Rationale of the study

The available options for treating bacterial infections have become very limited with the emergence of antibiotic-resistant and pesticide resistant strains of bacteria and the search for a novel general antibacterial therapy has become important. The most commonly exploited biocontrol mechanism against bacterial and fungal plant pathogen is antibiosis. It uses variety of approaches which majorly include competitive root colonization, antibiosis, lytic enzyme production, detoxification and degradation of virulence factors and systemic resistance induction. Usage of any of these mechanism, mainly antibiotics, against pathogen has created a problem of evolving resistance by the pathogens. The finding that quorum sensing could be a widely conserved mechanism in the regulation of bacterial virulence suggests that quorum quenching mechanisms might have promising potentials in biocontrol. The quorum quenching based biocontrol approach does not affect the growth of the pathogen rather it blocks the quorum sensing regulated virulence of the pathogen. Thus, this exerts very limited selection pressure on pathogen which decreases the possibility of development of resistance by the pathogen against this approach.

Actinomycetota are inhabitants of soil, endophytic in nature and are reported to produce AHL degrading enzymes. Being native to soil Actinomycetota affords a natural choice as biocontrol agent against soil borne pathogens. AHL degrading Actinomycetota in the soil therefore can be used to prevent virulence of *Pectobacterium carotovorum* subsp. *carotovorum*. At the same time, phytochemicals such as Eugenol, Carvacrol and Salicylic acid which are naturally occurring plant compounds can be used against the pathogenicity of *Pectobacterium carotovorum* subsp. *carotovorum*. This approach of enzymatic and non-enzymatic quorum quenching can serve as a potential strategy for efficiently reducing the pathogenicity of *Pcc* by AHL-degrading bacteria and phytochemical compounds without killing the bacteria in turn reducing antibiotic use.

Taking these factors into consideration the present study includes isolation and screening of Actinomycetotal isolates for AHL degradation phenotype. Further, the study also focuses on the properties important for biocontrol of quorum quenching bacteria such as adherence on seeds, root or plant colonization ability and persistence of these isolates on root (mung bean model), broad host range which is susceptible to *Pcc* (Potato, Carrot and Cucumber) on which the quorum quenching isolates can

survive and exhibit the biocontrol potential, development of a new cucumber infection model for *Pectobacterium carotovorum* subsp. *carotovorum*, the effect of *Pectobacterium carotovorum* subsp. *carotovorum* infection on potato model depending upon the site of infection and its biocontrol as well as ability of *Pectobacterium carotovorum* subsp. *carotovorum* to cause soft rot in stored vegetables and fruit and its biocontrol. Additionally, studies showing absence of deleterious effect of the isolates on the host plant and the ability of quorum quenching isolates to control the disease pre-infection (preventive) and post-infection (curative) are included. Finally, non-enzymatic quorum sensing inhibition approach against model phytopathogen *Pectobacterium carotovorum* subsp. *carotovorum* is explored using phytochemicals such as eugenol, carvacrol and salicylic acid and their ability to reduce pathogenicity.

The study was done taking into consideration the paucity of work at national level.

Objectives

1. To Isolate and characterize quorum quenching soil Actinomycetota

2. To test the quorum quenching bioefficacy of Actinomycetotal isolates for biological control of soft rot causing plant pathogen *Pectobacterium carotovorum* subsp. *carotovorum* in storage and greenhouse

3. To test the bioefficacy of non-enzymatc quorum quenching phytochemical compounds on virulence of *Pectobacterium carotovorum* subsp. *carotovorum*