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HERBAL MEDICINE IN DERMATOPHYTES SEPTICITY

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Abstract - millions of people each year are affected by dermatophytes, which are the most frequent cause of fungal infections worldwide. The emergence of resistance among dermatophytes and the availability of antifungal susceptibility tests appropriate for testing antifungal agents against this group of fungi make the combinatorial approach particularly interesting to be investigated. As a result, we examined the scientific literature on antifungal combinations that are effective against dermatophytes. A pubmed search of the relevant literature produced 68 publications: 37 articles mentioning in vitro studies and 31 articles mentioning case reports or clinical studies. More than 400 clinical isolates of dermatophytes (mostly trichophyton spp., microsporum spp., and 2% epidermophyton floccosum) were used in in vitro studies. Combinations included two antifungal substances or an antifungal substance plus a second chemical substance, such as plant extracts.

Keywords-dermatophytes, antifungal activity, fungitoxicity, herbs[medicinal plants], microemulsion.

Introduction -infections of the keratinized tissues (skin, hair, and nails) in both humans and animals are caused by a group of fungus called dermatophytes. Due to the fungi's capacity to extract nutrition from keratinized material, dermatophytes also known clinically as ringworm or tinea occur. Dermatophytes are divided into three groups based on their preferred habitats: anthropophilic (people), zoophilic (animals), and geophilic (soil).[1] as a result of the fungi's inability to enter the deeper tissues or organs of immunocompetent hosts, infection is typically limited to the non-living cornified layers and is usually cutaneous. The host's responses to the fungus metabolic products, the virulence of the infecting strain or species, the anatomic site of the infection, and local environmental factors can all affect how the host responds to a dermatophyte infection, which can range in severity from mild to severe.[2] geophilic dermatophytes typically associate with keratinous materials like hair, feathers, hooves, and horns as part of their decomposition process. Dermatophytes that have evolved to live on animals or people are known as zoophilic and anthropophilic dermatophytes, and they are the most common sources of superficial mycoses in both animals and people. These infections affect the stratum corneum, hair, nails, and claws.[3]

fig: types of dermatophytes [4]

Clinical aspects

According to anatomical locations, dermatophyte infections (ringworm) have traditionally been given names. Tinea capitis, tinea facial, tinea barbae, tinea corporis, tinea cruris, tinea manuum, tinea unquium, tinea pedis.[5]

(1) tinea capitis - tinea capitis is an infection that frequently affects the scalp and is typically brought on by organisms from the genera microsporum and trichophyton. A few patchy areas of scaling and mild, almost subclinical erythema may be present with the infection with gray hair stumps that are dull, to an extremely inflammatory reaction with folliculitis, kerion formation, extensive alopecia and scarring, occasionally with fever, malaise, likewise localized lymphadenopathy. The hairs and skin surface both are concerned. Ectothrix, a sheath of arthroconidia that forms on the outside of the hair, is one way to describe an infection of the hair or endothrix (arthroconidia that developed inside the hair shaft). The most common reason for tinea capitis right now in most t. Tonsurans (endothrix) is replacing m. Audouinii (ectothrix) in north, central, and south america [6]

(2) tinea barbae - the zoophilic dermatophytes trichophyton verrucosum, t. Mentagrophytes var. Mentagrophytes, and t. Mentagrophytes var. Erinacei are more frequently responsible for the severe inflammatory pustular folliculitis known as tinea barbae.[7]

(3) tinea corporis - any dermatophyte can cause body ringworm, which typically affects the trunk, shoulders, or limbs and sporadically the face (apart from the bearded area). From mild to severe, the infection can manifest as annular, scaly patches with sharply marginated, raised erythematous vesicular borders.[8]

(4) **tinea cruris (‘‘jock itch’’) -** adult men are more likely to develop infections of the groin, perianal, and perineal areas, as well as occasionally the upper thighs. The most common etiologic agents are t. Rubrum and e. Floccosum. Microbiological rev. Agents weitzman and summerbell. Thin, dry scales cover the erythematous to tawny-brown lesions. They typically have a raised, sharply marginated border that is frequently studded with small vesicles, and they usually extend down the sides of the inner thigh.[9]

(5) tinea manuum - tinea manuum typically affects the palmar and interdigital regions of the hand, and it most frequently manifests as unilateral diffuse hyperkeratosis with accentuation of the flexural creases. T. Rubrum is the main infectious agent.[10]

