



INDO AMERICAN JOURNAL OF PHARMACEUTICAL RESEARCH



RECENT HERBAL ANTIFUNGAL AGENTS.

Dhokade Kartik Dnyaneshwar, Dhupe Amol Vitthal*, Pagar Swati Appasaheb, Musmade Deepak Sitaram

SDSPM's Nandkumar Shinde College of Pharmacy, Vaijapur, Tal- Vaijapur, Dist-Aurangabad, MS, India-423701.

ARTICLE INFO

Article history

Received 20/09/2020
Available online
13/10/2020

Keywords

Fungal Infection,
Antifungal Activity,
Novel Herbs.

ABSTRACT

Fungal infections of skin are most common dermatological problems in this world. It has been investigated that worldwide 40 million people suffer from various kinds of fungal infections. During the past several years, there has been an increasing incidence of fungal infections due to a growth in immunocompromised population such as organ transplant recipients, cancer and HIV/AIDS patients. There are numerous antifungal agents used clinically to treat fungal infections, i.e., echinocandins, griseofulvin, azoles, allylamines, and flucytosine. The treatment with modern drugs has not been without its complications, particularly the drug resistances. Since ancient times, plants have been an exemplary source of medicine. Phytochemistry of different plant species has shown that the phytochemicals could be a superior wellspring of medication when contrasted with artificially created drugs. Regular drugs from a plant source are as yet utilized as remedial specialists, particularly for treating bacterial, contagious, viral, protozoal, helminthic diseases. This review focuses on the use of phytoconstituents to treat fungal infections caused by various pathogens. Hence, it will be beneficial for the drug industries and for research activities. Review also focuses on work done with some herbal antifungals and novel approaches which will be future prospective for new drug discoveries in providing better antifungal therapy.

Corresponding author

Dhupe Amol Vitthal

SDSPM's Nandkumar Shinde College of pharmacy,
Vaijapur, Tal- Vaijapur,
Dist-Aurangabad, MS, India-423701
amoldhupe143@gmail.com

Please cite this article in press as **Dhupe Amol Vitthal et al. Recent Herbal Antifungal Agents. Indo American Journal of Pharmaceutical Research.2020;10(09).**

Copy right © 2020 This is an Open Access article distributed under the terms of the Indo American journal of Pharmaceutical Research, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Fungal infections disease caused by the fungus. Fungus invalid the skin & skin tissue to cause Fungal infection a disease that's a skin, spreads into tissue, bones and organs or affects the whole body The rise patients number of fungal infections has dramatically increased in both developed and developing countries. In the develop countries micro-organisms are a infection by reason prevailing diseases a serious public health issue significant population uncovered by & health care systems^[1]

Fungi are ubiquitous within the environment only a few species are routinely found associated with humans who are capable of causing disease. A handful of fungi that is responsible for causing disease in healthy individuals are considered to stop fungal infections is against used to antifungal drugs.^{[1][2]}

Different Types of Fungal Infections:

- Athlete's foot.
- Ring worm.
- Nail fungus.
- Oral thrush.
- Diaper rash.

Drugs are usually by a doctor's prescription or purchased drug on the medical. But use of this type of drugs used in large way makes the unusable due to resistance to antibiotics and with the toxic drug during prolonged treatment. Drawback in synthetic drugs so people move towards herbal drugs this is the safer herbal drug. The use of broad-spectrum antibiotics, immunosuppressive drugs, and radiotherapy has led to an increased incidence of candidiasis. Other risk factors are increasing age, diabetes, salivation disorders, denture use, smoking, Jorgen's syndrome, cancers, and immunodeficiency syndromes, including AIDS.^[3]Herbal drug and their compound are generally recognized as safe either because of their traditional use without any documented detrimental impact or of is dedicated toxicological studies.^[4] Plant or plant parts that have been converted into phytopharmaceuticals by means of simpler process involving harvesting drying and storage it also include other crude products derived from plant which no longer show any organic structure shush as essential oil, fatty oil, resin & gums.

