AIM AND SCOPE OF THE WORK

Ever since mankind started suffering from ailments, the quest for finding remedies to treat the diseases started. Advancements in science lead to the isolation of chemical compounds from natural sources and their identification, characterization and testing for these bio-activities.

In recent years the natural antagonistic action of one microbe on another has been studied intensively. Bacteriologists have succeeded in isolating substances which have powerful inhibiting action on the growth of disease germ or which sometimes will actually kill them.

A substance produced by one kind of living organism which is injurious to another is called an antibiotic.

Living organisms protect themselves from other living organisms in several ways. They make the environment too acidic or too basic for their competitors or they excrete specific substances that interfere with the metabolism of other species, thereby preventing their growth or killing them.

The discovery of penicillin by Alexander Fleming in 1929 opened a new era in the field of study of the chemotherapeutic agents, namely antibiotics. These are produced by bacteria, actinomycetes, fungi, fungi imperfecti basidiomycetes, algae, lichens and green plants.

The science of antibiotics is one of the most important branches of modern knowledge, in developing successfully in various directions. The year of 1940 when penicillin was isolated in the crystal state is the date of birth of the new branch in science, the science of antibiotics. This branch has been rapidly developed during the last few decades.
Investigators are still striving to find and develop better methods of chemical synthesis of antibiotic derivatives and chemical modification of natural antibiotics.

Since the isolation of actinomycin in 1940, streptomycin in 1944 by Waksman, the actinomycetes have received tremendous attention of the scientists. Most the antibiotics produced by the end of 1940 originated from fungi, and to a lesser extent from bacteria. In the years 1955-62 about 80% were obtained from actinomycetes belonging to the different families of the order Actinomycetales.

Soils, composts and fodder are common sources of actinomycetes. Among these, soil is the richest source for the isolation of actinomycetes. Several soil samples were processed from different parts of the world by various investigators and they were systematically screened for antibiotic producers. The number of antibiotics is now greater than 6500 but only about 100 of them are used in medicine to treat patients with various inflammatory processes (pneumonia, peritonitis, and furuneulosis), various forms of tuberculosis and many infectious diseases, which were formerly considered incurable or difficult to cure. Mortality rate of scopolisis, meningitis, pneumonia etc markedly decreased owing to antibiotics.

Most of the antibiotics are not used in medicine because of their toxicity, instability in the patient body and for other reasons. Now a days the search for new antibiotics that might be efficacious against viral diseases and malignant tumors is an important field.

Quite a large number of research laboratories in USA, UK, Japan, Russia and other countries are intensively engaged in the isolation of newer antibiotics from actinomycetes.
In India, comparatively little work is being done in antibiotic research and very few soil samples have been subjected to detailed studies, either for isolation of new actinomycetes or for the development of newer antibiotics. Pioneering work in this field was taken up by Hindustan Antibiotics Limited at Poona and they have isolated 20 antibiotic substances from *Streptomyces*, *Streptoverticillium* and *Chainia* species, all of them isolated from soil samples near Poona. Of these 20 antibiotic residues, a dozen of them were found to be new and these were isolated from *Streptomyces* species. A few other research centres like the Regional Research Laboratories at Jammu, Central Drug Research Institute at Lucknow, Indian Institute of Science at Bangalore and the Department of Pharmaceutical Sciences, Andhra University reported very few new *Streptomyces* species, *Pseudonocardia* species from Indian soils and other natural substrates. A few of them were examined for antibiotic production.

The screening programmes for new actinomycetes and for these antibiotics are still proceeding at a very rapid pace.

The need for the development of new antibiotics are manifold which can be summarized as follows:

To overcome the problem of resistance as is happening with older antibiotics in hospital practice, to develop more effective antibiotics against Gram-negative bacillary infection (particularly those due to *Pseudomonas*, *Proteus*, *Klebsiella* and *Salmonella* species) to introduce more active and less toxic ones for fungal and yeast infections and better antibiotics against mycobacteria resistant to therapy with standard drugs, to isolate antibiotics for the prevention and treatment of viral infections (particularly AIDS) and neoplastic diseases, as better pesticides and for parasitic and helminthic diseases or as food for animals. To discover the new antibiotics it will be necessary to continue the use of conventional screening methods.

In view of the above, it is decided to screen a variety of soil samples collected from different places of Tirumala Hills, for the isolation of potent antibiotic producers.
Objectives:

- Isolation of antagonistic actinomycete species from natural substrates such as soil and water.
- Preliminary screening of the isolates for antimicrobial properties.
- Morphological and biochemical characterization of the selected actinomycete species.
- Antibiotic production by selected actinomycete species by submerged fermentation.
- Determination of antibacterial, antifungal activities and potency of isolated antibiotic.
- Optimization of nutritional parameters and cultural conditions in the selected media for maximizing antibiotic production.
- Comparison of antibacterial activity of the isolated antibiotic with standard antibiotics.
- Amplification of the DNA of the selected actinomycete by PCR and 16S rDNA sequencing for identification.