

# *Preface*

While agriculture worldwide is striving hard to provide healthy food to the rapidly growing global population, plant diseases are reducing both yield and quality of the products in terms of food, fibre or biofuel crops. Crop losses may often be catastrophic and lead to drastic and devastating impacts on socio-economy of the region of outbreak. Some losses are less dramatic but continue to cause sizeable losses which may cause serious concerns to farmers and administrators. Losses in food crops tend to be maximum in tropical countries where environmental conditions are particularly favourable for the disease proliferation. The condition aggravates in places where the incomes are low and knowledge remains lacking leading to minimum investments in crop health management.

Crop losses due to viral diseases can be disastrous, especially where the socio-economic conditions are poor and inadequate with low technical support. Research should focus on improving food security and, therefore, health conditions especially for the low-income groups. Viruses are known as plant pathogens from the ancient times. The earliest written evidence of a plant viral disease was a Japanese poem where leaf yellowing disease *Eupatorium* was described. In Western Europe during 1600-1660 AD many paintings and drawings of tulip colour breaking were observed. Viruses were grouped into several taxa on the basis of size, shape, chemical composition, structure of the genome and mode of replication. Later on, International Committee on Taxonomy of Viruses (ICTV) began to devise and implement rules for the naming and classification of viruses based on their genome structure. Among the plant viruses RNA viruses are the most widely distributed virus family and vary remarkably in genome structure. Till now, several RNA viral diseases have been described and identified from Indian subcontinent and other continents of the World. According to Ministry of Agriculture, Govt. of India, during 2016 to 2017 total horticultural production in India was 295,200,000 metric tons occupying

24,900,000 hector areas. In several places viruses have been reported to wipe out the whole productivity of certain area.

Plant disease management primarily aims at reducing the economic and aesthetic damage caused by plant diseases. However, drastic methods such as application of pesticide that pollute both the crop and the environment are no longer in common use. Current management practices often rely on anticipating occurrence of disease and targets specific vulnerable points in the disease cycle. This can be achieved only through a correct diagnosis of the disease and a thorough understanding of the identity and characteristic features of the pathogen which is the real target for disease management programme. Along with that, proper strategies need to be developed to comply with the strict regulations on chemical pesticide use. Several researchers working on disease management have, therefore, concentrated their efforts on developing alternative inputs to synthetic chemicals for controlling diseases.

The work embodied in this thesis was initiated in the year 2013 with broad objectives of understanding the occurrence of crop diseases caused by RNA viruses in the north-east Indian plains about which little is known. Management of the diseases by inducing systemic resistance in plants and application of antiviral botanical preparations to combat the pathogens was studied. The thesis begins with an introduction where the objectives are stated. A review on current status of diagnosis and management of RNA viral disease in plants has been embodied in the next chapter. The experimental procedure, results and inferences obtained along with a discussion with reference to current findings is represented in separate chapters. Bibliography and additional supplementary details are given as appendix at the end.