(6) tinea favosa - severe and chronic tinea favosa, which is typically brought on by trichophyton schoenleini, is characterized by the development of yellowish, cup-shaped crusts called scutula on the scalp and glabrous skin. Scutula are made up of epithelial debris and dense masses of mycelium. Africa and eurasia have the highest rates of the illness.[11]

(7) tinea pedis (''athlete's foot'') - the toe webs and soles of the feet are most frequently affected by tinea pedis. The intertriginous form, which primarily manifests as maceration, peeling, and fissuring between the fourth and fifth toes, is the most typical clinical manifestation. Another typical presentation is the chronic, squamous, hyperkeratotic type, or moccasin foot, in which the soles, heels, and sides of the feet have pinkish skin covered in fine silvery scales. T. Mentagrophytes typically results in an acute inflammatory condition marked by the development of vesicles, pustules, and occasionally bullae. T. Mentagrophytes var. Interdigitale, t. Rubrum, and e. Floccosum are the more persistent tinea pedis causative agents.[12]

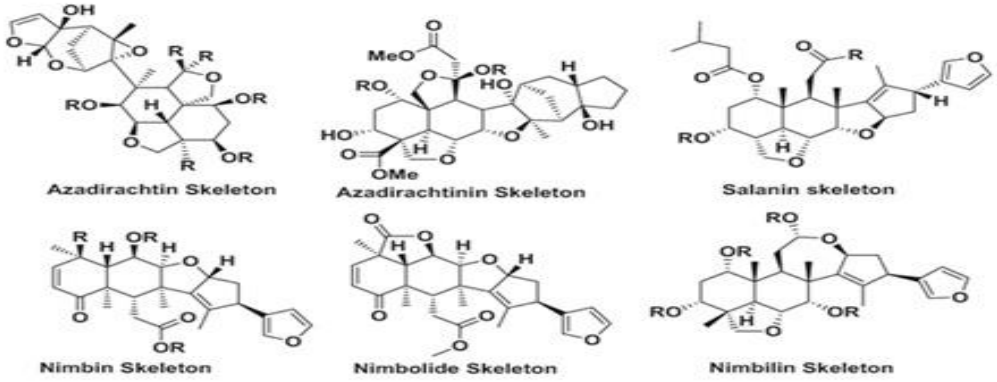
These are dosage form used for the treatment of dermatophytes :- pharmaceutical cream , pharmaceutical gel, buccal tablet , medicated oils are used for treatment of dermatophytes.

Material and methods –
Some examples of allopathic and herbal medication:

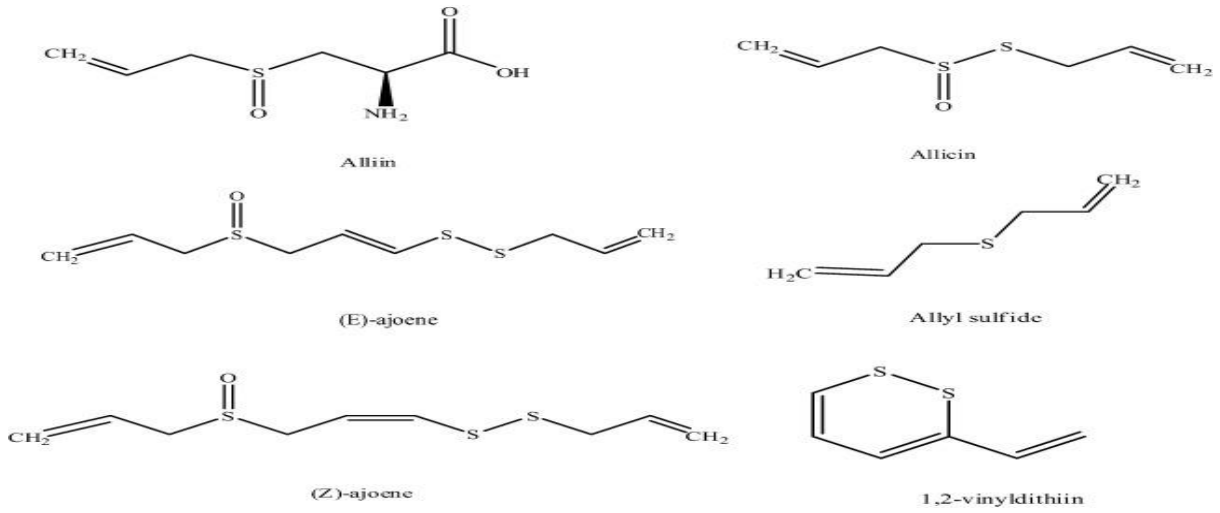
Allopathic medication	**Herbal medication**
• brand name – itact 200 capsule • composition - itraconzole [13]	• brand name - swiss itch cream • composition - shudh gandhak, shudh tankan (suhaga), veteria indica/ shorea robusta (raal) resin/exd. , sphatika bhasm (sphatika), cream based [17]
• brand name – abiflu 150 tablet • composition – fluconazole [14]	• brand name - sapat lotion • composition – salicylic acid, alcohol(spiritual) [18]
• brand name - abifine-b cream • composition- terbinafine hydrochloride benzyl alcohol [15]	• brand name - sure guard • composition – nila thotha bhasma, katha, tankan amla bhasma, gandhak khaniz. [19]
• brand name - ketogail tablet • composition – ketoconazole [16]	• brand name - marss skeensudha malam • composition - camphor, coconut oil, eucalyptus, lavender, zinc oxide [20]

