PREFACE

Ever since the human being learnt the art and technique of extensive agriculture to sate the hunger and needs of their rapidly growing populace, the problem of agricultural pest has also evolved. Scientists from across the globe have been pursuing research for years to develop effective and sustainable ways of managing pests, both agricultural and medical. The multi-front battle between the pest and human being is still far from won. Scientists have suggested many approaches and solutions for mitigating the pest related problem. Being one of the suggested solutions, application of various kinds of chemical pesticides gained popularity and hype within a short period of time for their effectiveness. During initial days, for about half a century, application of pesticides provided effective control of most of the agricultural as well as medical pests. Recently, the unlimited human greed of making a huge profit has led to an extensive and indiscriminate application of synthetic chemical pesticides resulting in development and the evolution of resistance and tolerance among pests, in addition to the resurgence of primary pests, evolution of secondary pests and adverse effects on non-targeted organisms.

India as a developing economy depends largely on agriculture. About 80 percent of Indian population dwelling in rural areas depends upon agriculture. Cultivation of tea as a prime agricultural/horticultural industry provides livelihood directly or indirectly to over a million in India including the northern part of West Bengal. Development of resistance against chemical pesticide in tea plantations infesting pest is a serious problem of the industry. Research work carried out by earlier workers and my colleagues from this region, reporting the development of pesticide resistance in tea pests made me realise the seriousness of the problem. The scientific work described in this thesis is an endeavour towards developing a suitable alternative approach of managing *Helopeltis theivora*, which is not only a notorious sucking pest of the tea plantations of India but also of many other economically important crops grown across the tropical continents.

The first half of the thesis describes experiments conducted on *Helopeltis theivora* by simulating the practice of the tea plantations of Terai in reference to repeated application of chemical pesticides. Such applications help in acquiring tolerance through generations at a faster rate. Correlation between the tolerance level and titer of some of the well established detoxifying enzymes especially general

esterases, cytochrome P450 and glutathione *S*-transferases expressed as activity level have been established. Development of an easy technique for detection of tolerance level in *Helopeltis theivora*, based on the activity of the defence enzyme has been suggested. In future, the technique may further be improvised and extended for detection of tolerance level and management of other tea and agricultural pests as well.

The second half of the thesis describes the studies relating to the bio-ecology of a common lynx spider *Oxyopes javanus*, an efficient predator of *H. theivora*. The experiments designed to study the biology pertaining to mating and courtship, fecundity, developmental period, longevity etc. of the spider have been elaborated. Predation potential of *O. javanus* against *H. theivora* as a part of the study has also been furnished in the concluding sections. The results showed the spider to be an agile and efficient biological control agent of the sucking pest *H. theivora*. This study has brought to our knowledge about the immense potential of the predatory spider as a possible biocontrol agent of the pest. With conservation and augmentation of the spider in tea ecosystem as a biocontrol agent, sustainable management of the pest as a part of IPM may be contemplated.

The outcome of my PhD work is expected to be helpful to the tea planters in choosing effective pesticide and apply at appropriate dose for better management of the pest. Such judicious application of pesticide would help to achieve the desired goal of reducing chemical contamination of the environment and economic burden to the planters. Further, it will also help in complying with the stringent maximum residue limit (MRL) set by various agencies for export of hard earned produce of the tea growers. This thesis would also be useful to the policy makers and other stakeholders in formulating policies concerning proper management of pest under regimes of IPM with combined application of effective pesticides and augmentation of biocontrol agents may prove its worth for production of tea sustainably.

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