PREFACE

As the word goes, Darjeeling Terai and the Dooars are famous for three T's – Tourism, Timber and of course Tea. Tea industry not only contributes a large share in the economy of the country but also offers maximum employment to people of this reason. But in recent past tea industry has gone through a cataclysmic phase incurring tremendous losses due to pest attack. After the discovery of insecticidal property of DDT, there has been a huge surge of more toxic forms of pesticides which builds the primary defense against the pest attack on tea. However, insects have also evolved a way out to nullify these chemical attacks by developing tolerance to these chemicals. Tea industry has been using these chemical arsenals at their will and might to tackle tolerant variety of pests. This seems like an unending war where no one is ready to lose but the aftereffects of chemical war are in the forms of hazardous effect to the environment and its biotic components. Pesticides may bio-magnify through food chains/webs and affect non-target organisms including humans, at times, even kill many beneficial organisms like biocontrol agents, livestock etc. Knowing the biology of a pest helps planters/farmers to control it more effectively with less input of chemical resources. As tea is heavily infested by a large array of arthropod pests, many workers have studied the biology of these tea pests to formulate Integrated Pest Management (IPM) strategies for most effective and economically viable pest control measures. Majority of such works are based on terrestrial pests, however, the pest like termites which are subterranean in nature require special attention.

Termites are one of the most interesting creatures on earth. For centuries its social structure has fascinated a scientists as well as a layman alike. Present work is one of such attempt to look into the meagerly touched forte of "termites of tea ecosystem" of Darjeeling Terai and the Dooars. The research embodied in this thesis deals with the termites of tea ecosystem based on four broad aspects. First two objectives of the thesis were to assess the diversity of different termite species and their phylogenetic relationship based on morphotaxonomy and RAPD based molecular taxonomy. Termite species from different tea plantations were accessed to make a list of them from this region along with their phylogenetic relationship with each other, which may serve as reference for future works.

The second and third objectives deals with the eco-toxicological study of two major termite pest species. *O. obesus* and *M. obesi* have been serious pests in many crop fields and have also been reported from tea ecosystem of Assam. In third objective, termites collected from tea plantations of different parts of Darjeeling Terai and the Dooars having with different management type were subjected to bioassays of different pesticides. Results of these experiments helped in mapping the tea plantation areas with differential level of tolerance shown by these termite pests which can serve as an impetus for developing appropriate IPM strategies. Fourth part of the objective mainly focused on the screening of the expression of some of the well established detoxifying enzymes, like general esterases, glutathione *S*-transferases and cytochrome P450 monoxygenases. A linear relationship between resistance factor of a pesticide and activity ratio of these enzymes was observed which signifies the dependency of tolerance status of a pest on expression level of its detoxifying enzymes. In future this relationship can be exploited for developing easy methods of identifying

resistance/tolerance in pest populations, furthermore, developing cheap and effective control measures.

My thesis and its outcomes are expected to come handy for developing IPM strategies based on biology of termite pests of Darjeeling Terai and the Dooars tea ecosystem. A thorough strategized control system based on data input from this type of findings will certainly help in reducing the load of pesticides in tea ecosystem in addition also helping planters to reduce their expenses by investing judiciously in chemical pest control.

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