There are some examples of herbs which are used in treatment of dermatophytes -

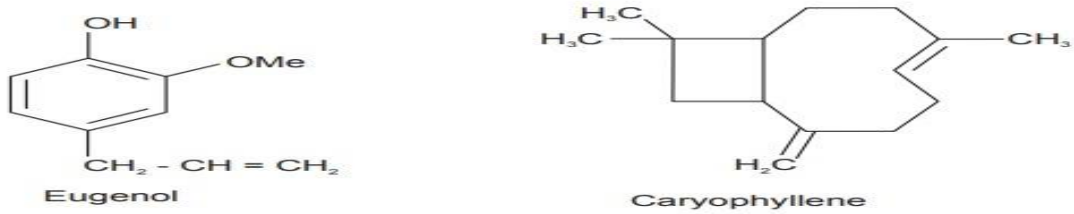
- **1. Neem leaves** - neem obtain almost all of the azadirachta indica plant's medicinal components from meliaceae family.it contain nimbin, elemene, azadiradione. All parts of neem tree used as anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive and sedative.[21]



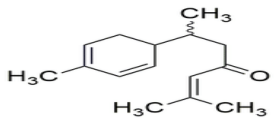
2. Garlic - garlic is the ripe bulb of allium sativum linn., belonging to family liliaceae.it contain allicin, alliin, diallyl sulfide, diallyl trisulfide. All part of garlic helps unclog pores, removes blackheads, fades acne scars, and reduce blood fungal infection. [22]

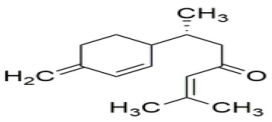


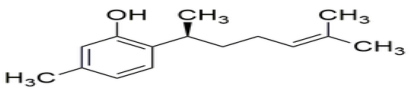
3.clove - cloves consist of dried flower buds of eugenia caryophyllus, which belonging from myrtaceae family.it contain eugenol, chavicol, caryophyllene, copaene, acetyl eugenol. Clove helps to calm irritated skin and helps to reduce the appearance of redness, pigmentation and puffiness to leave your complexion deeply soothed and supple. [23]

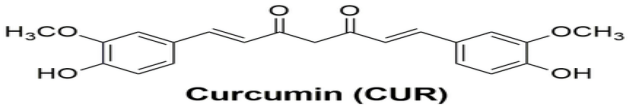


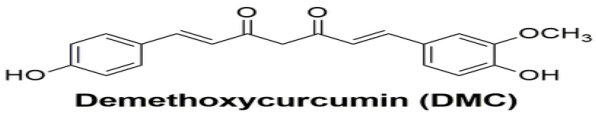
4.turmeric - turmeric is a product of curcuma longa, a rhizomatous herbaceous perennial plant belonging to the ginger family zingiberaceae, it contain curcumin, curcuminoid, vanillylidene acetone, vanillic acid. Turmeric providing relief of inflammation (anti-inflammatory), neutralisation of free radicals in body (antioxidant) and reduction of fungal infection (antifungal). [24]

