CHAPTER- V
SUMMARY AND CONCLUSION

Study on biology of Thrips, *Megalurothrips distalis* greengram was carried out under laboratory conditions at Department of Entomology, College of Agriculture, Junagadh Agriculture University, Junagadh. The other aspects viz., population dynamics and bio-efficacy of pesticides against thrips *Megalurothrips distalis* (Karny) infesting greengram crop were studied under field condition during kharif 2016. The main findings under different aspects of these studies are summarized in this chapter.

5.1 Biology of Thrips, *Megalurothrips distalis* on greengram

The biology of thrips *M. distalis* was studied in the laboratory. The average room temperature during the study was 28.40 ± 2.07 °C, while relative humidity was 89.6 ± 1.14 per cent. The results obtained are presented as under.

Female of *M. distalis* inserted the eggs inside the leaf tissues with its pointed ovipositor. The average incubation period was 5.48 ± 1.09 days at the average room temperature.

The first instar larva was tiny, delicate, starchy colored and segmented worm with red eyes. There was no indication of legs and antennae, when it was newly born. It was observed that the larva emerged out from the leaf tissues by a slight swaying motion and unfolded its antennae and legs. There were small setae on the dorsal side of head and a pair of setae on each 2nd and 8th abdominal segments. All the 8 abdominal segments were clearly visible, but the last segment was slightly elongated.

The second instar larva resembled with the first instar larva in general appearance except body size and colour. The body colour during this instar was whitish yellow. Few small setae were observed on the head. The abdomen was divided in 10 distinct segments and there were three pairs of setae on 2nd to 8th abdominal segments.
Summary and Conclusion

The duration of first and second larval instars had an average of 2.44 ± 0.48 and 3.48 ± 0.48 days, respectively. The total larval period of C. indicus in the culture reared on leaves was found 5.96 ± 0.70 days.

The pre pupal and pupa period had an average of 1.52 ± 0.49 and 2.56 ± 0.48 days, respectively. The total period was an average of 4.08 ± 0.54 days.

The female was easily recognized by three arc like pale brownish patches on the dorsal and ventral parts of the second to seventh abdominal segments while in male they were lacking. In female, the terminal segments of the abdomen looked tapering at one end, whereas, in male they were blunt and round in appearance.

The male and female thrips lived for an average of 18.84 ± 1.54 days and 20.28 ± 1.82 days respectively.

The pre-oviposition, oviposition and post-oviposition periods was varied an average of 1.50 ± 0.50, 2.20 ± 0.60 and 0.30 ± 0.46 days, respectively.

Fecundity of female of *M. distalis* was an average of 64.84 ± 15.08 at an average room temperature during the study was 28.40 ± 2.07 °C, while relative humidity was 89.6 ± 1.14 per cent.

Sex ratio of male and female *M. distalis* at a room temperature was 1: 1.47.

The entire life span of male was an average of 32.68 ± 3.42 days and that of female was an average of 36.92 ± 2.24 days. Thus, the life span of female was longer than male.

5.2 Population dynamics of Greengram thrips

A study was carried out to know the occurrence and abundance of thrips on GM-4 variety of greengram during kharif 2016. The thrips appeared with population density ranging from 0.40 to 5.21 thrips per tri-foliate leaf of plant. The incidence of thrips commenced in the 31st standard week i.e. 3rd week of sowing indicating 0.40 thrips/ per tri-foliate leaf of plant, which gradually increased and attained a peak of 5.21 thrips/plant during the 37th standard week i.e. 9th week of sowing. Thereafter, it started to decline slowly toward the maturity of the crop.
5.2.1 Correlation studies between thrips population and weather parameters

Among all the weather parameters, bright sunshine hours of the weather parameters showed statistically significant correlation with thrips population. However, the population of thrips exhibited negative correlation with morning relative humidity ($r = -0.3053$), evening relative humidity ($r = -0.5791^*$), mean relative humidity ($r = -0.5300$), wind speed ($r = -0.0358$), rainfall ($r = -0.1166$) and rainy days ($r = -0.1565$). While it was positively correlated with maximum temperature ($r = 0.4428$), minimum temperature ($r = 0.4076$), mean temperature ($r = 0.5210$), evaporation ($r = 0.2693$).*

5.3 Population of natural enemies of pests on greengram

5.3.1 Ladybird beetle *Cheilomenes sexmaculata* (Fab.)

The population of *C. sexmaculata* was ranging from 0.46 to 4.57 per plant. The predator during the population of the predator commenced in the 29th standard week i.e. 1st week after sowing (WAS) indicating (0.46 predators/plant), which gradually increased and attained a peak of (4.57 predators/plant) on 37th the standard week i.e. 9th WAS coinciding with second week of October. Thereafter, it started to decline in the 38th WAS. The population declined gradually during the successive weeks. However, the *C. sexmaculata* population remained throughout the crop period. The predators population was increase with increased in the sucking pest population.

