INTRODUCTION

Photosynthetic fixation of carbon dioxide in our biosphere yields approximately 136 x 10^{15}g of dry plant material annually, which represents Earth's most abundant form of biomass (Ljungdahl and Eriksson, 1985). Two major constituents of such biomass are cellulose and lignin, and hence this material is often referred to as lignocellulosic biomass, or simply lignocellulose. Most of the synthesis (about 2/3) occurs in terrestrial ecosystems where it is balanced, or nearly so, by the decomposition/ respiration side of the carbon cycle (Hobbie and Melillo, 1984). Decomposition of lignocellulose is carried out primarily by microorganisms, chiefly fungi and bacteria. However, augmenting the activities of microbes is an array of soil macro-invertebrates, whose effects may range from simple dispersion of plant material to actual dissimilation of the structural polymers of lignocellulose. Among the most abundant and important of these invertebrates are termites, which, with their associated microbial symbionts, dissimilate a significant proportion of the cellulose and hemicellulose components of the lignocellulosic plant material they ingest.

Termites cause serious economic damage to crops, forest trees, structural timbers in buildings and pastures in the tropics and the subtropics which unfortunately covers all the developing and underdeveloped countries such as Asia, Africa and Latin America (Sen-Sarma, 1995). Areas occupied by termites account for 68 percent earth's land area and 77 percent of the terrestrial net primary productivity (NPP). The world's termite population ($2.4x10^{17}$) processes material equivalent to 28 percent of the earth's annual NPP and an average of 37 percent of the NPP in areas where they occur. Out of two main groups of termites, viz, dry wood species and subterranean species, the latter are generally more harmful in this subcontinent. Around 200 species are found in India, of which *Odontotermes, Microtermes, Coptotermes, Heterotermes, Cryptotermes* and *Microcerotermes* are considered to be major pests in several parts of the country.

In order to find out the termite species available in and around the Jalpaiguri district, mainly Lataguri forest, Budhaganj forest and some other areas like Danguajhar, Moriambasti, Dewniapara, Domohoni and Kadobari were surveyed. *Odontotermes obesus* (Plate 1C and Plate-2), *O. distans, O. horni* and *O. boveni* were collected from variable forest plant species. Extensive damage of wood due to the termite infestation by *Odontotermes obesus* were recorded (Plate-1A). Besides, infestation of *Microcerotermes sp.* was also recorded on tea plantations (Plate-1B).

Application of pesticide is one of the effective methods of pest control in forests, plantations and nurseries. However, the use of pesticides is not always advisable as this leads to the development of resistant strains of insect pests, damage caused to non-target biota, and the pollution of the environment. It is now generally agreed that insecticide application should be replaced by pest management strategies integrating silvicultural, biological, chemical and other methods to reduce the pest population below economic threshold levels. In this context, use of biocontrol agents, especially microbial pathogens, is safe in a forest ecosystem ; but, we require basic information on various pathogens associated with specific pests, their host range, and their efficacy as a control agent under both laboratory and field conditions.

Keeping in view the awareness about the environmental and contamination problems associated with the use of pesticides, it is now an opportune time to restructure the future termite control measures using the concept of integrated pest management (IPM). At present, there is a resurgence of interest in the use of entomogenous fungi for insect pest control. The muscardine fungi *Metarhizium anisopliae* (Metsch) Sorokin and *Beauveria bassiana* (Bals.) Vuill., are being evaluated worldwide for control of various pests (Hajek and Leger, 1994). As a result of the combined effects of high cost of application and environmental contamination, there has been a significant increase in the development of methods to replace the use of chemical insecticides. One such method is the development of the entomopathogenic fungi - *Beauveria bassiana* and *Metarhizium anisopliae* as bioinsecticides (Driver *et.al*, 2000, Magalhaes *et.al.*2000)

Termites are major pests of timber and timber products which live in warm, humid environments that are conducive to the development and spread of entomopathogenic fungi. Laboratory studies have shown that termite species are highly susceptible to entomopathogenic fungi from genera including the most commonly studied species, *M. anisopliae and B. bassiana* (Rath, 2000).

Field studies have shown mixed results. Direct application of fungi to nests has resulted in complete colony mortality, but studies where feeding sites or bait stations have been treated with fungus have yet to show similar success. The effectiveness of termite control in urban pest management, has yet to be reported in detail. *B. bassiana* is a widely distributed fungus of insect pest and is considered as commercial a bio-control agent (Niranjana, 2002). It has been effectively used against coffee berry borer (*Hypothenemus hampei)* in Colombia and many other coffee growing countries world wide. In search of alternatives to pesticides, mycoinsecticides, *B. bassiana* was identified to have potential in tea management by Hazarika *et. al* (2002). Use of the agent has drastically reduced the cost of production by managing the pests and minimizing the hazards caused by chemical pesticides.

The present investigation has been undertaken with a view to generate a database on microbial pathogens especially fungi associated with termites and to evaluate the efficacy of two fungal pathogens *Metarhizium anisopliae* (Metsch.) Sorokin and *Beauveria bassiana* (Bals.) Vuill., against available termite species (*Odontotermes sp.*) in laboratory as well as in field conditions with the following objectives :

1. Identification of strains of entomopathogenic fungi (*Metarhizium anisopliae* and *Beauveria bassiana*) with greater virulence.
2. Pathogenicity studies, standardization of conidial count of entomopathogenic fungi.
3. Determination of qualitative and quantitative effects of characterization of termite colonies (*Odontotermes obesus*,) foraging in terms of activity, population and territory using fungal bait blocks.
4. Development of mass production and formulation techniques in terms of dosage, time, shelf life, and storage stability of entomopathogenic fungi.
5. Serological detection of entomopathogenic fungi using immunoassays and immunofluorescence in the field.
6. Development of microbial insecticidal program and integration with other methods of management.

Plate 1 (A - C) : Termite infestation and damage of Teak (A) and Tea (B) plants; Underground termite nests (C).