SECTION I

INTRODUCTION
**Introduction**

Dermatophyte literally means, "Skin plants," which is a group of 30-40 closely related filamentous fungi, that can infect only superficial keratinised tissue the skin, hairs & nails. They cause a variety of clinical conditions collectively known as dermatophytosis. There are virtually no human populations completely free of this disease.

Emmons et al., 1977, the superficial nature of dermatophytosis and the case with which fungi can be demonstrated in and on hairs enabled dermatologists to study and name the etiologic agent early in the era of microbiology. Charles Robin named the fungus now known as *Trichophyton mentagrophyte* in 1847 and Malmstem in 1845 gave the name *Trichophyton tonsurans* to another familiar dermatophyte in his book. These early studies described clearly several types of dermatophytosis and discussed the necessity for manual epilation of infected hairs and methods of topical therapy.

When Sabouraud began his systematic studies of dermatophytosis, he published after 1800 a series of paper correlating earlier studies and his own observations. Epilation of the scalp by X-ray was then possible and Sabouraud improved the method of treatment as well as method of studying the fungi in the laboratory. His work culminated in the publication in 1910 of his classic, His paper, although informative did not further clarify the taxonomy of the group of keratolytic fungi. Sabouraud
revolutionized the treatment of ringworm of the scalp in the thousand of infected children’s in the school of Paris.

However the natural grouping of dermatophyte by Emmons in 1934 into three genera remain as the principle classification. Taxonomic review in 1968 by Azello listed 37 dermatophytes species including one species in the genus Epidermophyton, 15 in Microsporum and 21 in Trichophyton. Only 11 species of dermatophytes produce most of the dermatophytic infection in the world and less than eight of these are common in the united state.

Source of Infection:

The source of infection from dermatophytes includes contact with infected human being and contaminated fomites or soil. Those dermatophytes, which are associated principally with human beings and are rarely, if even isolated from animals or soil are said to be Anthropophilic. Zoophilic dermatophytes are seen normally in animal species, may initiate infections in human beings that are acute and strongly inflammatory. Rarely a keratinophilic soil organism may produce dermatophytoses in human beings and these are said to be geophilic because of their normally saprophytic existence.

The dermatophytes can initiate disease on skin; hair or nail. Depending upon species response Microsporum may infect the hair or skin. Epidermophyton floccosum may infect the skin and or and Trichophyton specie can infecting the skin or scalp nail as a small eczematoid lesion that spreads outward in roughly circular patterns with the viable fungal element at the
erythematous periphery Bocobo and Benham, 1949; Griffin, 1960; Rabell & Toplin 1970 This ring shaped lesion was his to really thought to be caused by small insects or worms. So the common name for these infections became known as ring worm.

Clinical Types:

The clinical types & subtypes of dermatophytoses can be correlated only partially with specific dermatophytes. Species of dermatophytes are being mentioned only briefly and its clinical types are as under (Emmons 1977).

Tinea Pedis

(Athlete’s foot, ring worm of the foot) lesions of this most frequent type of dermatophytosis often begin in the web between the fourth and fifth toes as tissues bordered by narrow zones of pealing epidermis.

Lesions of the above types may be present on the hands (Tinea manuum) Eczematoid lesions on the hands often are due to hypersensitivity of the patient to some allergens.

The usual fungi in tinea pedis & tinea manuum are Trichophyton rubrum, Trichophyton & Epidermophyton floccosum

Tinea unguium-

(Ringworm of the nails or Onchomychosis) Onychomycosis is often associated with mycotic hyperkeritonic peeling or inconspicuous branny desquamation of the hand & fingers. Infected nails may have a chalky crumbling consistency and
striated surface Hypertrophy of the nail bed resulting in a raised thicked nail which overlies a spongy mass of keratinized cells & debris. The species usually responsible for Onychomycosis are Trichophyton rubrum and Trichophyton mentagrophyte.

**Tinea Corporis:**

(Tinea circinata, ringworm of the glabrous skin) Typical Tinea circinata of the glabrous skin is characterized by a circular lesion characterizes typical Tinea circinata of the glabrous skin. Which exhibits varying degrees of inflammation, which may maintain its circular pattern of radial growth at the periphery of the lesion. The periphery lesions are located on the face, shoulder arms or other exposed parts of the body. The species usually responsible for Tinea corporis are Trichophyton mentagrophyte, Trichophyton rubrum and Microsporum canis.

