TABLE OF CONTENTS

V- SUMMARY

Tomato crop is considered to be one of the most important vegetables cultivated in Egypt. This crop is growing in more than one season all over the year that allows the plants to be attacked by numerous insect pests. So, it is necessary to study the population density of those pests under dominant weather conditions and trying to use some alternative controlling methods instead of chemical insecticides, which have negative effects on either environment or mankind.

The obtained results could be illustrated briefly as follows:

1- Survey of Insect Fauna Associated with Tomato Crop in Alexandria Governorate:

Tomato, Kastel- Rock cultivar was transplanted during summer and fall/winter of the two successive years 2002 and 2003.

1.1- Survey of phytophagous insects:

Thirty seven species of insect pests belong to 20 families of 6 orders were surveyed which were:

Order: Homoptera represented by apihds, white fly, two species of psyllids and one species of mealy bugs beside 7 species of leaf hoppers, one species of plant hoppers and an unidentified species of frog hoppers. Order: Hemiptera represented by 6 species of phytophagus plant bugs. Order: Thysanoptera represented by 2 species of thrips. Order: Collempola which involve two species of spring tail insect. Order: Lepidoptera represented by larvae belong to three families. Order: Orthptera represented by one species of small cricket feeds on plant matter.

1.2- Survey of parasitic insects:

Twenty species of parasitic insects associated with insect pests of tomato were collected from tomato field. Three primary parasitoids of aphids (green peach aphid) were obtained beside four other species of secondary parasitoids. Also four parasitic species were detected parasitizing on pupae and larvae of whitefly. Four endoparasitoids and one ectoparasitoid were found parasitizing lepidoptrous larvae. Also, a secondary parasitoid was recorded in addition to one egg parasitoid (*Trichogramma* sp.). Also, one larval parasitoid of leaf miners was recorded. One egg parasitoid was detected attacking the leaf hopper eggs.

1.3- Survey of predaceous insects:

Predatory insect species following four insect orders were surveyed, which were: order: Hemiptera represented by four species of predatory bugs belong to three families. Order: Coleoptera represented by different coccinellid species beside another two staphylinid species. Order: Diptera represented by unidentified species of syrphid flies.

2- Population Fluctuation of Some Key Insect Pests and Their Natural Enemies Under the Effect of Daily Mean Temperature and Relative Humidity of the Two Successive Years 2002 and 2003:

2.1- Population fluctuation of insect pests:

2.1.1- Population fluctuation of eggs, larvae, pupae and adults of the whitefly:

The obtained data revealed that the populations of different stages of the whitefly were detected in very high levels during fall/ winter seasons compared with summer seasons of both studied years.

It was found that the range of 20- 28°C was suitable and encourages the populations build up. It was noticed that the temperature degree less than 20°C resulted in decrease in the populations of different stages of whitefly during fall/ winter seasons in which favourable temperature and relative humidity were dominant.

2.1.2- Population fluctuation of aphids, leaf miners, psyllids and thrips:

The obtained results revealed that aphid insects were found in high numbers at the beginning of summer seasons accompanied with moderate temperature and decreased with the increase of temperature within these seasons of the two years of study. During fall/ winter seasons, aphids appeared by the end of the season when the temperature became moderate again at the beginning of winter seasons. So, temperature can affect the population during all seasons. Also, it was detected that abundance of leaf miners was associated with fall/ winter seasons, while it was absent completely during summer seasons revealing the important role of both dominant temperature and relative humidity. Abundance of psyllids was more noticed during summer seasons than fall/ winter seasons. Numbers of these insects were relatively high at the beginning of summer seasons when moderate temperature was dominant, then the numbers decreased as the temperature relatively increase. That revealed a population fluctuation similar to that obtained with aphids. High level of thrips infestation was accompanied with the beginning of summer seasons when temperature is in moderate degrees. The population decreased with relative increase of temperature. It was also noticed that moderate degrees if relative humidity at the beginning of these seasons were important for population build up.

2.1.3- Population fluctuation of leaf hoppers, mirid bugs and lepidopterous larvae:

The obtained data revealed that activity and abundance of leaf-hoppers and mirid bugs were suitable at ranges of temperature from 20 to 28°C and relative humidity from 77 to 82% during summer seasons. Refer to leaf hoppers, numbers they were fewer during fall/ winter seasons than those of summer seasons. Also, mirid bugs numbers were relatively less during fall/ winter seasons than those of summer seasons.

