

A Review on Ethnobotanical, Pharmacological Activity of Medicinal Plants Used Against Fungal Infection

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ABSTRACT

This study investigates the antifungal properties and health benefits of five significant plant extracts: *Tabernaemontana alternifolia*, *Melaleuca alternifolia* (tea tree), *Cymbopogon citratus* (lemongrass), *Azadirachta indica* (neem), and *Curcuma longa* (turmeric), alongside *Ocimum sanctum* (Tulsi). Tea tree oil shows broad activity against numerous dermatophyte and yeast strains, while lemongrass oil significantly inhibits various *Candida* species. Neem oil demonstrates strong antifungal effects on *Aspergillus*, and turmeric's curcumin provides enhanced resistance against *C. albicans*. Tulsi extracts also show promise in conjunction with azole medications against resistant *Candida* species. This evaluation underscores the therapeutic potential of these botanicals in addressing a spectrum of health issues, advocating for the incorporation of traditional plant knowledge into modern health practices. Collectively, these findings highlight the resurgence of interest in natural remedies and their role in holistic health strategies.

KEYWORDS: Medicinal plants, Anti-fungal activity, Ethnobotanical use.

I. INTRODUCTION

Medicinal plants have been extensively exploited for varied pharmacological activities since prehistoric times and are gaining prominence in the current scenario. Many of the presently available drugs have been obtained from some or other natural resources^[1].

The name *Tabernaemontana* was given by Muller. There are currently about 100 species of this genus in tropical and subtropical regions of the world, including Africa, Asia, Oceania, and the Americas. *Tabernaemontana* species are typically found in the understory of woodlands, rocky outcrops, and savannahs. They are small to

medium-sized trees and flowering shrubs. The genus is distinguished by tubular white flowers, follicular fruit with seeds covered in a yellow to reddish aril, and a watery or milky latex discharge that is frequently present in injured species.^[2] Tea tree oil is an essential oil which is extracted from the leaves of *Melaleuca alternifolia*. It has a camphoraceous odor and a color that ranges from pale yellow to nearly colorless.^[3] Lemongrass essential oil comes from the lemongrass plant (*cymbopogon citratus*). Lemongrass plant is mostly found in tropical and subtropical regions of the world. The prefix "lemon" indicates its distinctive lemon-like odour, which is primarily caused by the presence of citral. Citral is derived by combining two stereoisomeric monoterpene aldehydes. Lemongrass oil used in traditional medicine to improve circulation, promote digestion, strengthen immunity, or stabilize menstrual cycles. It is also used to make fragrances, detergents, pharmaceuticals, and aromas.^[4] *Azadirachta indica*, also known as Neem, Nimtree and Indian Lilac is a tree in the mahogany family-Meliaceae. It is one of two species of the genus *Azadirachta*, and is native to India, Pakistan and Bangladesh, growing in tropical and semitropical regions. The Seed of the neem is used to treat intestinal worms and leprosy. The Gum is used to treat skin diseases, wounds and scabies.^[5] Turmeric (*Curcuma longa*), a perennial herb widely cultivated for its medicinal properties, has long been recognized for its potent antifungal activity. The bioactive compounds in turmeric, particularly curcuminoids, have been shown to inhibit a range of fungal pathogens. These compounds are believed to exert their antifungal effects through various mechanisms, such as disrupting cell membrane integrity, inducing oxidative stress, and interfering with fungal metabolic processes.^[6] Sacred basil (*Ocimum sanctum*) Syn. *Ocimum tenuiflorum* known as

“Tulsi” is a well known sacred plant of the Hindus. The active compounds in tulsi such as eugenol, in particular, disrupts fungal cell membranes and inhibits fungal growth by interfering with essential cellular processes.^[7]

ANTIFUNGAL ACTIVITY

TABERNAEMONTANA ALTERNIFOLIA:

The leaf extract of *Tabernaemontana alternifolia* L shows antifungal activity against a variety of fungal strains including *Rhizopus mucor*, *Candida albicans*, *Aspergillus niger*, *Gibberella fujikori*, *Penicillium chrysogenum*, and *Aspergillus terreus*. Gel diffusion method was used to test the in vitro antifungal property *Rhizopus mucor* and *Trichoderma viridins* both showed maximum and minimum antifungal effects. Of the seven fungi examined, it was discovered that *A. terreus* and *C. albicans* had significantly impeded development, while *R. mucor*, *P. chrysogenum*, and *A. niger* had significantly repressed growth. Ethanol was far more successful than other solvents at extracting antimicrobial compounds, as shown by the inhibitory zone values.^[8]

TEA TREE(CAMELLIA SINENSIS):

The in vitro antifungal activity of tea oil, the essential oil of *Melaleuca alternifolia*, has been tested on 26 strains of various dermatophyte species, 54 yeasts, including 32 strains of *Candida albicans* and other *Candida* sp., and 22 different strains of *Malassezia furfur*. Tea tree oil was found to be able to inhibit the growth of all clinical fungus isolates.^[9]

LEMON GRASS(CYMBOPOGON CITRATUS):