**Tinea imbricata:**

(Takelan) In tropical areas of the Eastern hemisphere. Tinea imbricata is a common infection. It is characterized by lesions which are originally circinate but which become irregular or serpiginous and coalescent and don’t heal at the centre. The patient does not develop local immunity and the lesions may cover large areas of the face, arms & legs for many years without remissions.

The name of the fungus is Trichophyton concentricum.
Tinea barbae:

(Sycosis, ringworm of the beard, barber’s itch) Tinea barbae is found on the beard and other areas of the face & neck, which the patient acquires, from animals.

Tinea barbe is seen often in farmers and may be caused by Trichophyton verrucosum acquired from cattle or by Trichophyton mentagrophyte. Acquired from the horse or dog. Microsporum canis is an occasional cause of Tinea barbae.

Tinea cruris:

(Eczema marginatum, jockey itch, dhobie itch, ringworm of the groin) Tinea cruris is an acute or chronic infection usually pruritic dermatophytosis of the groin, perineal and perianal areas. When the above lesions are caused by Epidermophyton floccosum. They rarely extend beyond the areas mentioned above. But when the etiologic agent is Trichophyton rubrum lesions may extend widely over the body. The lesions usually are sharply marginated, epidermal scales are thin, real and if not secondarily infected generally dry up.

Favus:

(Tinea favosa) Favus is a severe type of chronic ringworm, which may be acquired during infancy and if not treated is carried throughout life.

In geographic areas where forms has been endemic for many generations many patient have a milder form of the disease hardly distinguishable from a seborrheic form of Tinea capitis.
Although *Trichophyton schoenleini*, *Trichophyton violaceum* & *Microsporum gypseum* cause favus the differences in severity are not clearly related to the species of the fungus favus of the nails are similar in its clinical appearance to Onychomycosis caused by other dermatophytes.

Favus commonly occurs in countries adjacent to the Mediterranean, South Eastern Europe, Southern Asia, Northern Africa and the orient.

**Tinea capitis:**

Those dermatophytes invading actively growing hair usually begin by growing in the stratum corneum of the scalp and entering the follicle to grow down the hair shaft to a point just above the keratogenous zone. That is a “living” portion of the hair shaft just above the hair bulb, which produce fibrils of keratin on the hair shaft and become established above the keratogenous zone. Some dermatophytes such as *Trichophyton tonsurans* and *Trichophyton violaceum* remain essentially inside the hair shaft while producing chains of arthrospores. This is called as endothrix type of invasion. The hair often become so fragile that they break off close to the scalp surface leaving black stubs with a chicken skin’ appearance.

This condition is known as ‘blackdot’ ringworm and is typical of *Trichophyton tonsurans* and *Trichophyton violaceum*. Other dermatophytes *Microsporum audouini*, *Microsporum canis*, *Trichophyton mentagrophyte* and *Trichophyton verrucosum* secondarily break out into the surface of the hair and fragment
into spores (ectothrix). In the case of *Microsporum canis* and *Microsporum audouini* these spores are small (2 to 3 mm) and are packed-tightly into a mosaic and this small-spored ectothrix invasion is typical of these species. The spores of *Trichophyton* species producing ectothrix infections are larger (3 to 10 mm.) with a more apparent chain formation along the external hair shaft and include *Trichophyton mentagrophytes* and *Trichophyton verrucosum*.

*Trichophyton schoenlinii* produce distinctive patterns of hair invasion called favus. These hairs contain branched mycelium and empty spaces. Where the mycelium has degenerated. Such spaces readily fill with fluid when examined by KOH and bubbles can be seen in the fluid filled channels. These hairs are not as fragile as those in ‘black dot’ ringworm and the relatively long (2 to 8 inches) hairs take on a dull gray appearance.

