WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 7, 1755-1761. Review Article ISSN 2277–7105

PLANTS-DERIVED ANTIFUNGALS: A REVIEW

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Article Received on
15 February 2025,

Revised on 07 March 2025,
Accepted on 27 March 2025

DOI: 10.20959/wjpr20257-36181

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ABSTRACT

The growing prevalence of fungal infections and the increasing resistance of fungi to conventional antifungal drugs have intensified the search for novel and effective antifungal agents. Plants have long been recognized as a rich source of bioactive compounds, many of which exhibit potent antifungal activity. Various plant extracts and their bioactive compounds such as alkaloids, flavonoids, terpenoids and phenolic compounds are discussed for their efficacy against fungal pathogens. This review focuses on the identification of plants with Antifungal activity along with future prospects for utilizing plant-derived antifungal agents in pharmaceutical development. This comprehensive overview underscores the potential of plants as a sustainable and valuable resource for antifungal drug discovery.

KEYWORDS: Fungal infection, types, Medicinal Plants, Mechanism of Natural Antifungal agents.

INTRODUCTION

The estimated total number of fungal species worldwide has grown rapidly over time. According on morphological, physiological, and genetic traits, this estimate rose to 100,000 fungal species in 2015.[1] Over a billion individuals are afflicted by fungal infections, which claim the lives of over 1.5 million people. Even though the majority of fatalities from fungal illnesses are preventable, public health officials continue to ignore them. Asthma, AIDS, cancer, organ transplantation, and corticosteroid treatments are among the numerous medical conditions that might result in serious fungal infections.[2] Every year, the number of opportunistic fungi that can cause dangerous, life-threatening infections rises. The opportunistic fungus comprises yeasts other than Candida species in addition to Aspergillus,

Cryptococcus, and Candida species.[3] There has been a considerable increase in the occurrence of chronic, relapsing, recurrent instances of superficial dermatophytosis in India that are also often refractory to standard drugs and doses of recommended antifungal treatment. Chronic dermatophytosis accounts for around 15–20% of cases in the outpatient department.[4]

Fungal infection

A major public health risk is fungal infections. Fungal infections are linked to mortality and potentially fatal mycoses in patients with various illnesses, particularly COVID-19. Depending on their severity, fungal infections can be superficial, cutaneous, subcutaneous, mucosal, or systemic. Human microbiota includes organisms like Candida spp. that can cause invasive candidiasis, a potentially fatal infection in immunocompromised patients like those with HIV, cancer patients undergoing chemotherapy, and patients taking immunosuppressive medications, as well as opportunistic infections in healthy people. Types of Fungal infection:[5]

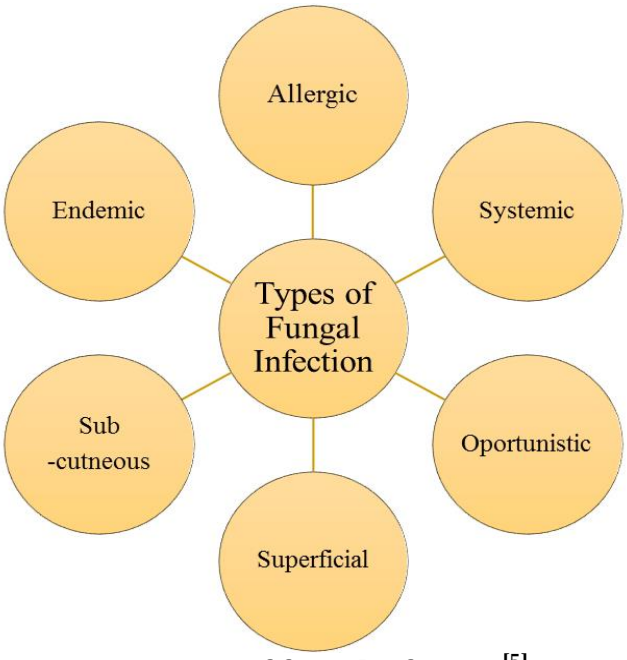

Fig. Types of fungal infection.[5]

There are four primary categories of fungal infections of the upper extremities: systemic, deep, subcutaneous, and cutaneous.[6] Organisms that can use keratin are responsible for cutaneous infections.21 Fungal infections, or mycoses, are categorized medically as cutaneous (Affecting the skin, hair, and nails), subcutaneous, and deep.[7]

MATERIALS AND METHODS

Plants are used in antifungal action

1) Triterpenoid

Scientific name: *Azadirachta indica*

Family: Meliaceae

Vernicular names: Neeb, Margosa Tree, Neem, Nimba, Arishta, Azadarachte

Extract: Methanol & Ethanol extract is effective against *Candida albicans*.[8]

Triterpenoid: Azadirachtin, Nimbidin, Nimbin

Chemical Constituents: Azadirachtin, Nimbidin, Nimbin, Alkaloids, Phenolic compounds, Triterpenoids, Lavonoids, carotenoids, etc.[9]

Pharmacological action: Antibacterial, anti-inflammatory, Anti-malarial, Antidiabetic, Antifungal.[10]

Fig. Neem.[11]

2) Phenolic compound

Scientific name: *Lawsonia inermis linn*

Family: Lythraceae

Vernicular names: Henna

Chemical constituents: 2-Hydroxy-1,4-naphthoquinone, Lecocyandin, Epicatechin, Cathechin, Quercetin

Phenolic compound: Lawsone (2-hydroxy-1,4-naphthoquinone)

Extract: Ehtyl acetate extract

Species: *Candida albicans*.

Pharmacological Properties: antimicrobial, Anti-oxidant, Anti-inflammatory, Wound healing, Antifungal.[12]

Fig. Henna.[13]

3) Essential Oil

Scientific name: *Lavandula angustifolia / Lavandula officinalis*

Family: Lameaceae[14]

Vernicular names: Therapeutic lavender, true lavender, Common lavender[15]

Essential Oil: linalool, linalyl acetate

Species: *Candida albicans*[16]

Chemical constituents: Linalool, camphor, eucalyptol, linalyl acetate

Pharmacological properties: Sedative, Antibacterial, Antifungal, Antidepressant, Antioxidnt, Anti- inflammatory[17]

Fig. Lavender Plant.[18]

Mechanism of action of natural plant

1) **Membrane and Cell wall disruption:** Numerous substances generated from plants weaken the membranes and cell walls of fungi. For example, by preventing the synthesis of ergosterol, carvacrol, which is present in plants in the Lamiaceae family, damages the integrity of fungal cell membranes, resulting in cell lysis and death.[19]

2) **Interference with Metabolism:** Antifungals derived from plants can potentially interfere with the metabolism of fungi. Certain natural compounds harm the cell wall and membrane, preventing ATP generation and ion movement, which eventually results in fungal cell death.[20]

3) **Induction of oxidative stress:** Fungal cells experience oxidative stress due to specific plant chemicals. For instance, the generation of reactive oxygen species in Candida albicans results in cell death as part of the antifungal activity of RsAFP2, a plant defensin derived from Raphanus sativus.[21]

CONCLUSION

A promising substitute for synthetic antifungal medications is provided by plant-derived antifungals. They are generally harmless, natural, and frequently broad-spectrum. But it's crucial to understand the drawbacks of antifungals derived from plants, namely their inconsistent effectiveness and interaction potential. To completely comprehend the effectiveness and safety of antifungals produced from plants, more research is required.

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