PREFACE

The economic stability of India is dependent on the agricultural yield. Great deal of research carried out in the last 50 years by agricultural scientists, has its major thrust on increasing crop productivity. Despite the developments, India has not yet been able to tackle the loss of nutritional value of food items. According to the estimates of the Indian National Commission on Agriculture, fruits and vegetable suffers huge loss of their nutritional value due to lack of proper disease management. In developing countries, agriculture is the driving force for broad-based economic growth. One of the major problems with agriculture now-a-days is the ever increasing demand of enhanced production in order to provide food for the population which is in permanent augmentation. In realizing this, one of the stumbling blocks seems to be the yield losses due to plant pathogen.

Pests, weeds, diseases take a toll on gross production in our country. The country is losing agricultural production worth Rs 1.48 lakh crore annually due to damage from pests, weeds and plant diseases, according to the Crop Care Foundation of India (CCFI) (Sobrinho et al., 2003).

Plant diseases need to be controlled to maintain the quality and abundance of food, feed, and fiber produced by growers around the world. Different approaches may be used to prevent, mitigate or control plant diseases. Beyond good agronomic and horticultural practices, growers often rely heavily on chemical fertilizers and pesticides. Such inputs to agriculture have contributed significantly to the spectacular improvements in crop productivity and quality over the past 100 years. However, the environmental pollution caused by excessive use and misuse of agrochemicals, as well as fear-mongering by some opponents of pesticides, has led to considerable changes in people's attitudes towards the use of pesticides in agriculture. Today, there are strict regulations on chemical pesticide use, and there is political pressure to remove the most hazardous chemicals from the market. Additionally, the spread of plant diseases in

natural ecosystems may prevent successful application of chemicals, because of the scale to which such applications might have to be applied. Consequently, some pest management researchers have focused their efforts on developing alternative inputs to synthetic chemicals for controlling pests and diseases. These alternatives are those referred to as biological controls (Pal and Gardener, 2006).

Biological control is an effective means of reducing the damage caused by plant pathogens. Biological control of plant diseases involves the use of one non-pathogenic organism to control or eliminate a pathogenic organism. Hence, biological control has attracted a great interest in plant pathology and it becomes important to develop cheaper management practices to control disease and obtain higher yield.

Some soil and water bacteria have been found to naturally promote growth of plants. These bacteria aggressively colonize the roots of plants and prevent the growth and inhibit the virulence of many species of fungi as well as other bacterial species. Production of siderophores by beneficial bacteria that bind iron and make it unavailable to the pathogenic bacteria or fungi is one mechanism by which bacteria can promote the growth of plants. The growth-promoting bacteria produce specific siderophores that cannot be used by the pathogenic organisms because they lack the appropriate siderophore receptor. The pathogens are therefore not able to compete for necessary iron in the environment of the plant root system. The production of siderophores by the biocontrol agents in quantities sufficient to limit Fe^{3+} availability to the pathogen may be used as potent disease control device (Glick and Bashan, 1997).

The work embodied in this thesis was initiated in the year 2007 with broad objectives of controlling crop disease by utilizing the siderophore producing and plant growth promoting rhizobacteria. The status of the work and their results and inferences drawn thereof is presented in seven major chapters and additional supplementary details given as appendix at the end.