Dermatophytes have been routinely placed in the class Deuteromycetes or ‘imperfect fungi’ because they were not known to reproduce sexually. More recently, however, an ‘asexual’ or ‘perfect form’ has been discovered for several dermatophyte species Ajello, 1968; Dawson and Gentles, 1959; Griffin, 1960; Stockdale, 1961 When certain strains are grown on sterile hair (human or horse) or sterile moist soil, they may produce cleistothecia that contain asci with ascospores. The cleistothecia may reach 700μ in diameter and the asci contain eight ascospores of varying sizes and shapes, according to the species. The perfect form of the dermatophyte is given a genus and species name different from that of the imperfect form. The
generic term *nannizea* is given to the perfect form of *Microsporum* in honour of Nannize. Who described cleistothecia in a plate of *Microsporum gypseum* in 1957. Other authors more recently verified these findings (Griffin, 1960; stock dale, 1961) Additionally perfect forms have been found for members of the genus *Trichophyton* and these have the generic term *Arthroderma*. Some of the ascigerous genera are listed with their imperfect equivalents. The ascigerous states are not likely to be seen in the routine clinical laboratory because:

i) The dermatophytes producing an ascigerous state are rarely isolated in human infections.

ii) The demonstration of the ascigerous state required specialized techniques not common to the clinical laboratory. The knowledge of ascigerous states however is useful in identifying certain fungi otherwise difficult the identity.

This is accomplished by attempting to mate an unknown strain with a known strain. If sexual structure (Cleistothecia) is produced along the line where the colonies meet on the agar surface, the two organisms is considered to be of the same strain.

Emmons in 1934 defined in mycological terms three old generic names and proposed a natural simplified classification. Critical studies by Georg (1960); Ajello et. al., 1968 led to further clarification of specific nomenclature. Neal & Emmons 1939 isolated dermatophyte from 93 of 35h employees in an industrial plant.
Evidence that the dermatophytes are related to the Gymnoascaceae has been accumulating since 1899. Matruchat and Dassonville, et al., 1899 Nannizzia et al., 1927 observed cleistothecia in Microsporum gypseum and he named this ascomycetons form Gymnoascus gypseus. Griffin 1960 rediscovered G.gypsum and Szathmary and Herpay. 1960, observed this fungus and the ascomycetons state of Microsporum fulvum, a species generally considered identical with Microsporum gypseum. Stockdale et al., 1961 using the hair bait method. Stockdale. et al., 1963 published a second report on the Microsporum gypseum complex, in which she concluded that two species were included under the name Microsporum gypseum. In addition to N. incurvata stockdale, 1961, proposed the new combination, N. gypseu (Nannizzia).

Ajello and Cheng 1967 described Arthroderma ubenhiamia as the perfect state of Trichophyton mentagrophyte. Takashio et al., 1972 investigated the mating reactions between various strains of Trichophyton mentagrophyte and two tester strains A and a types of A. benhamiae. It was found that Trichophyton mentagrophytes is a complex group producing sexual states which can be assigned to more than one species as is the case in Microsporum gypseum complex. Takashio 1973 later found the second ascomycetous species Arthroderma vanbreuseghemii. In the Trichophyton mentagrophyte complex. Hasegawa and Usui (1974) reported the perfect state of Microsporum canis to be a new heterothallic species of Nannizzia and the species were described as Nannizzia otal.
Spontaneous or induced variants involving an altered growth rate, pigmentation, or conidial or colonial morphology were reported long before the discovery of sexual reproduction in dermatophytes (Emmons & Hollaender, 1939). It was later known that these changes are due to the mutation of nuclear gene using nutritional mutants obtained by irradiation.

**Microsporum gruby.** 1843 is characterized by fusiform or spindle shaped macroconidia which have usually thick walls. Except in rare strains, the outer surface of the wall is pitted, a sperulate, or spiny at least near the distal end. Depending upon the species, the macroconidia are 7 to 20 x 35 to 125μ (rarely up to 160μ long) and they have usually 4 to 15 septa.

**Microsporum gypseum** (Emmons et. al., 1977)

(Bodin) Guiart and Giorakis, 1928. Synonymy: Achorion gypseum Bodin 1907; Microsporum flavescens Horta, 1911; Microsporum scortecum Priestley, 1914; Microsporum xanthoides Fisher, 1918.

**Microsporum gypseum** is normally a soil (geophilic) fungus and human being acquire this infection from soil contact (Farmers etc.) Presumably man and animal are infected from the soil, which serve as a saprobic reservoir of the fungus. **Microsporum gypseum** grows rapidly. Although it is not common Sinski - 84, 85. These fungi rarely invade the dermis Rinaldi 2000.