The majority of current antifungal treatments are having various drawbacks like, efficacy problem, resistance and toxicity, cost etc. hence there is great need and also demand for safer, more potent and efficacious antifungal drugs. Natural products either as pure phytoconstituents or in as standardized dosage form offer limitless opportunities to treat fungal infections because of their matchless chemical diversity.

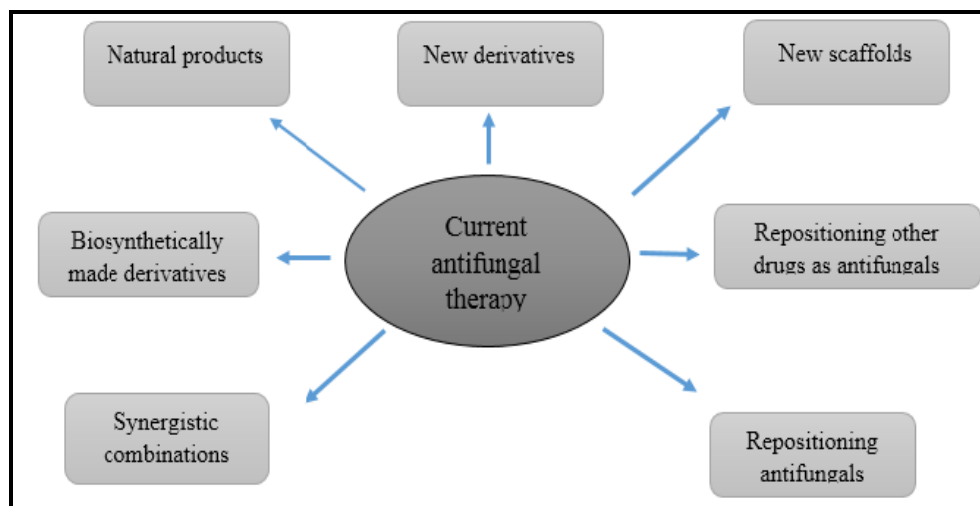


Fig-1: Different antifungal agents.

Herbal Antifungal Agents

Medicinal plants are of great importance to the health of individuals and communities, and their importance lies in the chemical substances that produce a definite physiological action on the human body. Many of the pharmaceuticals currently available have a long history of use as herbal remedies including opium, aspirin, digitalis, and quinine while their purification and quantification makes them more predictable and chemical processing can sometimes modify their effects in desirable ways. Herbal remedies tend to have a more complex and subtle mix of chemicals and can sometimes offer access to drugs or combinations of drugs that the pharmaceutical industry has not yet exploited. These natural compounds formed the basis of discovering modern drugs^[5, 6]. Some of the plants having wide fungal activity are listed in. Which will be proved beneficial for the pharmaceutical industry when formulated. Herbal formulations always have attracted considerable attention due to their good activity and comparatively lesser side effects when compared to synthetic drugs.^[7] Therefore, there is a need to develop new antifungal agents providing new mechanisms of action, with a broad spectrum of antifungal activity, fewer dose-limiting side effects, and economic^[8,9] Some of the antifungal drugs most recently introduced in clinical practice are ethanolamine's derived from natural products Some^[10,11]

Azadirachta Indica :

Evaluation of the activity of the cold expeller neem oil (*Azadirachta indica* A. Juss.) and the fractions derived through solvent partitioning, against *Drechsleraoryzae*, *Fusariumoxysporum* and *Alternaria tenuis* showed that the active antifungal fraction is a mixture of tetra nor tritrapezoids. Further, testing the triterpenoidal mixture derived from the 90% methanol (MeOH) extract of neem oil against 13 phytopathogenic fungi revealed that various species were inhibited to different degrees. Pure azadiradione, nimbin, salannin and epoxy-azadiradione did not have appreciable activity. However, when these terpenoids were mixed and bioassayed, they showed antifungal activity, indicating possible additive/synergistic effects.^[12, 13]

