CHAPTER I

INTRODUCTION

The actinomycetes are the most common antibiotic-producing microorganisms found in soil. Most are biologically active. To date they have produced the greatest number of commercial antibiotics. Schatz and Hagen have noticed that actinomycetes as a group contain a greater proportion of activity than fungi or bacteria (Schatz and Hazen, 1948). In a comprehensive study on soil antagonisms, Stressl, Leber & Keitt found that 80 % of antagonism to fungi was due to actinomycetes. The fact of microbial antagonism in soils and its relation to potential antibiotic production indicates that actinomycetes will continue to be the most important source, followed by the fungi and the bacteria (Goodfellow *et al.*,1988). Until 1974 antibiotics of actinomycete origin were almost exclusively provided by *Streptomyces* (about 95% of a total of about 2,000 antibiotics). There after, the role of 'rare' actinomycetes as an antibiotics source became apparent as these organisms provided about 25 % of the approximately 1,100 antibiotics of actinomycete origin reported in the following six years (Nisbet, 1982). Rare actinomycetes proved to be a good source of antibiotics, with the result that microbiologists were encouraged to concentrate on the isolation and screening of these microorganisms.

Rare actinomycetes have usually been regarded as strains of actinomycetes genera whose isolation frequency by conventional methods is much lower than that of *Streptomyces* strains (Lechevalier and Lechevalier, 1967). Thus they included groups such as *Actinoplanetes*, *Micromonosporas* and *Nocardiae*. Their capacity to produce diverse antibiotics are comparable to *Streptomyces*. It can be concluded that isolation and screening of rare actinomycetes can be expected to lead to the discovery of new antibiotics. It should, however, be noted that *Streptomyces* strains continue to provide larger numbers and wide varieties of new antibiotics than any of the other actinomycete genera; suggesting that large numbers of undiscovered *Streptomyces* species or strains

with novel antibiotic productivity exist in nature. Such *Streptomyces* strains can also be regarded as 'rare' since they have not been isolated by conventional approaches (Goldberg, 1959).

Streptomyces is in the family *Streptomycetaceae* of the order *Actinomycetales*. Antimicrobial activity from *Streptomyces* is active against *Aspergillus niger, Bacillus subtilis, Candida albicans, Escherichia coli, Micrococcus luteus, Pseudomonas fluorescens, Saccharomyces cerevisiae, Streptomyces murinus* and many other microorganisms.

Since Waksman introduced *Streptomyces* into his systemic screening program for new antibiotics in the early 1940. they have provided about two-thrid (more than 4,000) of the naturally occurring antibiotics discovered, including many of those important in medicine, such as aminoglycosides, anthracyclines, chloramphenicol, macrolides and tetracyclines.

The use of antibiotics in the past decade has led to the appearance of an ever increasing number of resistant strains. The relative specificity of the antibiotics have challenged the potential for evolution of microorganisms in many climes. Many of the "side reactions" of antibiotics make them most useful tools in biology.

The problem of bacterial resistance to antibiotics has evolved, and antibiotics are sought for use against those organisms which rapidly develope resistance (Goodfellow, 1988).

It is therefore important to enhance the probability of discovering new antibiotics. Our screening for antifungal substances from soil microorganisms is based on the idea of searching for new drugs to combat against the *Candida albicans*, the causative agent of Candiasis, one of the most frequently encounted of the fungal diseases. This is particularly true in the category of opportunistic infections. Substance to be studied is produced by *Streptomyces hygroscopicus*. Results of this study should

constitute preliminary information that may need further study before a practical use is realized.

The objectives of this study are:

1. To screen and isolate *Streptomyces species* producing antifungal antibiotics.
2. To identify species of the producing strain.
3. To ferment and study the conditions of producing strain.
4. To isolate and determine active fractions against *Candida albicans.*