both seasons respectively. The number of larvae showed 2 and 3 peaks of activity in both seasons, respectively. After that the numbers decreased gradually to the end of the two seasons.

5.2. The population fluctuation of major predators associated with pests infesting tomato plants in Sohag region during 2018/2019 and 2019/2020 seasons:

5.2.1. Tomato bug, *Nesidicoris tenuis*:

Nesidicoris tenuis had three and two peaks on the tomato hybrids,in the two seasons, respectively. During 2018\2019 season the first peak was during the second week of November, the second one was in the first and fourth week of December. However, in 2019\2020 season the first peak was during the third week of November and the second one was in the third week of December. For the nymph had two peaks in the both seasons. The first peak was during the fourth week of October, the second peak was during fourth week of November 2018\2019 and 2019\2020respectively.

5.2.2. The lady beetle, *Coccinella undecimpunctata*:

Data revealed that *C. undecimpunctata* appeared in a few numbers ranged between 0.5 to 1.5 individuals/ 10 plants in the first season. The predator number maximized 4 times in 29th September, 13th and 27th October and 17th November respectively. After that, the predator number decreased to disappear completely, however, few numbers were recorded in the last two samples. However, in the second season the predator *C. undecimpunctata* maximized 4 times in 29thSeptember, 20thOctober, 17th November and 8th December

respectively. After that, the predator number decreased to disappear completely, however, a few numbers were recorded in the last two samples.

5.2.3. The common green lace wing, *Chrysoperla carnea*:

Data showed that *Chrysoperla carnea* appeared in a few numbers ranged between 0.5 to 1.8 individuals/ 10 plants in the first season and 0.3 to 2.0 in the second season. After that, the predator number decreased to disappear completely, however, a few numbers were recorded in the last three samples in the first season but in the second season the predator number continued to 9th February in both seasons, respectively.

5.2.4. The minute bug, *Orius* spp.:

Orius spp. was observed from the first week of inspection and continued to 23rd and 9th February in both seasons, respectively. The numbers ranged between 4.0 and 25.0 individuals/ 10 plants in the first season, and between 2.5 and 23.0 individuals/ 10 plants in the second season. The highest number was recorded in 13th October and 20thOctoberin both seasons of the study, respectively. In both seasons, three and four peaks were observed, respectively.

5.3. The effect of some weather factors and associated predators on the main insect pests infesting tomato plants:

The interrelation between main insect pests and the prevailing climatic in 2018\2019 season revealed a significant positive correlation the weekly sampling of main insect and either corresponding reading of maximum, minimum temperature and was insignificant negative with the pest *H. armigera*. Whereas the average humidity was insignificant negative correlation to all main pests under study. In 2019\2020 season the interrelation between main insect pests except *T. absoluta* (fruits) indicated a significant correlation between the weekly sampling and either corresponding reading of maximum, minimum temperature and was insignificant negative with the pest *T. absoluta*

(fruits).Whereas the average humidity was insignificant negative correlation to all main pests except *H. armigera*.

Concerning the predators in 2018\2019 season obtained results showed that the interrelation between main insect pests and the biotic factors revealed a significant positive the weekly sampling of main insect pests and either the corresponding reading of predators and was insignificant negative correlation with the pest *T. absoluta (leaves)*. In 2019\2020 season the same trend a significant positive correlation the weekly sampling of main insect pests and either the corresponding reading of predators and was insignificant negative correlation with the pest *T. absoluta* (leaves).

5.4. The susceptibility of certain tomato hybrids to infestation by main insect pests:

5.4.1. *Bemisia tabaci*:

Obtained results revealed that all tested tomato hybrids were variably infested with *Bemisia tabaci* (adults and nymphs) during study seasons. The population density of *Bemisia tabaci* during the second season was markedly higher than that the first season. The susceptibility degree of seven tomato hybrids can be divided in three groups of susceptibility, the first one includes hybrid 65010, hybrid 039 and hybrid 783 this groups were susceptible (s), the second group had moderately resistance (MR) and include one hybrid Logain, hybrid 102 and hybrid super red during two successive seasons of 2018\2019 and 2019\2020.