The colony is fawn brown buff or reddish brown and the pigment is conspicuously visible on the reverse side of the colony. The
surface is floccose, becoming powdery with production of many large septate macroconidia. Colonies are zonate with a powdery center and more woolly or floccose growth in the younger mycelium in peripheral zones. The colony rapidly becomes pleomorphic when hair is invaded it is ectothrix but sparse and there is no fluorescence with a wood’s light. Macroconidia are produced in great number. They are 25µ to 60µ x 7.5µ to 16µ in size, broadly spindly shaped (although not so pointed at the distal end as those of Microsporum canis) with moderately thick walls and 4-6 septa. Micro conidia 2.5µ to 2µ x 4µ to 6µ are produced sparsely but sometimes more freely in subcultures after several transfers on media in the laboratory.

It is heterothallic, and mating by two strains produces cleistothecia. Nannizzea gypseae (Nannizzi) Stockdale 1963 is an ascomycetous state of Microsporum gypseum, which develops when compatible strains are mated on a suitable substratum such as soil mixed with hair or feathers. The cleistothecia are globose, pale buff. 300 to 750µ (rarely 900µ) in diameter. The peridial hyphae verticillately branched and branches curve back over the cleistothecium. Nannizzia incurvata stockdale 1961 is another ascomycetous state of the species complex now recognized as Microsporum gypseum. It develops when compatible strains are mated on a substratum of soil mixed with hair or feather. The cleistothecia are globose, pale buff 350 to 650µ in diameter. The peridial hyphae verticillately branched. Branches curving towards the main axis and away from the cleistothecium.
**Microsporum nannum**

*Microsporum nannum* was isolated from a lesion of the scalp of a boy and from the body of an adult in Cuba, later from swine in Kenya and subsequently from man and swine in other parts of the world. *Microsporum nanum* is a zoophilic fungus and human being acquired this infection from animal contact through generally pigs. It produces Tinea corporis in human beings.

The genus *Microsporum* is immediately recognized by the presence of large (8μ x 8μ to 15μ x 15 to 150μ spindles shaped, rough walled macroconidia with thick (up to 4μm) walls that contain 4 to 15 septa. The exception is *Microsporum nanum*, which characteristically produces macro conidia having two cells. It’s macro conidia are ovate or elliptical 12μ to 18μ x 5μ to 7μ with 1 to 2 cells (rarely 24μ long and with 4 cells), and with outer walls which are verrucose (rarely smooth) The micro conidia when present are clavate 2μ x 5μ and are borne on the hyphae either laterally or on short conidiophores. Species of *Microsporum* develop either slowly or rapidly and produce aerial hyphae that is velvety, powdery, glabrous or cottony varying in colour from whitish, buff to a cinnamon brown, with varying shades on the reverse side of colony.

*Nannizzia obtusa* 1961 is the ascomycetous state of *Microsporum nanum*. Its eleistothece are globose pale buff and 250 to 450μ in diameter.
Trichophyton is characterized by clavate macroconidia, 4 to 8 x 8 to 50µ with smooth walls usually not exceeding 2µ in thickness and zero to four septa. The cells of macroconidia are multinucleate as in other dermatophytes. The microconidia are spherical 2.5 to 4µ in diameter or clavate 2 to 3 x 3 to 4µ Species of Trichophyton attack skin, hairs or nails.

Trichophyton mentagrophyte


Trichophyton is the most common and complex, containing over 15 species and several varieties with in the species. Trichophyton mentagrophyte Rippon 1988 and Weitzman I. Summerball 1995. The species of Trichophytons are the most commonly isolated of all dermatophyte species from human ringworm infections. Their identity however, presents the most difficult of all the dermatophytes. Most of the species common to human infections fail to produce macroaleuriospores and there are limited
physiologic tests available to assist in the differentiation of these species. *Trichophyton* is characterized by clavate macroconidia with smooth walls usually not exceeding 24μ in thickness and with zero to four cells of macroconidia.

