CHAPTER 1

1. INTRODUCTION

Marine microorganisms continue to provide pharmacologically important unique secondary metabolites and novel chemical compounds. Marine microorganisms are continuously explored for drug discovery. Apart from microbes all other marine sources have also provided valuable chemical diversity (Kelecom, 2002). Marine actinomycetes have been traditionally a rich source for biologically active metabolites. Actinomycetes are continued to prove themselves as reliable sources of novel bioactive compounds. Among the well characterized pharmaceutically relevant natural product (Jensen and Fenical, 2000), the majority of these compounds demonstrate one or more bioactivities and many of them are developed into drugs for treatment of wide range of diseases in human, veterinary and agricultural craps (Bernan *et al.,* 1997). In the recent years, marine microorganisms have gained importance, as they are the potential source of microbial produces exhibiting antimicrobial, antiviral, antitumor as well as anticoagulant and cardiovascular properties. Though, the bacteriologists have long been fascinated with identification of novel actinomycetes and novel compounds from diverse environments, the marine environment is relatively of recent attempt.

The actinomycetes are Gram positive bacteria having high G+C (>55%) content in their DNA. The name "Actinomycetes" was derived from Greek "aktis" (a ray) and "mykes" (fungus) and given to these organisms form initial observation of their morphology. Actinomycetes were originally considered to be an intermediate group between bacteria and fungi but now are recognized as prokaryotic organisms (Kieser *et al*., 2000).

Actinomycetes taxonomy is extremely complex and the traditional method of classification is based on a few heterogeneous supra generic groups. More recently, three main approaches have been suggested namely chemo taxonomy, numerical taxonomy and molecular taxonomy (Bull *et al.,* 1992).

Actinomycetes from marine samples have rarely undergone screening for novel metabolites and there is evidence that actinomycetes usually make up only a small proportion of the bacterial flora of marine habitats with absolute numbers of actinomycetes much lower than in terrestrial habitats (Goodfellow and Haynes, 1984).

The *Streptomycetes* which belong to the bacterial order Actinomycetales**,** (Miyadoh *et al.*, 1997*)* is aerobic, Gram-positive bacteria, which produce extensive branching vegetative mycelium and aerial mycelium bearing chains of arthrospores. The substrate mycelium and spores can be pigmented, but also diffusible pigments are produced. On agar plates, they form lichenoid, leathery or butyrous colonies. The GC-content of the DNA is 69-78 % (Williams *et al.*, 1989). The characteristic compound present in the cell wall peptidoglycan of *Streptomycetes* (Lechevalier and Lechevalier, 1970 is L-diaminopimelic acid. *Streptomyces* is the most common actinomycetes genus in soil which forms 90% of the population. However, new approaches for the isolation of soil actinomycetes have revealed that other genera are also significant and many new species have been isolated. Most of them have been demonstrated to produce novel secondary metabolites. Although, the first antibiotic from actinomycetes has been reported more than 50 years ago (Schatz *et al.*, 1944) and more than 4,000 new bioactive compounds have been obtained. The search for new actinomycetes of interest to biotechnology is still important.

The marine environment is an important source for many useful drugs and an assessment of this potential is imperative. It is well known that, the antibiotics have medicinal value and the actinomycetes are the potential sources for antibiotics, which could be profitably used by the pharmaceutical industries. The best known example is the product of actinomycetes. There is a growing demand and need for new antibiotics to control many bacterial, fungal and neoplastic diseases of plants, animals and human beings.

The present study has been undertaken to isolate and screen the antimicrobial compounds producing actinomycetes from Muthupet mangrove ecosystem, Muthupet

wetlants are associated with the coastal wetlands of Vedaranyam. Its unique ecosystem covers an area of about 6800ha, along the South East coast of Thiruvarur district, Tamil Nadu, India. An attempt has been made to characterize the different isolates by analyzing biochemical, molecular characteristics and antimicrobial spectrum of actinomycetes. Emphasis has also been made for the biosynthesis of silver nanoparticles by using identified actinomycetes and further characterization, antimicrobial properties of silver nanoparticles have also been under taken. Application of actinomycetes as a probiotics in the laboratory culture of *Penaeus monodon* (Fabricius). In order to achieve this goal, the present investigation has been planned with the following objectives:

- Isolation and characterization of actinomycetes from muthupet mangrove ecosystem of Tamil Nadu, South East coast of India.
- Standardiation of the production of antimicrobial compounds from actinomycetes.
- Identification of the actinomycetes through morphological, biochemical, physiological and molecular characteristics by following 16s rDNA sequencing.
- Charaterization of antimicrobial compounds by Ultra Violet, Infrared and NMR Spectral analysis and carry out antimicrobial properties.
- Biosynthesize of silver nanoparticles by marine actinomycetes.
- Characterization of silver nanoparticles by using UV-Vis absorption spectroscopy, FTIR, SEM and XRD.
- Probiotic potential of marine actinomycetes for the larval culture of *Penaeus monodon*