As daily means temperatures and relative humidities of both summer and fall/ winter seasons were relatively similar within each year of study, no differences were detected between numbers of Lepidopterous populations which revealed no effect of both factors within both seasons of the study on those pests.

2.2- Population fluctuation of parasitic insects:

2.2.1- Population fluctuation of whitefly parasitoids:

It was found that the population of whitefly parasitoids increased with the increase of both temperature and relative humidity during summer seasons, while it was at the highest levels at the beginnings and the ends of fall/ winter seasons, when both temperature and relative humidity were moderate. That reveals the importance of both weather factors on the population build up.

2.2.2- Population fluctuation of aphid parasitoids:

Data revealed that the population of aphid parasitoids was accompanied with the beginnings of summer seasons, where moderate temperature was dominant and host insects were exist. These parasitoids disappeared with host disappearance with the

increase of temperature during summer seasons. The role of these parasitoids was low during fall/ winter seasons.

2.2.3- Population fluctuation of leaf miner parasitoids:

It was found that leaf-miner parasitoids were not existed during summer seasons where high temperatures accompanied with relatively low relative humidity were dominant, and as a result disappearance of host insects. High existence of leaf miner parasitoids was detected with its host existence during fall/ winter seasons where suitable temperature and relative humidity were dominant.

2.3- Population fluctuation of predaceous insects:

It was notable that the abundance of different predatory insects was low during the two years 2002 and 2003. It was found that the populations of adults and larvae of chrysopid, coccinellid and syrphid predators were relatively high at the beginning of summer seasons where moderate temperature and relative humidity were dominant and the populations of favourable preys (aphids) were existed. An increase in predators populations was noticed by the ends of fall/ winter seasons where moderate temperature and a relatively moderate to high relative humidity were dominant. It was found also that the populations of staphylinid insects were most abundant during summer seasons compared with fall/ winter seasons, especially at moderate temperatures. Also, it was noticed that populations of predatory bugs were more abundant during fall/ winter seasons than summer seasons, when the soft-bodied insect preys were found in great numbers such as whitefly.

3- Correlation Between Some Environmental Factors and Seasonal Abundance of Some Key Insect Pests During Summer and Fall/ Winter Seasons of 2002 and 2003:

The results revealed that there was negative and highly significant correlation between daily mean temperature and the mean numbers of aphids and leaf- hoppers during summer seasons of 2002, while there was no significant correlation between the daily mean relative humidity and the abundance of any of the studied insect. It was also found that there was negative and highly significant correlation between temperature and the numbers of whitefly, aphids, and thrips beside another negative and significant correlation between temperature and number of leaf- hoppers during summer seasons of 2003. No significant correlation was detected between relative humidity and numbers of aphids or mired bugs during summer of 2002, while there were highly significant correlations between relative humidity and the activity of whitefly, leaf-hoppers and thrips during summer of 2002. A significant and highly significant correlations were detected with whitefly, mired bugs and thrips,while the relations were significant with aphids and leaf-hoppers.

During fall/ winter seasons of 2002, there was a negative and highly significant correlation between daily mean temperature and mean number of aphids. Also, there was a positive and highly significant correlation between daily mean temperature and the mean numbers of leaf- hoppers and mirid bugs. During fall/ winter season of 2003, the correlation between temperature and leaf miner mean numbers was negative and highly significant, while it was positive and highly significant with each of whitefly, aphids, leaf- hoppers and thrips.

It was also detected that there were positive and highly significant correlation between relative humidity and the mean numbers of aphids and thrips during fall/ winter of 2002 and between relative humidity and the mean numbers of aphids, leaf miners and thrips during fall/ winter season of 2003.

4- Effect of Using Microbial, Botanical and Chemical Compounds on *B. tabaci* Infesting Tomato Crop in the Field:

Spraying with different tested compounds was carried out in three sprays on tomato crop during fall/ winter seasons of the two successive years of 2002 and 2003. The obtained data showed the following results:

4.1- Initial effect of the tested compounds:

The obtained results showed that both chemical insecticides (Actara and Mospilan) reflected the highest initial percentage reduction (after one day from any spray) of pest population (larvae+ pupae) of the whitefly reached 67.14%, 89.47%, 95.9% after one day from Actara first, second and third spray during season of 2002 while they were 85.27%, 90.37% and 85.37% after the three sprays of the season of 2003. Mospilan gave percentage reduction 83.53%, 84.4% and 98.6% after one day from each spray, respectively during season of 2002, while they were 86.71%, 90.73%, and 96.5% during season of 2003. Also it was found that Neem-Juvani, as well as microbial compounds started its activity against the whitefly after the second and third spray.

