CHAPTER V
SUMMARY AND CONCLUSION

Soybean [Glycine max (L.) Merrill.] is an important leguminous crop. It is attacked by several insect pests from germination to maturity causing considerable damage to the crop. Efforts were therefore, made to study the seasonal incidence, varietal susceptibility and biopesticides based management of pest complex of soybean. The important conclusion emerged from these investigations are summarized and given hereafter.

5.1 Seasonal incidence of pest complex of soybean

5.1.1 Whitefly, Bemisia tabaci (Gennadius)

The results showed that the population build-up of whitefly commenced from third week of September (1.9 whiteflies per three leaves per plant). The pest population increased in successive weeks and reached to the peak level of 5.6 whiteflies per three leaves during second week of October. The population declined gradually during the successive weeks and disappeared at the time of harvest.

Among all the weather parameters, only evaporation rate exhibited higher significant negative correlation with the pest population. All the other weather parameters exhibited non-significant correlation with whitefly during kharif season-2013.

5.1.2 Jassid, Empoasca kerri (Pruthi)

The jassid population, commenced from second week of September (0.16 jassid per three leaves per plant) and reached peak level (3.78 jassid per three leaves per plant) at second week of October. The population of jassid remained throughout the crop period and disappeared at the time of harvest.

Among all the weather parameters, only evaporation rate exhibited significant negative correlation with the pest population. All the other weather parameters exhibited non-significant correlation with jassid during kharif season-2013.

5.1.3 Aphid, Aphis glycine (Koch)

The infestation of aphid was initiated from third week of September (0.01 aphid index) and reached peak level (3.57 aphid index) at second week of October. Thereafter, it gradually declined and reached to zero level at the time of harvest.
The correlation study indicated that population of aphid and evaporation rate was negatively significant, while other parameters exhibited non-significant correlation during kharif season-2013.

5.1.4 Tobacco leaf eating caterpillar, Spodoptera litura (Fabricius)

The population of tobacco leaf eating caterpillar was started from third week of September (1.1 larvae per plant) and reached peak level (5.7 larvae per plant) at second week of October and second peak level (3.1 larvae per plant) at second week of November. Then after, it gradually declined and finally reached to zero level at the time of harvest.

The correlation study indicated that non-significant positive correlation exhibited between pest population and minimum temperature, morning relative humidity, evening relative humidity, rainfall and rainy days, while maximum temperature, sunshine hours and evaporation rate were negatively non-significant.

5.2 Varietal susceptibility against pest complex of soybean

5.2.1 Whitefly, Bemisia tabaci (Gennadius)

Among the eight genotypes/varieties of soybean the minimum population of whitefly was found on genotype GS-3 (2.75 whiteflies per three leaves per plant) followed by J-645 and PK-746 (2.94 and 2.97 whiteflies per three leaves per plant, respectively). The highest population was found on genotype AGS-112 (4.16 whiteflies per three leaves per plant) which was at par with GS-2 and AGS-107 (3.94 and 3.73 whiteflies per three leaves per plant, respectively). The genotypes/varieties viz., GS-1 and J-659 recorded 3.24 and 3.37 whiteflies per three leaves respectively and can be considered as moderately susceptible.

5.2.2 Jassid, Empoasca kerri (Pruthi)

Among all the genotypes/varieties of soybean, genotype J-659 (2.91 jassid per three leaves per plant) recorded minimum population of jassid followed by J-645, GS-2 and GS-3 (2.96, 3.09 and 3.14 jassid per three leaves per plant, respectively). The highest population was found on genotype AGS-107 (4.05 jassid per three leaves per plant) which was at par with GS-1, PK-746 and AGS-112 (3.99, 3.97 and 3.72 jassid per three leaves per plant, respectively) and these can be considered as the highly susceptible.

5.2.3 Aphid, Aphis glycine (Koch)

The genotype GS-3 (2.13 aphid index per plant) recorded lower incidence of aphid which was at par with PK-746, J-645 and GS-2 (2.33, 2.45 and 2.47 aphid index
per plant, respectively). The highest incidence was recorded in genotypes AGS-112 (3.57 aphid index per plant) which was at par with AGS-107 and J-659 (3.42 and 3.18 aphid index per plant, respectively). The genotype/variety GS-1 (2.92 aphid index per plant) can be considered as the moderately susceptible.

