CHAPTER VII

CONCLUSION AND RECOMMENDATION
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CONCLUSION

Over all study on the population dynamics of this pest clearly indicated that this species is abundant in this part of the country. This species is peculiar in nature of distribution in this district as many of the authors mentioned that it undergoes hibernation during winter season. But our present investigation clearly indicates their abundance throughout the year. The study of population fluctuation with the abiotic factors clearly indicated that moderate temperature, high humidity and no rainfall may favourable for the pest resurgence. Overall study of population dynamics reveals that the maximum pest incidence occurs during autumn and winter. All the abiotic factors during those seasons prevail moderate to high may favours their abundance in this district considered as a conducive climate.

The adult beetles infested on various parts of crops viz., leaves, flowers, stems and fruits of major cucurbitaceous crops. The adults in groups on the under surface of the young leaves, flowers and petals, making characteristic patches which result in poor vegetative growth and yield.

Regarding host preference besides Pumpkin (C. maxima), the pest prefers other available cucurbit hosts except bitter gourd (M. charantia L.). This may be due to the presence of cucurbitacin in bitter gourd which deters the feeding activity. Along with the major cucurbit crops this pest also prefers some other alternative hosts where D. lablab, S. tuberosum, and V. feba are reported first time from this valley.
The extent of damage caused by adults and larvae indicated that the adult damage was highest. The feeding rates of adults were maximum on *C. maxima* the lowest on *L. vulgaris*. Maximum larval feeding rates were recorded on *C. sativus* by first instar followed by second instar. There was no damage recorded by fourth instar.

Diurnal activity in three crop seasons revealed that the activity of the beetle was maximum during summer followed by autumn and less in winter. Within season study the peak period of activities was recorded during morning (8:00 AM) and afternoon (5:00 PM) during summer, morning (10:00 and 11:00 AM) during autumn and afternoon (1:00 and 2:00 PM) during winter seasons, respectively. The variation of activities in three seasons may be due to variation of prevailing climatic condition.

As regards the morphometry and biology, it was observed that there was no significant variation among the different stages of grubs and pupae in their body length, width, head capsule and weight.

The morphometry of adult beetles revealed that the body, head capsule, antennae, legs and wings were comparatively larger in females than males. The adult male measured 6.93±0.43mm in length and 3.20±0.21mm in width whereas females measured as 8.14±0.35mm in length and 3.66±0.18mm in width. This may be due to nutritional availability, hereditary or agro climatic conditions which can influence in this region.
Present findings based on the reduction in the pest population, it is evident that out of seven insecticides belonging to different chemical groups, cypermethrin (0.002%) and fenvalerate (0.002%) performance were the most effective in controlling the beetles and afforded cent per cent reduction up to 20 days. Data revealed that higher concentration of all the treatments showed more efficacy than lower treatments except deltamethrin and malathion. Pyrethroids are photodegradable, possess less mammalian toxicity and therefore, these chemicals may be recommended against this Chrysomelid beetle. Malathion was found to be less effective in present study than the other insecticides.

As regards the cost-benefit-ratio it may be said that the cypermethrin (0.002%) and fenvalerate (0.001%) showed the highest performance of crop yield where C: B ratio was 1:3.36 by cypermethrin only. The outcome of the yield in terms of monetary value was Rs. 7659.80/- per hectare. Phosphamidon (0.03%) also proved as one of the higher yield group performer which gave profit money of Rs 5585.00/- from a hectare of land. Effectiveness of bio-pesticides in two concentrations of each of the five treatments revealed that all the treatments proved their various performances against pest reduction. All the treatments were found to be active up to 7th day of post application except Cal-10 (0.4%). The higher concentration of Cal-paste (0.4%) gave rapid quick knock down action against the beetle where cent per cent reduction was recorded just after a day and continued up to a week in a decreasing trend. Larvocel (0.5%) also showed cent per cent mortality after 3 days and continued up
to 5 days of application and both the concentrations of Larvocel remained active for a week.

The bio-efficacy of six plant extracts (*Ipomoea quamoclit, Ricinus communis, Capsicum frutescens, Eupatorium odoratum, Neirium indicum and Vinca rosea*) in different solvents with four concentrations (0.5%, 1.0%, 1.5% and 2.0%) each against *R. foveicollis* revealed that highest performance was obtained by all the concentrations of *Eupatorium odoratum* in ethanol, *Neirium indicum* in methanol and hexane solvents where almost cent per cent efficacy obtained and remained active up to a week.

The study of bio-efficacy by using traditional methods revealed that wood ash and fly ash gave cent per cent pest population reduction within 24 hours thereafter this was decreased in case of wood ash from third day of application. In case of fly ash, the cent per cent effectiveness was continued up to 5th day thereafter it was found to be decreased. But residual effects of both the above treatments were continued up to a week.

As far as the uses of traditional methods are concerned for pest management it indicated that about 77.50% farmers were practiced this methods out of the study sites. It was explored and documented that they used wood ash, fly ash, cow dung, chilly, tobacco, lime and turmeric as traditional practices to control *R. foveicollis*. Almost 75.00% farmers were found to be engaged to cultivate cucurbit crops among the four study sites. Data also revealed that on an average farmer earned 7.10 to 24.75% from cucurbit crops only out of total annual family income.
RECOMMENDATION

Among the synthetic pesticides tested, cypermethrin (0.002%) and fenvalerate (0.002%) were found to be the best performed pesticides against *R. foveicollis*. Since these are pyrethroids therefore they possess less mammalian toxicity, photodegradable in nature and short residual life. These chemicals may be recommended against this Chrysomelid beetle.

As far as the effectiveness of biopesticides is concerned to control *R. foveicollis*, Cal-paste (0.2 and 0.4%) and Larvocel (0.5%) may be recommended as these are biological origin compound and eco-friendly in nature. Larvocel is composed of *B. bassiana*, a fungal spore for which effectiveness remains for a long time. In other way the Cal-paste contains neem oil which is one of the major component of this mixture therefore this mixture also give high effectiveness.

Among plant origin materials the extracts of *E. odoratum* (1.5% and 2.0%) and *N. indicum* (1.0 % and 1.5%) may be recommended to control this pest species. At present these plants grows abundantly in Southern part of Assam and adjoining regions and there is no use of these plant products.

Regarding the farmers’ belief as a traditional practice to manage *R. foveicollis* species, may be recommended to document as well as encouraged for practicing such Indigenous Traditional Knowledge (ITK) based methods. The traditional practices, if properly incorporated in pest management strategies, can help to a great extent to check an increasing
pest problems because these practices are eco-friendly as well as sustainable manner of pest management.