Zingiber Officinalis:

Ginger contains the compound caprylic acid, which has potent antifungal properties. Simmer about an ounce of ginger root in a cup of boiling water and then apply it directly to the affected area of the foot at least twice a day.^[14, 15]

Piper Betel:

P. betel exhibited more than 50% inhibition against all the test pathogens except *M. phaseolina* the ethanolic extract of several higher plants could be used as alternative source of antifungal agents for protection of plants or crops against fungal infection.^[16]

Allium Sativum:

The antifungal activity of six fractions derived from garlic was investigated in an in vitro system. Ajoene had the strongest activity in these fractions. The growth of both *Aspergillus niger* and *Candida albicans* was inhibited by a gene at less than 20 micrograms/ml. Scientific studies have shown garlic to be a very effective treatment for athlete's foot and other fungal infections. Soaking the infected foot in a tub of warm water containing several cloves of garlic generally relieves itching and burning. Garlic can also be steeped in olive oil and applied directly to the area of infection once or twice daily.^[17, 18]

Acorus Calamus:

The rhizome extract of *A. calamus* exhibited highest antifungal activity inhibiting the mycelial growth completely (100%) against all the 6 test pathogens.^[19]

SEARCH FOR NEW ANTIFUNGALS:

There is a clear need to search for new antifungal agents providing new mechanisms of action, with a broad spectrum of antifungal activity, fewer dose-limiting side effects, and economic^[20,21] Nature offers a wide chemical diversity and natural products are an important source for the development of new therapeutic agents, in particular anti-infective agents. Some of the antifungal drugs most recently introduced in clinical practice (echinocandines and sordarines) are derived from natural products^[20]

Eysenhardtia texana

E. texana is sprawling shrub which contain novel antifungal agents from flavonoids category viz 4',5,7-trihydroxy-8-methyl-6-(3-methyl-[2-butenyl])-(2S)-avanone, 4',5,7-trihydroxy-6-methyl-8-(3-methyl-[2-butenyl])-(2S)-avanone and 4',5-dihydroxy-7-methoxy-6-(3-methyl-[2-butenyl])-(2S)-avanone^[20]

Xanthium strumarium

Decoction of leaves of *xanthium strumarium* is widely used in treating ski pruritis and infected wound healing. Oil from plant contains different chemical components like β -caryophyllene (17.53%), α -cadinol (6.66%), spathulenol (6.09%), limonene (5.66%) and 1,3,5-trimethyl-2[2-nitroallyl]benzene (3.29%). Phytol (2.42%), α -muurolene (2.08%), copaene (1.47%) were present in appreciable amounts. E, E,Z-1,3,12-nonadecatriene-5,14-diol (0.27%)^[21]

Polygonum ferrugineum

Polygonum ferrugineum Wedd. (Polygonaceae) is used to heal infected wounds and as antiseptic, antibiotic or antifungal in the traditional Argentinean medicine. Two active constituents viz cardamonin 2 showed a selective inhibition of *Epidermophyton floccosum* and pashanone 1 possessed moderate antifungal activity^[22]

Lawsonia Inermis

In the aqueous and methanolic extracts of the leaves anthraquinones were found to be a major antifungal agents which are active against *candida albicans*, *trichophyton rubrum* etc.

Phytolacca tetramera

Phytolaccoside B an antifungal monodesmoside triterpenoid glycoside isolated from berries of *Phytolacca tetramera* Hauman (Phytolaccaceae), alters the morphology of yeasts and molds.^[24]

HERBAL ANTIFUNGAL MARKETED PRODUCTS:**Fig-3: Herbal antifungal Market Products.****Purifica 1% Vaginal Gel:**

Purifica gel contains Pueraria mirifica root extract.

Himalaya Wellness Acne-n-Pimple Cream:

Himalaya acne-n-pimple cream works wonders with the help of natural ingredients such as Lentil, Silk Cotton Tree, Five-leaved Chaste Tree, Barbados Aloe, and Alum. Lentil's astringent and anti-inflammatory properties help in reducing inflammation associated with acne.