5.4.2. *Tuta absoluta*:

Obtained results revealed that generally population density of *T. absoluta* during the second season was markedly higher than that of the first season. The susceptibility degree among the tested tomato hybrids to *T. absoluta* infestation showed that hybrid 65010, hybrid 039, hybrid 783 and hybrid 449 received the highest infestation with *T. absoluta* while, hybrid super red was infested by the

lowest numbers. The susceptibility degree of seven tomato hybrids can be divided in three groups of susceptibility, the first one included hybrid 65010, hybrid 039 and hybrid 783 this group was susceptible (S), and the second group had low resistance (LR) and included two hybrids Logain and hybrid 02, third group was moderately resistance and included one hybrid super red.

5.4.3. *Liriomyza trifolii*:

Obtained results revealed that, generally all tested tomato hybrids were variably infested with leaf miners, *Liriomyza trifolii* during study period. The susceptibility degree of the tested tomato hybrids to *Liriomyza trifolii* infestation showed that tomato hybrids hybrid 65010, hybrid 039 and hybrid 783 exhibited susceptible (S), meanwhile, except hybrid 783 exhibited low resistance (LR) in 2019\2020 season. While hybrid Logain seemed to be (LR), hybrid super red and hybrid 102 seemed to be moderately resistance (MR) for infestation by *Liriomyza trifolii* during two successive seasons of 2018\2019 and 2019\2020.

5.4.4. *Helicoverpa armigera*:

Obtained results indicated that the population density of *Helicoverpa armigera* during the second season was markedly higher than that of the first season. The susceptibility degree among the tested tomato hybrids to *Helicoverpa armigera* infestation showed that hybrid 65010, hybrid 783 and hybrid 449 in the first season and hybrid 039 in the second season received the highest numbers. While hybrid 102, hybrid super red in the first season and hybrid Logain in the second season infested by the lowest numbers. The susceptibility degree of seven tomato hybrids can be divided in three groups in the first season and two groups in the second season. In the first season includes hybrid 65010, hybrid 039 and hybrid 783 this group was susceptible (S) and the second group had moderately resistance (MR) and included one hybrid Logain and the third group had low resistance (LR) included two hybrids, hybrid 102 and hybrid 039. In the second season the susceptible degrees of tomato hybrids

can be divided in two groups of susceptibility, the first one included hybrid 65010, hybrid 783, hybrid 039 and hybrid 449 was susceptible (S) and the second group had low resistance (LR) and included two hybrids hybrid Logain and hybrid 102.

5.5. The effect of certain tomato hybrids on insect predators ssociated with main insect pests infesting tomato:

5.5.1. *Nesidicoris tenuis*:

Data showed that the highest population of *N. tenuis* adults was in October for Hybrid 783 and Hybrid 102, during both seasons. While it was in November for Hybrid 65010, Hybrid Super red, Hybrid Logain, Hybrid 449 and Hybrid 039 during both seasons. Also, the data included that the attractiveness of tested hybrids classified in to three categories in both seasons. Hybrid super red, hybrid Logain and hybrid 449 recorded the most attractive category in both seasons. While, each hybrid 65010, hybrid 039 and hybrid 102 represented the low attractive category in both seasons. On the other hand, only hybrid 783 categorized with moderate attractive in both seasons

The occurrence pattern of *N. tenuis* nymphs are concedes with *N. tenuis* adults in the seven tested tomato hybrids during both seasons. Where, the highest population recorded in both hybrid 783 and hybrid 102 in October. While, hybrid super red, hybrid Logain, hybrid 449, hybrid 039 and hybrid 65010 recorded the highest population of *N. tenuis* in November in two tested seasons. The highest population was recorded on Super red with 8.51 and 9.02 nymphs/ 10 leaves during the two seasons, respectively, however, the lowest population was recorded on Hybrid 783 with 3.14 and 3.06 nymphs/ 10 leaves during the two seasons, respectively, by insignificant differences with Hybrid 65010, Hybrid 102 and Hybrid 39 during both seasons.

