Biological control of plant pathogens is considered as a potential control strategy in recent years, because chemical control results in accumulation of harmful chemical residues, which may lead to serious ecological problems. At present, effective management of plant diseases and microbial contamination in several agricultural commodities is generally achieved by the use of synthetic pesticides. However, the incessant and indiscriminate application of these chemical fungicides has caused health hazards in animals and humans due to residual toxicity. In recent years, large numbers of synthetic fungicides have been banned in the western world because of their undesirable attributes such as high and acute toxicity. Many pathogenic microorganisms have developed resistance against chemical fungicides. This seriously hinders the management of diseases of crops and agricultural plants. Considering the deleterious effects of synthetic fungicides on life supporting systems, there is an urgent need for alternative agents for the management of pathogenic microorganisms.

Although the value of eco-friendly pest management in sustainable agriculture has been well recognized, only very little is being adapted at field level. This eco-friendly pest management gives greater emphasis for the usage of biological control. Bio-control methods are successful in non-chemical and eco-friendly approach in the sustainable agricultural production. Fungi belonging to the genus *Trichoderma* and bacteria such as *Pseudomonas, Bacillus subtilis* are the most promising bio control
agent against a range of plant pathogens under a variety of environmental conditions.

Vanilla has a real economic value in the food and related industries, owing its unique flavour and pleasant aroma. In India the production of Vanilla was estimated to be 10 tons during 2000-2005, and a recent survey puts it at 1600 hectares with 60 tons. A number of pathogenic fungi and bacteria cause diseases in vanilla and some of which result in the total death of the plant. The pathogen affect almost all the plant parts like root, stem, leaves, and beans. Species of *Fusarium, Sclerotium, Rhizoctonia, Phytophthora* and *Colletotrichum* are the commonly occurring pathogens, which cause serious damages.

*Trichoderma* spp. are a group of antagonistic cellulolytic fungi, capable of controlling a number of diseases of plants. Many species of *Trichoderma* namely *Trichoderma harzianum, Trichoderma viride, Trichoderma virens* etc. isolates from rhizosphere were found to have good antagonistic potential against many soil born fungi, such as *Fusarium oxysporum, Sclerotium rolfsii, Rhizoctonia solani*. As an antagonist, *Trichoderma* spp. produce antibiotics and antifungal toxic metabolites *Pseudomonas* spp. are also used as potential bio-control agents which are major group of bacteria found surviving in the rhizosphere of most of the field crops. They are also known as plant growth promoting rhizobacteria [PGPR], as they promote plant growth by secreting auxins, giberllins, cytokines. etc. *Pseudomonas fluorescens, Pseudomonas putida, Pseudomonas cepacia* are the important biocontrol agents. They produce antibiotics like Pyrol, Nitrin, Oomycin-A etc.
Hormones like Indol acetic acid, Gibberllic acid and produce siderphores and HCN which inhibit the growth of pathogen.

In this study biocontrol agents *Pseudomonas fluorescens* and *Trichoderma harzianum* play a major role in suppressing diseases caused by phytopathogens of vanilla. These biocontrol agents also enhanced the growth of vanilla crop. Increase in the growth parameters as well as nutrient uptake were attributed to the production of plant growth promoting substances. In pot culture experiment the bio control agents showed high efficiency in decreasing the infection rate and all the bio control agents showed bio control activity against phytopathogens of vanilla. Combined inoculation of *Pseudomonas fluorescens* and *Trichoderma harzianum* had additive effect on controlling the diseases of vanilla.

In this study these biocontrol agents showed compatibility with few common fungicides but found compatible with each other. They not only enhanced the vanilla growth but also suppressed the diseases of vanilla. The possible mechanism in bio control may be due to the production of antibiotics, volatile and non volatile compounds, siderphores, HCN, lytic enzymes or production of such growth inhibiting substances. The production of above mentioned fungal growth inhibiting substances were observed in this study. Colonization study using green fluorescent protein (GFP) as a marker was studied in the case of *Pseudomonas fluorescens* and the marked bacterium established its colonisation inside the leaves of vanilla.