5.2.4 Tobacco leaf eating caterpillar, *Spodoptera litura* (Fabricius)

Among the genotypes/varieties of soybean, genotype J-659 recorded lowest population of *S. litura* (2.63 larvae per plant) which was at par with GS-3 (2.98 larvae per plant) and J-645 (3.13 larvae per plant) and these can be considered as the least susceptible. The highest population was found on the genotype AGS-112 (3.89 larvae per plant) which was at par with PK-746, GS-2 and AGS-107 (3.82, 3.75 and 3.57 larvae per plant, respectively) and these can be considered as highly susceptible. The genotype GS-1 (3.29 larvae per plant) can be considered as the moderately susceptible.

5.3 Biopesticides based management of pest complex of soybean

5.3.1 Whitefly, *Bemisia tabaci* (Gennadius)

The results of relative efficacy of biopesticides/insecticides against whitefly revealed that monocrotophos 0.04 per cent and NSKE 5 per cent were the most effective treatments.

Among the different biopesticides and combination of treatments, Bb @ 1.0 Kg/ha + monocrotophos 0.02 per cent was most effective against whitefly followed by *V. lecanii* @ 1.0 Kg/ha + monocrotophos 0.02 per cent. The treatment with Bt @ 1.0 Kg/ha + NSKE 2.5 per cent and *Bacillus thuringiensis* @ 2.0 Kg/ha were found least effective against the whitefly on soybean.

5.3.2 Jassid, *Empoasca kerri* (Pruthi)

Treatments of monocrotophos 0.04 per cent and NSKE 5 per cent were found most effective treatments against jassid on soybean.

Among the different biopesticides and combination of treatments, *V. lecanii* @ 1.0 Kg/ha + monocrotophos 0.02 per cent was most effective against jassid followed by Bb @ 1.0 Kg/ha + monocrotophos 0.02 per cent. The treatment with *Beauveria bassiana* @ 2.0 Kg/ha and *Bacillus thuringiensis* @ 2.0 Kg/ha were found least effective against jassid on soybean.

5.3.3 Aphid, *Aphis glycine* (Koch)

The results of relative efficacy of biopesticides/insecticides against aphid revealed that monocrotophos 0.04 per cent was the most effective treatment.
Among the different biopesticides and combination of treatment used against aphid, *V. lecanii* @ 1.0 Kg/ha + monocrotophos @ 0.02 per cent was most effective followed by Bb @ 1.0 Kg/ha + monocrotophos @ 0.02 per cent and *V. lecanii* @ 1.0 Kg/ha + NSKE 2.5 per cent. The treatment with Bt @ 1.0 Kg/ha + NSKE 2.5 per cent and *Bacillus thuringiensis* @ 2.0 Kg/ha were found least effective against aphid on soybean.

### 5.3.4 Tobacco leaf eating caterpillar, *Spodoptera litura* (Fabricius)

A treatment of monocrotophos 0.04 per cent was the most effective treatments against tobacco leaf eating caterpillar on soybean.

Among the different biopesticides and combination of treatments, Bb @ 1.0 Kg/ha + monocrotophos 0.02 per cent was most effective against tobacco leaf eating caterpillar followed by Bb @ 1.0 Kg/ha + NSKE 2.5 per cent on soybean. The treatment with *V. lecanii* @ 1.0 Kg/ha + NSKE 2.5 per cent and *V. lecanii* @ 2.0 Kg/ha were found least effective against tobacco leaf eating caterpillar on soybean.

### 5.3.5 Yield

The results on yield obtained in various treatments revealed that monocrotophos 0.04 per cent gave the highest yield of 1934 kg/ha and proved as good as NSKE 5 per cent (1893 kg/ha).

Among the biopesticides and combination treatments Bb @ 1.0 kg/ha + monocrotophos @ 0.02 % gave higher yield (1609 kg/ha). The treatments *viz.*, *V. lecanii* @ 1.0 kg/ha + monocrotophos @ 0.02 %, Bb @ 1.0 kg/ha + NSKE @ 2.5 %, *V. lecanii* @ 1.0 kg/ha + NSKE @ 2.5 %, Bt @ 1.0 kg/ha + monocrotophos @ 0.02 % and Bt @ 1.0 kg/ha + NSKE @ 2.5 % were the next effective treatments. The rest of the treatments also gave the higher yield as compared to control.