CHAPTER-V
SUMMARY AND CONCLUSION

Tomato (*Lycopersicon esculentum* Mill.) is attacked by several insect pests causing considerable damage to the crop. Therefore, investigations were carried on seasonal incidence, yield losses and bio-efficacy of insecticides against the major sucking pests of infesting tomato viz., whiteflies, *Bemisia tabaci* (Genn.), aphid, *Aphis gossypii* (Glover), jassid, *Amrasca biguttula biguttula* (Ishida) and *Thrips tabaci* (Lind.) during the year 2016. The main conclusions have been summarized and discussed in this chapter.

5.1 Seasonal incidence of major sucking pests of tomato during *kharif*

5.1.1 Whitefly, *B. tabaci*

The study revealed that the whitefly population initiated from the 3rd week after transplanting i.e. the third week of August with (0.28 whitefly/ 3 leaves/ plant). The population of the pest increased gradually from the 3rd to 11th WATP and reached the peak population (9.48 whitefly/ 3 leaves/ plant) in the 12th WATP coinciding with the 3rd week of October and whitefly population was found to occur throughout the crop period. Later on, it was found to decline drastically and reached 0.28 whiteflies/ 3 leaves/ plant at the time of harvest i.e. the 20th WATP.

Correlation coefficient values revealed that the population of whitefly exhibited significant positive correlation with bright sun shine hours (r= 0.4924), maximum temperature (r= 0.4296) and evaporation (r= 0.2885) whereas, negative non-significant correlations found with minimum temperature (r= -0.1080), morning relative humidity (r= -0.3320), evening relative humidity (r= -0.3289) and wind velocity (r= -0.5131).

5.1.2 Aphid, *A. gossypii*

The study on aphid revealed that the population of aphid (0.44 aphid/ 3 leaves/ plant) appeared from the 4th WATP i.e. the first week of September and remained active throughout the crop period. The pest population increased gradually and reached the peak level of (7.28 aphid/ 3 leaves/ plant) during the 13th WATP coinciding with the fourth week of October. Later on, it was found to decline drastically and reached 0.88 aphid/ 3 leaves/ plant at the time of harvest i.e. the 20th WATP.
The correlation matrix indicated that the population of aphid exhibited positive correlation with bright sunshine hours ($r=0.5611$), maximum temperature ($r=0.5569$) and evaporation ($r=0.3521$) whereas, negative correlations with wind velocity ($r=-0.6099$), morning relative humidity ($r=-0.4997$) and evening relative humidity ($r=-0.5263$). While minimum temperature ($r=-0.3439$) and total rainfall ($r=-0.2809$) exhibited non-significant negative correlations with aphid population.

5.1.3 Jassid, *A. biguttula biguttula*

The results showed that the jassid population initiated from the 3rd WATP i.e. third week of August with (0.36 jassid/ 3 leaves/ plant). The population of the pest increased eventually from the 3rd to 12th WATP and reached the peak population (10.80 jassid/ 3 leaves/ plant) in the 13th WATP coinciding with the 3rd week of October. Jassid population was found to occur throughout the crop period. The population declined gradually towards the end of the crop period and was reach (1.41 jassid/ 3 leaves/ plant) at the time of harvest.

The correlation matrix indicated that the population of jassid exhibited significant positive correlation with bright sun shine hours ($r=0.5597$) and maximum temperature ($r=0.4548$) whereas, highly significant negative correlations was found with wind velocity ($r=-0.6704$).The remaining abiotic factors did not have any significant effect.

5.1.4 Thrips, *T. tabaci*

The results indicated that the population of thrips (0.44 thrips/ 3 leaves/ plant) appeared from the 7th WATP i.e. the 4th week of September and remained active throughout the flowering period. The pest population increased gradually and reached a peak level of (10.68 thrips/ 3 leaves/ plant) during the 14th WATP coinciding with the fourth week of October. The population declined gradually during the successive weeks and reached (3.20 thrips/ 3 leaves/ plant) at the time of harvest.

The correlation coefficient values indicated that the population of thrips exhibited highly significant positive correlation with maximum temperature ($r=0.7242$) and bright sunshine hours ($r=0.6514$) whereas, highly negative significant correlations found with minimum temperature ($r=-0.8654$), morning relative humidity ($r=-0.8406$), evening relative humidity ($r=-0.8645$) and wind velocity ($r=-0.6083$).Other factors did not significant effect on population of thrips.
5.2 Estimation of yield losses due to major sucking pests of tomato

An experiment was conducted to estimate the loss in yield caused by major sucking pests of tomato. Significantly higher yield of 15278 kg/ha was recorded from plots protected against the sucking pests of tomato while yield of 11620 kg/ha was recorded from the unprotected plots. The increase in yield in protected plots over unprotected plots was 3657 kg/ha. This showed 31.47 per cent increase in yield and 23.93 per cent avoidable yield loss.

5.3 Bio-efficacy of insecticides against major sucking pests in tomato

5.3.1 Whitefly, B. tabaci

The results from the three sprays have revealed that imidacloprid 0.005 per cent, acetamiprid 0.008 per cent, difenthiuron 0.05 per cent and thiacloprid 0.024 per cent were found to be the most effective insecticides. Whereas, the treatments, dimethoate 0.03 per cent, thiacloprid 0.024 per cent, flonicamid 0.015 per cent were found next in order of their efficacy. The other treatments fared poorly in this context.

5.3.2 Aphid, A. gossypii

The results of relative efficacy of different insecticides against aphid have revealed that flonicamid 0.015 per cent, imidacloprid 0.005 per cent, dimethoate 0.03 per cent and acetamiprid 0.008 per cent gave very good results against aphid. clothianidin 0.025 per cent was and thiacloprid 0.024 found to be the immediate next best one. The others insecticides were less efficacy.

5.3.3 Jassid, A. biguttula biguttula

In accordance with the results obtained from three sprays, flonicamid 0.015 per cent, imidacloprid 0.005 per cent and dinotefuran 0.01 per cent were undisputedly the most effective against thrips. Next in the order, clothianidin 0.025 per cent acetamiprid 0.008 per cent and dimethoate 0.03 per cent were also found to be moderate in their action against the pests. The remaining insecticides were found dismal in their performance yet again.

5.3.4 Thrips, T. tabaci

The results of relative efficacy of different insecticides against thrips have revealed that Spinosad 0.009 per cent, imidacloprid 0.005 per cent and difenthiuron 0.05 per cent gave very good results against thrips. Acetamiprid 0.008 per cent and dimethoate 0.03 per cent was found to be the next best insecticides. The others insecticides were less efficacy against thrips.
5.4 Yield and economics of different insecticidal treatments

Highest fruit yield of 21235 kg/ha was obtained from the treatment of imidacloprid 0.005 per cent which was statistically at par with flonicamid 0.015 per cent, clothianidin 0.025 per cent, difenthiuron 0.05 per cent, acetamiprid 0.008 per cent and dimethoate 0.03 per cent which recorded 20617, 20494, 20123, 19691 and 19012 kg/ha yield respectively. The maximum per cent increase in yield (89.00%) was recorded from the treatment of imidacloprid 0.005 per cent follow by flonicamid 0.015 per cent (83.50%), clothianidin 0.025 per cent (82.41%), difenthiuron 0.05 per cent (79.10%) and acetamiprid 0.008 per cent (75.26%).

The highest cost benefit ratio (1:77.51) was obtained from the treatment of imidacloprid 0.005 followed by acetamiprid 0.008 per cent (1:74.83), dimethoate 0.03 per cent (1:74.06) and flonicamid 0.015 per cent (1:26.80). Other insecticides register lower yield and economic.