*Trichophyton mentagrophytes* is nearly as common as *Trichophyton rubrum* as an etiology agent of dermatophytosis in human beings and is the most common agent of Tinea pedis. While being an important cause of most other forms of tinea as well. The colonies of *Trichophyton mentagrophytes* vary from white floccose colonies with no distinctive microscopic features except a few clavate microconida of cream coloured, yellowish or peach-coloured granular, flat colonies which bear spores freely. The morphologic features of these strains include clavate 3 to 4 septate macroconidia 6μ to 8μ x 20μ to 50μ in size: spherical or clavate microconidia; spirally coiled hyphae and nodular organs which are abortive ascogonia. The colors may include tan and reddish brown. The reverse pigmentation is equally variable and confusing. The colours may range from colourless or white, through various shade of brown to a red pigmentation. *Trichophyton mentagrophytes* fail to produce a red pigment on corn meal dextrose agar. Whereas *Trichophyton rubrum* produce a red pigment consistently on it. *Trichophyton mentagrophyton* is further characterized by production of enzymes, which permit it to penetrate hair in-vitro by formation of deep narrow conical pits, and by production of urease. Most strains of *Trichophyton rubrum* either lack these enzymes or produce them slowly.
Macroconidia vary within the strain and from strain to strain from single celled spores 4\( \mu \) to 8\( \mu \) in size to 2\( \mu \) to 5\( \mu \) celled spores 8\( \mu \) x 50\( \mu \) in size. They may be most easily found in young cultures five to ten days old. Microconidia may be clavate and borne laterally on undifferentiated hyphae in floccose strains or nearly spherical on conidiophores in powdery or granular strains. The conidiophores may be once or twice branched to produce clusters of these sub spherical microconidia or microalerisopores. The short branches arising at almost right angles.

**Trichophyton mentagrophyte** falls within the “Small spored ectothrix” group, although most of the floccose strains of the type commonly isolated from Tinea pedis, do not spread to the scalp and do not invade hairs of the glabrous skin. The species includes strains, which do invade hair follicles and hairs and cause severe host reaction, which may be supportive expulsion of hairs and spontaneous termination.

**Arthroderma benhamiae** Ajello and cheng 1967, is the ascomyecetous state of **Trichophyton mentagrophytes.** Cleistothecia are white spherical, 400 to 500\( \mu \) in diameter. **Arthroderma vanbreuseghemii** (Takashio 1973) is another ascomyecetous state of the **Trichophyton** mentgrophyte complex. The morphological characteristics are similar to those of **A. benhamiae** except it has slightly larger ascospores measuring 2 x 3.5\( \mu \) in diameter. Interspecific crossing does not occur between **A. benhamiae** and **A. vanbreuseghemii.**
Trichophyton rubrum

Trichophyton rubrum (castellani) Sab; 1911. Synonymy: Trichophyton rubrum cast; 1910; Epidermophyton pernete cast; 1910; Trichophyton purpureum Bang, 1910; Trichophyton rubidum Priestley, 1917; Trichophyton plurizoniforme Mac carthy, 1925; Trichophyton anoroseum Mac carthy, 1925; Trichophyton coecineum Katon; 1925; Trichophyton spadix Katoh, 1925; Trichophyton multicolor magathaes and Neves, 1927; Trichophyton Kagawaense Fujii, 1931.

The anthropophilic dermatophyte Trichophyton rubrum is considered to be the most common cause of dermatophytosis in the United State and is normally isolated from Tinea corporis and Tinea pedis.

Trichophyton rubrum can be highly variable in morphology, but is normally seen on sabouraud’s Agar medium as a slow glowing, heaped white to reddish floccose or velvety colony. The cherry red pigment is most apparent on the reverse side of the colony. The pigment usually develops after some weeks of growth but may be developed at all for some strains of Trichophyton rubrum particularly if the patient is on griseofulvin therapy. This red pigmentation can be more consistent at Trichophyton rubrum is grown on corn meal dextrose agar, while Trichophyton mentagrophyte fails to produce red pigment on this medium (Bocobo and Benham. 1949). On agar slant may appear first at the margin of a colony at the dry tip of the slant or at the center and in a concentric circle on the reverse side of a colony.
Macroconidia are typically long and narrow (4μ to 6μ x 15μ to 30μ) are sparse or lacking except on enriched media such as heart infusion tryptose agar. Microconidia are clavate (2μ to 3μ x 3μ x 5μ), borne laterally on undifferentiated hyphae or on simple lateral conidiophores. They may be almost sessile or on short stalks. Ascogonia produced but are less numerous in most strains than in granular types of Trichophyton mentagrophyte.

Trichophyton rubrum rarely invades hairs, but when it does so, it is ectothrix in nature. It is frequent cause of Tinea pedis, onychomycosis, and may extend widely over the body, particularly in the perineal, groin and waist areas. It is a rare cause of subcutaneous and systemic of infection.