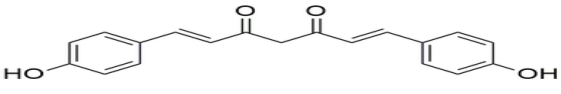

Turmerone

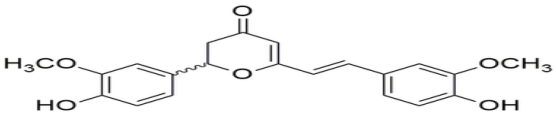

Curlone


Curcuphenol

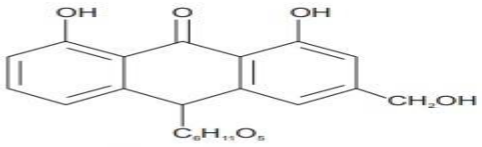

Curcumin (CUR)

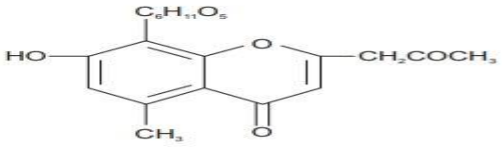

Demethoxycurcumin (DMC)

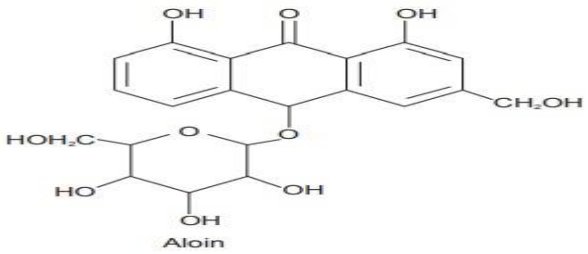

Bisdemethoxycurcumin (BDMC)


Cyclocurcumin (CC)

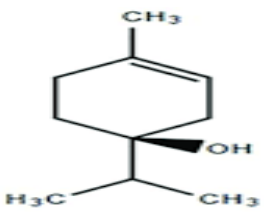
5. Aloe vera - aloe is the dried juice that is extracted by cutting into the leaf bases of different species of aloe. The liliaceae family includes aloe perryi baker, aloe vera linn, aloe barbadensis mil, and aloe ferox miller.it contains anthraquinone, cinnamic acid, chromone, vanillic acid, catechol. Aloe vera works against fungus and bacteria, killing them. [25]

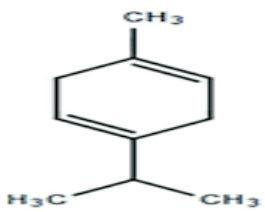

Barbaloin

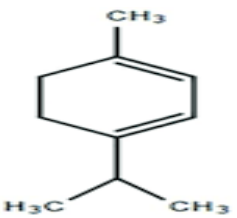

Aloesin


Aloin

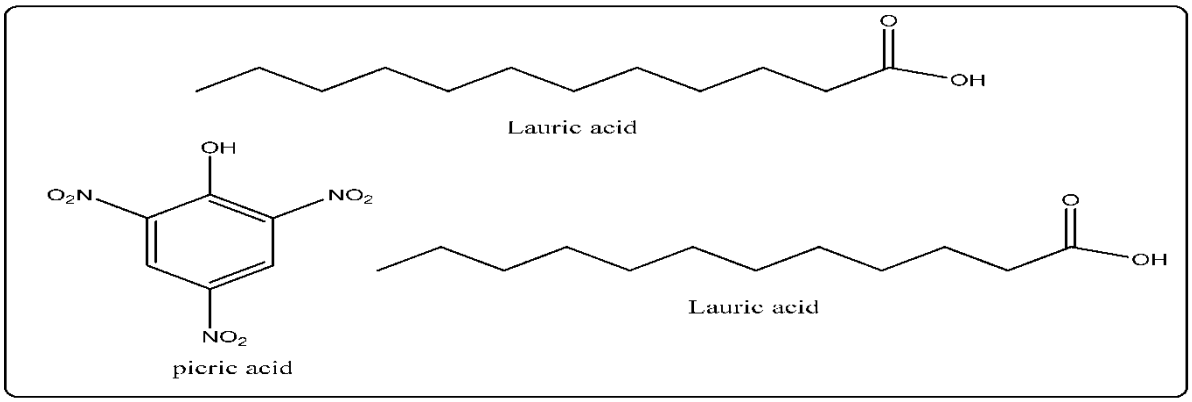
6.tea tree oil - the tea tree, or melaleuca alternifolia, is a species of tree or tall shrub in the myrtaceae family of plants.it contains terpinon 4 ol, terpineol, limonene, eucalyptol. It may be effective with toenails fungus and possibly athlete's foot fungus. [26]


