Chapter 1

Introduction
1. INTRODUCTION

Superficial fungal infections of the skin are among the most common infectious diseases (Odum, 1997). Mycotic infections are the common cause of skin diseases in developing countries, of which dermatophytes are of particular concern in the tropics (Caceres et al., 1993) and this remains a major public health problem especially in India (Venugopal and Venugopal, 1993).

Dermatophytes are an important group of skin pathogens, which cause superficial skin infections of man and the various clinical conditions are classified as dermatophytoses.

Dermatophytes were among the first pathogenic micro-organisms to be recognised and named. Dermatophytes are a group of closely related fungi that have the capacity to invade keratinous tissue (skin, hair, nails and fur) of humans and animals.

Dermatophytoses, is clinically described as "Ringworm" or "Tinea" infections. The name ringworm was in use from the sixteenth century and was coined to describe the circular lesion produced by the dermatophytes on the skin or scalp.
The Romans associated the lesion with the insects and named the disease as "Tinea" meaning any small insect larva and this name is even today used to describe the clinical forms of the infection. "Tinea" also refers to a group of keratinophilic insects, the "clothes moths" and hence the word "ring worm" is a combination of the meaning of the Greek and Latin terms. The earliest usage of the term goes back to as early as 1882-1885. (Tanaka et al., 1992).

The etiologic agents of dermatophytoses are classified into three anamorphic genera *Epidermophyton*, *Microsporum* and *Trichophyton* (Rippon, 1982). Dermatophytes can be divided into three groups anthropophilic, zoophilic and geophilic based on their host preference and ecological habitat. Geophilic organisms are found as saprophytes in the soil and can exceptionally be pathogenic for man, more especially in children after a direct contact with the soil. Zoophilic are found on animals with host specificity and can also be pathogenic for man, while the anthropophilic organisms are those which cause human infection.

Infections caused by dermatophytes are classified according to the site (or) the area of the body involved.
Various clinical manifestations of the disease are as follows:

1. **Scalp disease**
   a. Tinea capitis
   b. Tinea favus

2. **Glabrous disease**
   a. Tinea corporis
   b. Tinea faciei
   c. Tinea axillaris

3. **Groin region**
   a. Tinea cruris
   b. Tinea glutaealis

4. **Hand**
   a. Tinea manuum

5. **Nail**
   a. Tinea unguium
6. **Feet**

   a. *Tinea pedis*

7. **Beard region**

   a. *Tinea barbae*

   Dermatophytes can also cause subcutaneous or deep mycosis. Severity of the disease produced by the dermatophytes varies considerably from species to species and from host to host. The major predisposing factors of the disease are over-population, poor hygienic conditions and high atmospheric humidity.

   *Trichophyton rubrum* and *Trichophyton mentagrophytes* are the most commonly encountered species. Tinea cruris and tinea corporis are the most common type of tinea infection and is usually caused by *T. rubrum*, *T. mentagrophytes* and *E. floccosum*.

   The infections caused by dermatophytes are often chronic and require prolonged treatment with antifungal agents that are expensive and sometimes in effective (Caceres *et al.*, 1991). Recurrent and chronic infections are frequently seen and prolonged treatment can sometimes produces unpleasant side effects.
Since the 1950's, amphotericin B has been the drug of choice for most fungal infections (Gallis et al., 1990). The discovery of Griseofulvin in 1958 by Gentles revolutionized the therapy of ringworm infections. Subsequently several antifungal agents including variousazole derivatives and allylamine derivatives were introduced for the treatment.

The 1990's have witnessed the introduction of 2 triazole agents, fluconazole and itraconazole and subsequently there has been marked change in the treatment of fungal infections (Kauffman and Carver, 1997; Como and Dismukes, 1994).

Medicinal plants are the oldest source of pharmacologically active compounds and provided virtually the only source of medicinally useful compounds for centuries (Cordell, 1981). Today it is estimated that more than two-thirds of the world population relies on plant based drugs; about 7000 medicinal compounds used in the western pharmacopoeia are derived from plants (Caufield, 1991). In the USA, approximately 25% of all prescribed drugs contain one or more bio active compounds derived from vascular plants (Farnsworth and Morris, 1976; Farnsworth, 1984a).
The use of plants as medicine still represents a very important phenomenon in traditional culture. However, the increasing use of pharmaceutical products has led to a decrease in the use of traditional remedies in popular medicine. Nevertheless, in some rural areas traditional remedies are still widely used and go side by side with the use of modern medicine and often, especially in the case of minor illness, they actually substitute academic medicine. Knowledge of the use of medicinal plants is deep rooted in the cultural background of the population in certain places (Feo and Senatore, 1993).

The World Health Organisation (WHO) has recommended all the member countries to actively promote native medicines of their country as well as to initiate steps to conserve and / or to cultivate medicinal plants so that genuine raw materials become readily available to a large section of the population. The WHO has also brought a technical report series on the usefulness of traditional medicine and the strategies that are to be adopted to integrate and to rationalize the scientific approach in the evaluation of traditional practices (WHO, 1983).

The World Health Organisation estimates that 80% of the population living in developing countries exclusively use traditional medicine. In order
Plumbagin [5-hydroxy-2-methyl-1,4 napthaquinone] is a crystalline substance derived from the root of *Plumbago zeylanica*, *Plumbago rosea* and *Plumbago europea* of the family Plumbaginaceae. These plants grow as perennial herbs in the plains of Bengal and South India. It is used in skin diseases, diarrhoea, dyspepsia and piles etc. Plumbagin, the active principle isolated from the root of *P.zeylanica* and *P.rosea* possess significant antibacterial, antifungal and anticancer properties in both experimental animals and humans (Krishnaswamy and Purushothaman, 1980).

The milky juice of plumbagin is used in the form of local application for scabies and other ulcers. Topical application of plumbagin has been found to be useful in patients with common wart. Plumbagin is known to reduce toxicity of chemotherapeutic agents and has shown anticancer activity in BALB/C mice. It is known to possess growth inhibitory and radiosensitizing effects on experimental mouse tumors. It is also responsible to prevent the development of antibiotic resistance in bacteria.
to fulfill its aim of making health care to all by the year 2000 A.D. The World Health Organisation is taking an official interest in herbal medicines which are subjected to systematic and scientific evaluation (Menon and Nair, 1991).

An all India survey found that 80% of the households in urban areas used allopathic medicine and only 4% used ayurvedic medicine, not very different from the rural population which showed 75% going for allopathic and 8% for traditional medicines (Srinivasan, 1995).

Medicinal plants are the natural resources yielding valuable herbal products which are often used in the treatment of various ailments. Herbal medicines have been known to man for many centuries. The therapeutic efficacy of many indigenous plants for a variety of diseases / disorders have been documented in traditional medicinal literature (Satyavathi and Gupta, 1987). Many Indian medicinal plants were widely used in the treatment of various skin diseases by the siddha and ayurvedic physicians (Kirtikar and Basu, 1935).

Therefore, we felt the need to do an in vitro study on the antidermatophytic properties of Indian medicinal plants on various species of dermatophytes and its therapeutic efficacy in a suitable animal model (guinea pig).