5.5.2. *Coccinella undecimpunctata*:

Data present the population of *C. undecimpunctata* on seven tomato hybrids during 2018/2019 and 2019/2020 seasons. Data showed that the highest population of *C. undecimpunctata* was in October for hybrid 102 and hybrid 449 and in November for Super red and hybrid 039 but in December for hybrid65010 and hybrid 83 during the both seasons. But it was in November for the hybrids, hybrid logain and Hybrid 449 during the first season only. Also, it was in September and October for the hybrids, hybrid logain and Hybrid 83 respectively during the second season only.

The lowest population was recorded on Hybrid 039 during both seasons respectively, by insignificant differences with all hybrids during the first season and with Hybrid 65010, Hybrid 83 and Hybrid 449 during the second season. However, the highest population was recorded on Super red during both seasons, respectively.

5.5.3. *Chrysoperla carnea*:

Data present the population of *Chrysoperla carnea* on seven tomato hybrids during 2018/2019 and 2019/2020 seasons. Data showed that the highest population of *Chrysoperla carnea* was in September, for hybrid logain during both seasons But for Hybrid 65010 during the first season only. It was in October for hybrid 83, hybrid 102, hybrid 449 and hybrid 039 during both seasons. But it was in November for the hybrid 039, during the first season only. Also, it was in December for the hybrid, Super red during the second season only.

The lowest population was recorded on Hybrid 65010 during both seasons respectively, by insignificant differences with all hybrids during both seasons. However, the highest population was recorded on hybrid logain hybrid during both seasons, respectively.

5.5.4. *Orius* spp.:

Data present the population of *Orius* spp. on seven tomato hybrids during 2018/2019 and 2019/2020 seasons. Data showed that the highest population of *Orius* spp. was in October for all hybrids during the both seasons except hybrid logain hybrid during the second season it was in November.

The lowest population was recorded on Hybrid o39 during both seasons respectively, by insignificant differences with Hybrid 65010, Hybrid 83 and Hybrid 102 during the first season and with Hybrid 65010 only during the second season. However, the highest population was recorded on hybrid Super red and hybrid logain during both seasons, respectively.

5.6. Laboratory studies:

5.6.1. Feeding preference of *Tuta absoluta* larvae on seven tomato hybrids:

Data showed the feeding preference of *T. absoluta* larvae on leaves of the seven tested tomato hybrids. Results indicated that the differences between hybrids were significantly after 1 and 24 hours. After one hour, the seven hybrids arranged into three significantly groups, the first and (the highest) included Hybrid 83, Hybrid 102 and hybrid logain with 20.10%, 22.19% and 18.73%, respectively, the second consisted of Hybrid 65010, Hybrid 449 and Hybrid 039 with 10.51%, 13.92% and 11.02%, respectively, however, the third included (the lowest) hybrid Super red with 3.53%. No significantly differences were found between the second group inside and the other groups in the other side. However, after 24 hours, Hybrid 102 attracted the highest percentage of larvae followed insignificantly by Hybrid 83 with 27.56% and 23.36%, respectively. Hybrid 039 attracted the lowest percentage of larvae with 9.03% followed insignificantly by Hybrid 65010, hybrid Super red, hybrid logain and Hybrid 449 with 12.01%, 4.05%, 14.61% and 9.38%, respectively.

For fruits, data indicated that the differences between hybrids were significantly and insignificantly after 1 and 24 hours, respectively. After one hour, the seven hybrids arranged into three significantly groups, the first and (the highest) included Super red with 24.14%, the second consisted of Hybrid 83 with 17.98%, however, the third included (the lowest) included Hybrid 65010, Hybrid 102, hybrid logain, Hybrid 449 and Hybrid 039 with 11.43%, 12.62%, 12.37, 13.68 and 7.78%, respectively. No significant differences were found between the second group in side and the other groups in the other side. After 24 hours, the highest and the lowest percentages of attracted larvae were recorded on Hybrid 039 and Hybrid 65010, respectively, with 16.15% and 8.92%, respectively.