Terpinene-4-ol


γ-Terpinene


α-Terpinene

7.coconut fruit- a significant member of the arecaceae (palm family) family is the coconut, also known as coco, coco-da-bahia, or coconut-of-the-beach. It contains myristic acid, water, oil, lauric acid. Coconut oil's antifungal and moisturizing properties are useful for treating mild cases of ringworm.[27]

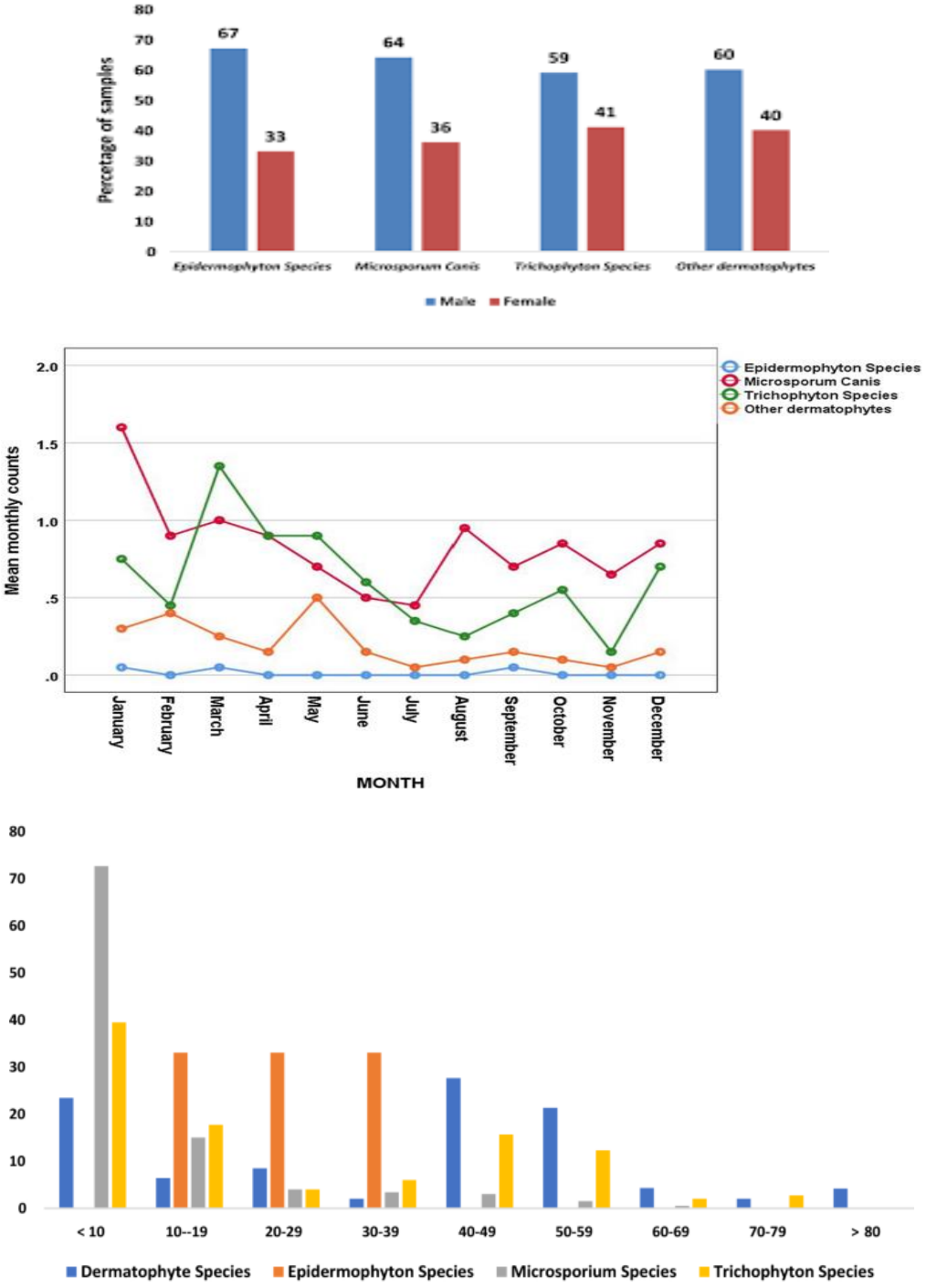


Microemulsion - colloids made up of two or more immiscible liquids in which one liquid has a dispersion of the other are called emulsions. It has a dispersed phase and a continuous phase, and surfactants stabilize both phases.[28,29] a microemulsion can be created simultaneously without requiring a significant energy input and is made up of colloidal nano dispersions that are stabilized by surfactants. Depending on the phase, there are two different types of microemulsions: water in oil emulsions and oil in water emulsions. Droplet sizes in microemulsions range from 5 to 100 nm.[30] unlike macroemulsions, which are kinetically stable systems, microemulsions are thermodynamically stable systems. Microemulsions have a number of benefits, including the ability to increase the solubility and stability of pharmaceuticals and the simplicity of scaling up production. However, some of their drawbacks[31]