5.3.2 Spider

The population of spider commenced in the 29th standard week i.e. 1st week after sowing (WAS) indicating (0.29 spider/plant), which gradually increased and attained a peak of (3.70 spider/plant) 37th the standard week i.e. 9th WAS coinciding with second week of October. Thereafter, it started to decline in the 38 WAS. The population declined gradually during the successive weeks. However, the spider population remained throughout the crop period.

5.3.3 Correlation studies between natural enemies population and weather parameters

The correlation of natural enemies population of *C. sexmaculata* exhibited significant positive correlation with mean bright sunshine ($r = 0.6295^*$). The population of spider exhibited
significant positive correlation with mean bright sunshine ($r = 0.6386^*$) and non-significant positive correlation with maximum temperature ($r = 0.4616$), minimum temperature ($r = 0.5231$) and evaporation ($r = 0.2980$). Significant negative correlation with evening relative humidity ($r = -0.5918^*$).

**5.4. Evaluation of direct and indirect effects of biotic and abiotic factors on thrips population greengram through path co-efficient analysis**

The maximum temperature found to be negative high direct effect (-1.2776) whereas minimum temperature showed negative but high direct effect (-0.1766) on population build-up of thrips. So, it indicates that the minimum and maximum temperature was an unfavourable. Indirect effect of both parameters positive high to low on thrips population through almost all the other biotic and abiotic factors except morning relative humidity, evening relative humidity and mean relative humidity.

Direct effect of morning relative humidity found positive low effect (0.3266) and evening relative humidity (-4.0520) were observed negatively very high on thrips population. It indicates that the evening relative humidity was more unfavorable to population of thrips. This parameter exhibited positive high to low indirect effect on thrips population through almost all the other biotic and abiotic factors except minimum temperature and mean temperature.

Direct effect of mean bright sunshine found negatively and high (-1.5748), indicating an unfavorable individual influence on the population build-up of thrips. This parameter exhibited positive high to low indirect effect on thrips population through almost all the other biotic and abiotic factors except minimum temperature and evening relative humidity.

The wind and rainfall was found positive low effect (0.1339) indicating favorable to population build-up of thrips and rainy day found negatively very low (-0.0039) indicating unfavorable to population build-up of thrips. This parameter exhibited positive high to low indirect effect on thrips population through almost all the other biotic and abiotic factors except maximum temperature, minimum temperature and evening relative humidity.

The evaporation had a negatively high direct effect (-1.2365) on population of thrips. This parameter exhibited positive high to low indirect effect on thrips population through
almost all the other biotic and abiotic factors except maximum temperature, minimum temperature, evening relative humidity and mean bright sunshine hours.

The bio-agent (lady bird beetle) exhibited negatively very high direct effect (-5.1005) and spider (5.9051) positively very high direct effect on thrips population. This parameter exhibited positive high to low indirect effect on thrips population through almost all the other biotic and abiotic factors.

5.5 **Efficacy of different pesticides against thrips of greengram**

Thus, the results of the three spraying of the pesticides against the greengram thrips revealed that imidacloprid 0.02 per cent, fipronil 0.01 per cent and profenophose 0.05 per cent were found more effective treatments against the pest as compared to other treatments. They caused around 68 to 83 per cent pest mortality in the field.

However, the treatments of cypermethrin 0.0125 per cent and dimethoate 0.03 per cent were found less effective treatment against the thrips.

5.6 **Yield and economics of different insecticidal treatments**

Data obtained from Table 16 revealed that the highest grain yield of 1390 kg/ ha was obtained from the treatment of imidacloprid 0.02 per cent which was statistically at par with profenophose 0.05 per cent and fipronil 0.01 per cent, which recorded 1320 and 1296 kg/ ha yield, respectively. The insecticidal treatments of acetamiprid 0.07 per cent, spinosad 0.018 per cent, thiamethoxam 0.0125 per cent, dimethoate 0.03 per cent, buprofezin 0.05 per cent, per cent were the next in the order giving yields of 1045, 1010, 970, 940, and 930, respectively. The treatment cypermethrin gave the lowest yield of 860 kg/ ha and it did not differ significantly from the control treatment which registered 850 kg/ ha of yield.

As far as the increase in yield is concerned, the maximum per cent increase (85.33 per cent) was recorded from the treatment of imidacloprid 0.002 per cent. The treatments which gave higher percentage of yield include profenophose 0.05 per cent and fipronil 0.01 per cent recording 76.00 and 72.80 per cent increase over control. The other treatments gave less than 40 per cent increase in yield.

The highest cost benefit ratio (1: 24.58) was obtained from the treatment of imidacloprid 0.006 per cent followed by acetamiprid 0.008 per cent (1:16.33), chlorantraniliprole 0.006 per cent (1:11.47), spiromesifen 0.408 per cent (1:11.22), spinosad
0.0135 per cent (1:8.35), and buprofezin 0.05 per cent (1:6.19). The other treatments such as dinetofuran 0.01 per cent (1:3.73), chlorfenapyr 0.015 per cent (1:1.52) and clothianidin 0.025 per cent (1:1.26), registered low cost benefit ratios.

Thus, anyone of the above effective insecticides can be recommended for the control of the major sucking pests of green gram.