4.2- Residual effect of the tested compounds:

The data revealed that both Actara and Mospilan gave the highest residual effects against *B. tabaci* expressed as percentage

reduction followed by Neem- Juvani and Biokenza, then Biosect and Biofly after three sprays of the two seasons of 2002 and 2003.

4.3- Main effect of the tested compounds:

Data of main effects (Mean of three sprays) of the tested compounds revealed that Mospilan gave the highest percentage reduction during the two studied seasons followed by Actara then Neem-Juvani and finally the microbial compounds.

4.4- Effect of the tested compounds on the percentages of infested plants with viral diseases:

Infected plants were counted weekly in tomato field under the application of the tested compounds from the beginning to the end of each season, it was found that:

Control check gave the highest percentage of infected plants (96%) and (97%) during seasons of 2002 and 2003, respectively. Microbial compounds come in the second order after control check, while Neem- Juvani application resulted in moderate percentages of infected plants 54.33% and 51%, during seasons of 2002 and 2003, respectively. The neonecotinoides (Actara and Mospilan) were responsible for preventing the dispersion of viral diseases in tomato field during the two studied seasons and low percentages of infected plants were recorded which were 19.67% and 28% with Mospilan and 15% and 16.67% with Actara during the seasons of 2002 and 2003, respectively.

5- Effect late Release of *Encarsia mineoi* on Tomato Plants Infested with Whitefly:

Within this experiment, numbers of mass reared individuals of the parasiotid *E. mineoi* were used for release on tomato plants infested

with whitefly at the beginning of fruiting time. Release was done using 7-10 black scales of parasitoids, per tomato plant in the field during fall/ winter season of 2003.

The obtained data revealed no significant differences between the treatment and control check during the first week after release. The percentage of parasitism with relase treatment was increased compared with control check at the end of the season, as it was found that there were significant differences between them. The percentage of parasitism reached 18.18% with relase treatment compared with 4.88% with the control, which reflect the success of the release experiment.

6- Evaluation of Four Different Controlling Programmes on the Population Density of *B. tabaci* and Their Effects on the Associated Parasitoids and Predators:

Four different controlling programmes of whitefly were applied on tomato plants in the field during the fall/ winter season of 2004. They were:

- Programme (1): including tolerant variety of tomato to whitefly infestation, intercropping system with cucumber, using sticky traps, application of Carbofuran and Actara and release of the parasitoid *E. mineoi*.
- Programme (2): the same as (1) except releasing the parasitoids.
- Programme (3): the same as (1) except releasing the parasitoids and application of Actara.
- Programme (4): the same as (1) except releasing the parasitoids and application of Actara and Carbofuran. The obtained results indicated the following:

6.1- The effect of different programmes on whitefly:

It was found that both programmes (1) and (2) were the most effective in declining the population density of whitefly on tomato plants. They include application of Actara for one time, using the systemic pesticide carbofuran for one time during transplanting, using tolerant variety of tomato to whitefly infestation, using yellow sticky traps for attracting high numbers of adults of whitefly in addition to releasing the parasitoids of whitefly only within programme (1).

6.2- Effect of different programmes on parasitized scales of whitefly:

It was noticed that the parasitized scales were more existed in the control check followed by programmes (1) and (4) than in programmes (2) and (3).

6.3- Effect of different programmes on the population density of predaceous insects:

It was found that the predatory insects of Coccinellidae, Chrysopidae, Anthocoridae, Staphylinidae and Syrphidae were more existed with all programmes than with the control.

6.4- Effect of different programmes on the percentages of infected plants with viral diseases:

Weekly visual examination of tomato plants under the effects, of different controlling programmes was carried out from the beginning till the end of the seasons. The results revealed that the lowest percentages of infected plants were recorded with programmes (1) and (2), which were 16% and 17% respectively. Moderate percentages were recorded with programmes (3) and (4), which were 37% and 45% respectively, while it was very high with control check (63%).