There are relatively few therapeutic agents developed for dermatopityosis treatments. Eukaryotic nature of the fungi is one of the reasons and it has been difficult to develop antifungal agent specific for fungal structures (Kobayashi and Medoff, 1977)

The first therapeutic agent, sensitive against mycoses was Potassium iodide the use of which was chiefly confined to sporotrichosis (Conant et al., 1971). However, during the last 50 years a large number of synthetic compounds Viz. Benzimidazole, diamidines, diothiocarbonates, hydroquinolines and pyrimidines have been reported to be effective against dermatophytes. Unfortunately, the use of such synthetic compounds in human chemotherapy remained limited (Stevens et al., 1976 Botter 1980;Brass et al., 1980; Createsas et al.,
1980; Fainstein and Body 1980; Carybill et al., 1980; Heel and Brogden. 1980; Lawson and Body, 1980; Mucke 1980; Peterson et al., 1980; Utz. 1980; Wojtulewaski et al., 1980) Some antifungal antibiotics Viz. Griseofulvin, Nystatin, and Amphotericine prevalent in the treatment of human mycosis have recently been found to possess various side effects Viz. Headache, gastro-intestinal upset and transienttrashes (Roxburgh and Borrie 1973) Many polyens antibiotics produced by species of Strephomyces have been of potential clinical usefulness for the control of such diseases. However at present only two products Viz. Amphotericin B and Nystatin are being used as chemotherapeutic agents in human mycotic infections. Recently, Nystatin has been found to show some side effects (Pareck 1980) and Amphotericin B also exhibits the whole range of side effects including fever, headache, malasia, chill, sweating, depression, nausea, vomiting, anorexia and anemia (Emmons et al., 1977) Treatment usually requires systemic antifungal therapy. Although a topical transfungal drug delivery system including 8% Ciclopirox and 5% Amorolfine nail lacquer has been developed for distal nail infection. Qadripur et al.,1981 and Zaias, 1985. Both the systemic and the new topical treatments require several months of medication. Systemic antifungal agents may cause serious idiosyncratic effects such as hepatitis or drug induced lupus erytheromatous. (Zaias 1985)

Terbinafine is an allylamine effective against dermatophytes and some moulds. The drug is well absorbed after oral administration, binds strongly to plasma proteins and diffuses
readily into formed nail plate from both the nail bed and matrix. (Balfour and Faulds 1992) & (Gupta, et. al., 1997) Most side effects have been characterized as minor and transient, although some patients have been reported to develop Neutropenia, Pancytopenia and Hepatotoxic reactions while receiving the drug. Blood counts and liver function tests are thus necessary during treatment.

In the modern times Griseofulvin is a first line well tolerated therapy for dermatophyte infections specially for Microsporum species. Which have many side effects such as headache, nausea and vomiting are most frequently countered. This systematic antifungal antibiotic Griseofulvin is by no means the perfect treatment of such infection (Roxburgh and Borrie 1973). Drug results in stunting and shrinking of fungal hyphae. It does not impede but enhances deoxyribonucleic acid synthesis. Occasionally patients don't response to these modern drugs and at the same time may causes harmful effects. So it is necessary to develop an effective and safe therapy. In view of this the present study is designed to organize a screening programme to test the antifungal principle present in plants.

Plants tested so far for their antifungal activity have not been worked out in detail. It is not known that which specific part is active whether they are safe or not and it which dilution of plant extract the growth of dermatophytes is inhibited which could be recommended for use. Some of the plants which have already been reported to posses anti-fungal agents against the
dermatophytes are:

* Asteracantha longifolia* against *Trichophyton mentagrophyte*, *Trichophyton rubrum*, *Microsporum gypseum* *Epidermophyton floccosum* and *Candida albicans* (Venkitaraman and Radhakrishana, 1972).

*Cassia abrus; Cassia auriculata* and *Cassia fistula* against *Microsporum tonsurans*, *Trichophyton rubrum* and *Trichophyton magninii* (Lillykutty and Santhakumari, 1969) *Cocos nucifera* against *Trichophyton mentagrophyte* and *Microsporum gypseum* (Gaind and Single, 1968) *Euphorbia thymifolia* against *Trichophyton mentagrophyte* (Rao and Gupta, 1970).

Water extract of *Cassia angustifolia* was found effective against *Trichophyton purpureum* (Itok and Najayo, et al., 1951).

The root bark of *Cassia fistula* (Caesalpiniaceae) was found effective during in vitro studies. Its 100mg of acetone extract of root and stem bark showed antifungal action against *Trichophyton tonsurans*, *Trichophyton rubrum* and *Trichophyton megnini* and was more potent than 10 g. griseofulvin. (Narayanana and Seshadri, 1972).