Himalaya V-gel:

Himalaya V-gel consists of persian rose, triphala, and cardamom. Himalaya V-gel is indicated for vaginal candidiasis (fungal yeast infection), vaginal trichomoniasis (parasitic vaginal infection), and nonspecific bacterial vaginitis:^[1]

CONCLUSION

Although wide progress has been made in recent decades in medicine, fungal infections are still an unsolved health problem. It is mainly due to the fact that some of the available antifungal drugs cause resistance. The plant kingdom is a rich source of medicinal preparations that offer a wide chemical diversity, making it of huge potential for new drug development. Phytochemistry of various plant species has indicated that the phytochemicals could be a better source of medicine as compared to synthetically produced drugs. Researchers over the last years have developed a variety of chemical structures with antifungal activity based on natural compounds which are in the process of design and development but for most of these compounds, however, factors such as a susceptibility to efflux pumps, narrow spectrum of activity, serum inactivation and poor pharmaceutical properties, protein binding, prevent their use in the clinic. Even so, these compounds are novel substrates for synthetic modifications that could lead to the discovery of future antifungal drugs. Hence elaborate study regarding safe and systemic investigation in herbal antifungals can improve the profit of global pharma market. This review focuses on the use of phytoconstituents to treat fungal infections caused by various pathogens. Hence, it will be beneficial for the drug industries and for research activities. Review also focuses on work done with some herbal antifungals and novel approaches which will be future prospective for new drug discoveries in providing better antifungal therapy.

Authors wish to express their sincere thanks to Hon. Smt. Padmatai Shinde mam, President, Shriram Dnyan Shikshan Prasarak Mandal, Vaijapur, Dist-Aurangabad, MS, India-423701 and Hon. Shri. Rajesh Shinde sir, President, Shriram Dnyan Shikshan Prasarak Mandal, Vaijapur, Dist-Aurangabad, MS, India-423701 for their constant encouragement and support.

Conflicts of interests:

Nil

List of abbreviations:

HIV - human immunodeficiency virus.
AIDS - acquired immunodeficiency syndrome.