The antifungal activity of lemongrass oil has been tested against some species that induced human infections, including dermatophyte species and *C. albicans*. The antifungal activity of the lemongrass oil and citral against yeasts was studied. Eight strains of *Candida* species were used: *Candida albicans* ATCC 10231, *Candida albicans* ATCC 18804, *Candida albicans* CI-I (clinical isolate), *Candida albicans* CI-II, *Candida krusei* ATCC 6258, *Candida glabrata* ATCC 2001, *Candida tropicalis* ATCC750 and *Candida parapsilosis* ATCC 22019. The cultures of *Candida* spp. were cultivated on Sabouraud dextrose 4% agar (SDA) at 25°C for 48 hours.^[10]

NEEM (AZADIRACHTA INDICA):

Neem's constituents, such as azadirachtin, nimbin, and nimbidin, have been shown to inhibit the growth of fungi, including those that cause nail infections like onychomycosis. Neem showed antifungal activity. The method that is used in extracting oil are Agar well Diffusion method. This study determines the antifungal activity of neem oil against various species of fungi such as *Aspergillus niger*, *Aspergillus flavus*, *Trichoderma viride*. The essential oil caused a significant decrease in the activity of the above mentioned fungi and it causes suppression in their growth at concentrations 20µL, 40µL, and 60µL. Ketoconazole was taken as a positive control in well diffusion method.^[11]

TURMERIC (CURCUMA LONGA):

The results obtained in the study indicates that *Curcuma longa* is rich in different phytochemicals. *Curcuma longa* shows the antifungal activity against *Aspergillus* sp. And *Fusarium* sp. *Curcuma longa* having more antifungal potential as compare to other plants. The antifungal activity with methanol, chloroform, n-hexane and water at room temperature and 121°C extracted turmeric against *Candida albicans*.^[12]

TULSI (OCIMUM SANCTUM):

The anti-fungal nature of Tulsi was tested, by testing its synergistic action with azoles as well as the anti-fungal nature of two of the main components of Tulsi extract- methyl chavicol and linalool. In both the experiments, fungal strains, both fluconazole resistant and non-resistant, were taken and exposed to *Ocimum sanctum* L. Extract, methyl chavicol and linalool. The experiment shows that Tulsi extract to be synergistic with fluconazole and to be effective against strains of *C. albicans*, *C. tropicalis*, *C. glabrata*, *C. parapsilosis* and *C. krusei*.^[13]

ETHNOBOTANICAL USE

Tabernaemontana alternifolia is used to treat skin conditions like onychomycosis. *F. benghalensis* and *M. longifolia* stem and leaf bark powder is heated with coconut oil and applied topically. Scabies is treated with leaf powder that has been fried after being sun-dried. The roots are effective for treating biliousness, blood disorders, and intestinal worms.^[14]

Tea tree (*Camellia sinensis*) is used to treat acne, vaginal infection, athlete's foot. Stings burns

wounds and skin infections of all kinds. Dandruff and to promote hair growth.^[15]

Lemon grass(*Cymbopogon citratus*): In this lemon grass oil help to reduce dandruff.used as skin care and other cosmetic uses and also used to treat bacterial and fungal infections.^[16]

Neem (*Azadirachta indica*)leaves are used to treat, skin diseases.The Seed of the neem is used to treat intestinal worms, leprosy. The Gum is used to treat skin diseases, wounds and scabies.^[17]

Turmeric (*Curcuma longa*)has antifungal, antimicrobial, activity.^[18]

Tulsi (*Ocimum sanctum*)is recommended as a treatment for ringworm . The active compounds in tulsi such as eugenol, in particular, disrupts fungal cell membranes and inhibits fungal growth by interfering with essential cellular processes.^[19]

II. CONCLUSION

In conclusion, the analysis of several plant extracts reveals significant antifungal properties alongside diverse ethnomedicinal applications. *Tabernaemontana alternifolia* leaf extract exhibits broad-spectrum antifungal activity, with ethanol proving the most effective solvent, and its various parts are traditionally used for skin issues, pain relief, and digestive ailments. Tea Tree oil (*Melaleuca alternifolia*) effectively inhibits a wide range of dermatophytes, yeasts, and *Candida* species, mirroring its traditional use for skin infections, inflammation, and oral health. Lemongrass (*Cymbopogon citratus*) oil shows antifungal activity against human pathogens like *C. albicans* and is traditionally employed for colds, pain, and digestive problems. Neem (*Azadirachta indica*) constituents suppress fungal growth, including species causing onychomycosis, aligning with its use for skin conditions, fevers, and digestive health. Turmeric (*Curcuma longa*) demonstrates strong antifungal potential, particularly against *Aspergillus* and *Fusarium* species, and is widely utilized in managing inflammation, diabetes, and ulcers. Finally, Tulsi (*Ocimum sanctum*) extract displays synergistic antifungal action with azoles against various *Candida* strains and is traditionally recommended for respiratory issues, fever, arthritis, and various pains. Collectively, these plants represent valuable natural sources for developing antifungal agents, consistent with their established roles in traditional medicine.

CONFLICT OF INTEREST

No conflict of interest is disclosed by the author.

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