Two flavonoid glycoside fractions isolated from the acetone extract of the root bark also possessed marked antifungal activity against *Microsporum gypseum*, *Trichophyton mentagrophytes*, *Trichophyton rubrum* and *Trichophyton tonsurans*. Extract of roots and leaves of *Leptadenia reticulata* (Aclepiadaceae) was found active against ringworm (Patel and Dantwala: 1958).
Clinical trials has been done with a preparation from the fresh leaves of *Azaadiracta indica* in common skin conditions eczema, ringworm infection by Singh, et. al., 1979).

*Ocimum americanum* oil showed antifungal activity against *Trichophyton mentagrophyte*, *Trichophyton rubrum* *Epidermophyton floccosum* and *Candida albicans* (Narasimha Rao & Subba Rao, 1972). In another study the essential oil was found to be active against *Epidermophyton floccosum*, *Trichophyton mentagrophyte*, and *Microsporum canis* (Singh et. al., 1983).

Eugenol acetate, geranyl acetate and methyl heptanone, the three components isolated from the essential oil of *O. americanum* were evaluated for their antimycotic activity against keratinophilic fungi, Among the three compounds strong potent fungitoxic activity was in eugenol and geranyl acetate (Jain et. al., & Agrawal 1978) against dermatophytes also. The activity of these compounds however, was some what less potent than that of griseofulvin (Jain et. al., 1980) Geranyl acetate was found to be highly toxic to *Trichophyton rubrum*.

The oil of *O. basilicum* showed antifungal activity against *Microsporum gypseum* (Sawhney et. al., 1977) *Trichophyton mentagrophyte*, *Microsporum canis* and *Epidermophyton floccosum* (Singh et. al., 1983).

The oil of *O. gratissimum* plant showed antifungal activity against *Microsporum gypseum* (Sawhney et. al., 1977) as well as against *Epidermophyton floccosum*, *Microsporum canis* and
Trichophyton mentagrophytes at a concentration of 1000 ppm (Singh et al., 1983).

The essential oil of *O. Kilimandschoricum* showed potent antifungal activity against *Epidermophyton rubrum*, *Microsporum gypseum*. The oil was most effective against *Microsporum gypseum* (Suri & Thind; 1979).

The essential oil of *Ocimum sanctum* from the plant also showed antifungal activity against dermatophytes Viz. *Epidermophyton floccosum*, *Trichophyton mentagrophyte* & *Microsporum canis* (Singh et al., 1983).

In view of the above findings the present work has been planned in the following lines.

1-  
   a)  Collection of plants and preparation of powdered material.
   b)  Preparation of water extracts from plants powders.
   c)  Preparation of solvent extracts from plants part
   d)  Preparation of hot solvent extract by soxhlet apparatus.
   e)  Extraction of Essential oils from plants material
   f)  Preparation of composite samples.

2-  
   Isolation of dermatophyte from patients
   a)  Examination of infected organisms.
   b)  Isolation of infected organisms.

3-  
   a)  Screening of plant material for antifungal activity.
   b)  Screening of different parts of the active plants for fungitoxicity.
   a) Anifungal study of water extract against fungal organism.
   b) Anifungal study of solvent extracts against fungal organism.
   c) Anifungal study of oil extracted from active plants.
   d) Anti fungal activity of composite samples of selected plant materials.
   e) Anti fungal activity of plants solvent extracts on spore germination.
   f) Minimum inhibitory concentration of oils
   g) Study of fungicidal or fungistatic nature of oils.

5. Antifungal study of selected plant materials In-vivo.
   a) Sensitivity test of the oil on the human skin.
   b) Efficiency of the oil for the cure of infection.


The above plan has been covered in the following chapters:

CHAPTER-1. Introduction: This chapter includes the introduction of the subject with its importance in the field of medicine as has already been described in the previous texts.
CHAPTER 2. Review of Literature - This chapter includes the review of the work done in the field with details of the available literature.

CHAPTER 3. Materials and methods - This chapter deals with the materials & methods used during the study of the present work.

CHAPTER 4. Observations & Results - This chapter deals with the observations & results obtained on the various experiments performed during the study.

CHAPTER 5. Summary & Discussion - This chapter deals with general summary of the entire work conducted and the result obtained has been discussed with those of the other workers.

CHAPTER 6. Bibliography