REFERENCES

1. Kaushik K, Agarwal S. The role of herbal antifungal agents for the management of fungal diseases: a systematic review. *Asian journal of pharmaceutical and clinical research.* 2009; 12(7) :34-40,
2. Meena AK, Sachan A , Singh B, Kaur R, Pal B, Yadav AK, Kiran, M. et al. A Review on Herbal Plants used in Skin and Hair Treatment. *Res. J. Topical and Cosmetic Sci.*2010; 1(1): 13-17.
3. Khorram Z, Hakimaneh SM, Naeni A, Rafieinezhad R, Salari AM, Shayegh SS. The Antifungal Effects of Two Herbal Essences in Comparison with Nystatin on the Candida Strains Isolated from the Edentulous Patients. *J Contemp Dent Pract.* 2019; 20(6):716-719.
4. Chattopadhyay R.R Bhattacharyya. S.K. Agricultural and Ecological Research Unit Indian Statistical Institute 203, Barrackpore Trunk Road Kolkata – 700 108,
5. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. *Afr J Biotech* 2005;4:685-8.
6. Rout SP, Choudhary KA, Kar DM, Das L, and Jain A. Plants in traditional medicinal system-future source of new drugs. *Int J Pharm PharmSci* 2009; 1:1-23.
7. Taha KF, EL-Hawary SS, EL-Hefnawy HM, Mabrouk MI, Sanad RA, Harriry MY. Formulation and assessment of an herbal hair cream against certain dermatophytes. *Int J Pharm PharmSci* 2016; 8:167-73.
8. Tomishima M, Ohki H, Yamada A, Maki K, Ikeda F. Novel echinocandin antifungals. *Bioorg Med Chem Lett* 2008; 18:1474-7.79.
9. Barrett D. From natural products to clinically useful antifungals. *BiochimBiophysActa* 2002; 1587:224-33.10
10. Tomishima M, Ohki H, Yamada A, Maki K, Ikeda F. Novel echinocandin antifungals. *Bioorg Med Chem Lett* 2008;18:1474-7.
11. Farshba F Moghadam M.,Omid Beygi R.,Pourbaig M.V.M.,Ghaemi A.composition and antifungal activity of peppermint (menthapiperita)essential oil, iranian journal of pharmaceutical research (ijpr) october2004; 3(2):68-69.
12. Masilamani S. et al, Identification of antifungal compounds from theseed oil of Azadirachta Indica, *Phytoparasitica Publisher SpringerNetherlands*, 1998; 26(2):109-116.
13. Pai ST, Platt MW, Antifungal effects of Allium sativum (garlic) ex-tract against the Aspergillus species involved in otomycosis, *Journal compilation The Society for Applied Microbiology*,2010;20(1):14-18
14. Ficker C, et al; Bioassay-guided isolation and identification of antifungal compounds from ginger, *Phytotherapy Research*, 2003; 17 (8), 897 – 902.
15. D. Jasso de Rodríguez et al, Antifungal activity in vitro of Aloe Vera pulp and liquid fraction against plant pathogenic fungi.2005; 21 (1) :81-87
16. Anwar MN, Singa P, Begum J &Chowdhury JU. Antifungal activity of some selected plant extracts on phytopathonic fungi. *Bangladesh J Life Sci.*1995; 6(2): 23-26.
17. Esquenazi D, Alviano CS, DeSouza W, Rozental S, The influence of surface carbohydrates during in vitro infection of mammalian cells bythe dermatophyte Trichophytonrubrum. *Research in Microbiology.* 2004, 155; 144–153.
18. S Yoshida, S Kasuga, N Hayashi, T Ushiroguchi, H Matsuura and SNakagawa, Antifungal activity of ajoene derived from garlic. *Appl Environ Microbiol.* 1987 ;53(3): 615-617

19. Jaripa Begum, Mohammad Yusuf, Jashim Uddin Chowdhury, SaifullaKhan and M Nural Anwar, Antifungal Activity of Forty Higher Plants against Phytopathogenic Fungi, Bangladesh J Microbiol. .2007. 24(1): 76-78.
20. Wachter GA, Hoffmann JJ, Furbacher T, Blake ME, Timmermann BN. Antibacterial and antifungal flavanones from *Eysenhardtia texana*. *Phytochemistry*. 1999; 52(8):1469-1471.
21. Sharifi-Rad J, Hoseini-Alfatemi SM, Sharifi-Rad M, Sharifi-Rad M, Marcello I, Sharifi-Rad M, etal. Phytochemical compositions and biological activities of essential oil from *Xanthium strumarium*L. *Molecules*2015; 20:7034-47.
22. Escalante A, Gattuso M, Pérez P, Zacchino S. Evidence for the mechanism of action of the antifungal phytolaccoside B isolated from *Phytolacca tetramera* Hauman. *J Nat Prod*. 2008; 71(10):1720-1725.
23. Gupta S, Ali M, Alam MS. A naphthoquinone from *Lawsonia inermis* stem bark. *Phytochemistry*. 1993; 33:723-724.
24. Lopez, Silvia & Furlan, Ricardo & Zacchino, Susana. Detection of antifungal compounds in *Polygonum ferrugineum* Wedd. Extracts by bioassay-guided fractionation. Some evidences of their mode of action *Journal of ethnopharmacology*. 2011; 138(2):633-6.



54878478451200908



Submit your next manuscript to **IAJPR** and take advantage of:

Convenient online manuscript submission

Access Online first

Double blind peer review policy

International recognition

No space constraints or color figure charges

Immediate publication on acceptance

Inclusion in **ScopeMed** and other full-text repositories

Redistributing your research freely

Submit your manuscript at: editorinchief@iajpr.com

