CHAPTER 6

SUMMARY

- A total of 300 CSD actinomycetes were isolated from the coastal sand dune rhizosphere soil of the Chennai coastal area.
- All the 300 actinomycetes were morphologically characterized for their cultural characteristics on SCA medium.
- In the morphological characterization, the colour of the aerial and substrate mycelium, production of extracellular diffusible pigments, and production of exopolysaccharides and the texture of all the 300 strains were recorded.
- Of all the 300 strains 70 morphologically unique strains were selected to study their salt tolerance.
- The selected 70 strains were subcultured at various salt concentrations ranging from 0% to 12% and studied for their growth and morphological characteristics.
- Accordingly their changes in growth and morphological characteristics such as aerial and substrate mycelium colour, growth abundance, colony emergence, production of exopolysaccharides and diffusible pigments were recorded.
- Through this study, except 10 strains, majority of the strains (290) were demonstrated to have originated from marine environment as they grow only at salt concentrations above 3%.
- Further 70 actinomycetes from the CSD rhizosphere soil of Chennai coast were subjected to various beneficial bioactivities.
- These 70 CSD actinomycetes were screened for in vitro antagonistic activity against the three selected fungal phytopathogens such as Fusarium oxysporum, Rhizoctonia solani and Sclerotium rolfsii.
- Totally 25 CSD actinomycetes showed *in vitro* antagonistic activity against the fungal phytopathogen *F. oxysporum*, and AMET053 showed maximum zone of inhibition of 18 mm.
- Of the 70 CSD actinomycetes 16 actinomycetes showed antagonism against *R. solani*. Strains AMET046, AMET053 and AMET67 showed highest antagonism against *R. solani*.
- In the case of antagonism against *S. rolfsii*, only 9 CSD actinomycetes were able to show antagonism; among them AMET016, AMET021 and AMET053 showed maximum zone of inhibition.
- In this study, the crude extract of all the 70 CSD actinomycetes were tested for antagonism of which AMET053 has exhibited significantly higher antifungal activity than any other CSD actinomycetes against all the tested pathogens.
- On the whole this study has concluded that of all the 70 selected actinomycetes AMET053 is a potential inhibitor of the selected three fungal phytopathogens.
- In the screening for *in vitro* antibacterial activity, all 70 CSD actinomycetes were screened against five virulent human pathogens *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Enterococcus faecalis* and human pathogenic yeast *Candida albicans*.
- Of all the 70 CSD actinomycetes 11 actinomycetes inhibited *S. aureus*, 4 showed antagonism against *E. coli*, 3 showed antagonism against *P. aeruginosa* and 4 showed antagonism against *C. albicans*. None of the strains showed antagonism against *E. faecalis*.
- Alongside, the efficiency of CSD actinomycetes to degrade substrate such as starch, skim milk, tannic acid, chitin, pectin and gelatine by using different lytic/oxidative enzymes was determined.
- In this study AMET016, AMET024, AMET047, AMET053 and AMET058 were notable in producing an array of enzymes, gelatinase, tannase, amylase, pectinase and caseinase.
• Among the tested 70 strains of CSD actinomycetes, 12 have solubilised tricalcium phosphate and 17 have produced IAA in their culture filtrate. AMET053 was found to produce larger phosphate clearing zone and highest production of IAA.

• Among the 70 selected actinomycetes, 50 strains showing either enzyme activity, IAA activity or the ability to solubilize phosphate were selected for further studies.

• The selected strains were screened for their effect on the plant growth characteristics of two monocot and two dicot plants viz., rice, wheat, green gram and bengal gram in a seedling growth assay.

• Many of the CSD actinomycetes strains have increased seed germination percentage, shoot and root lengths, fresh and dry weight of the seedlings.

• Based on the results of various in vitro experiments, strain AMET053 was selected for further studies. The selected strain AMET053 was efficient in:
  - Exhibiting soaring antagonism against all the tested fungal phytopathogens
  - Producing an array of lytic/oxidative enzymes
  - Producing plant growth hormone IAA
  - Solubilising complex nutrient tricalcium phosphate
  - Enhancing the growth characteristics of selected crop plant seedlings.

• The selected strain AMET053 was further identified using a polyphasic approach as *Streptomyces rochei* AMET053.

• Further the effect of talc formulations of *S. rochei* AMET053 against the Fusarium wilt of tomato was studied using screen house experiment.

• In this study, *S. rochei* AMET053 which is used as a biocontrol agent had a significant disease control than the commercially available fungicides used in the treatments besides remarkably enhancing the plant growth parameters such as root and shoot lengths and fresh and dry weights of biomass.
CONCLUSION
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This study has demonstrated that a neglected ecosystem such as the coastal sand dune rhizosphere has been the habitat of an efficient biocontrol agent *Streptomyces rochei* AMET053. The selected actinomycete *S. rochei* AMET053 has shown considerable control over Fusarium wilt disease of tomato in addition to the promotion of growth. Further, this CSD actinomycete exhibited 60% more activity against fusarium wilt of tomato than the commercially available biocontrol agents. Thus, the present study on the biotechnological potential of *S. rochei* AMET053 isolated from the coastal sand dune rhizosphere soil, paved a new way for looking beneficial microorganisms in less studied marine ecosystems.