Simple methods for preparation –

1. Gather your materials: you'll need the oil phase, water phase, surfactant, and co-surfactant.
2. Determine the ratios: calculate the appropriate ratios of oil, water, surfactant, and co-surfactant based on your desired formulation.
3. Mix the phases: combine the oil phase and water phase separately.
4. Add the surfactant and co-surfactant: slowly add the surfactant and co-surfactant to the water phase while stirring gently.
5. Combine the phases: slowly add the oil phase to the water phase while continuously stirring.
6. Observe the emulsion: check the appearance and stability of the emulsion under different conditions (temperature, ph, etc.).
7. Adjust if needed: if the emulsion is not stable or has undesirable properties, you may need to adjust the ratios or experiment with different surfactants. [32]

Discussion - the majority of plant species tested in this study's aqueous extracts had fungitoxic effects, demonstrating the value of many plant species as a source of natural antimycotic compounds (the major active constituents present are noted). Other researchers have also reported the antifungal activity of medicinal plant extracts, such as juglans sp. And solanum sp. Extracts, against some dermatophytes, such as m. Canis and t. Mentagrophytes [33, 34]. 41% (9/22) of the extracts (15 mg ml1) in the current study completely inhibited the growth of at least one of the test dermatophytes. In fact, against one or more of the test dermatophytes, 27 to 81% (6/22-18/22) of the extracts exhibited high antimycotic activity (80-100% inhibition), and 9 to 55% (2/22-12/22) of the extracts exhibited moderate (60-80% inhibition) activity[35]. Dermatophytes only develop in the stratum corneum and feed on the keratin and various cross-linked proteins of the cornified cell wall. Accordingly, it makes sense to hypothesize that during an infection, dermatophytes secrete a full complement of endo- and exo-proteases to break down keratinized structures into short peptides and free amino acids that the fungus can use as food.[36,37] here, we demonstrate that closely related dermatophyte species that are grown in the same culture medium secrete various protein patterns. T. Tonsurans, t. Equinum, t. Rubrum, t. Soudanense, and t. Violaceum are just a few examples of closely related species with different ecologies that could be distinguished through the analysis of secreted protein profiles.[38,39]



A class of fungi known as dermatophytes primarily infect superficial keratinized tissues, including skin, hair, and nails, and can result in cutaneous mycoses [41]. The past ten years have seen a rise in cutaneous infections [41, 42], and dermatophytes are responsible for 20–25% of fungal infections globally [42]. A study on the prevalence of tinea capitis in Saudi Arabian nationals was carried out in 1993 at Qatif Central Hospital. Of the 372 patients whose clinical samples were obtained, only 240 (64.5%) were found to be positive upon direct microscopic inspection. According to the findings, 47.7% of infections with superficial mycosis are caused by tinea capitis [43]. Microsporum canis (82.3%) was the most frequent etiological agent, followed by Trichophyton violaceum (13.9%) and M. audouini (2.2%) [44].

Dermatophyte infections are influenced by humidity and high temperatures, with the most common being tinea corporis and tinea cruris in the Eastern Province of Saudi Arabia.[45] However, the central region has tinea capitis and tinea pedis, possibly due to different environmental conditions.[46] Microsporum species are mostly found in the younger age group.[47]

The study found that Microsporum species, primarily zoophilic, were the most common dermatophytes in the region, consistent with previous Saudi Arabian research.[48,49] However, additional Middle Eastern research revealed tinea as the most prevalent species, with M. canis, T. mentagrophytes, and T. capitis being the most prevalent.[50,51]

Conclusion:- many antifungal agents are too expensive for the average person to afford, so they turn to more conventional forms of treatment. Therefore, siddha system of medicine practitioners must persuade themselves that their medications are safe and effective. It is hoped that this literature review will make clear that numerous herbs still need to have their anti-dermatophyte properties thoroughly investigated. The siddha system of medicine will be much better supported by research in this area.

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