e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:10/October-2023 Impact Factor- 7.868 www.irjmets.com

REVIEW ON ANTIFUNGAL ACTIVITY OF HERBAL MEDICINAL PLANT

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ABSTRACT

Fungal infections are becoming more common at an alarming rate, which has increased the demand for novel antifungal drug that are highly effective and have better safety and toxicity profiles than the ones now available arise in some pathogenic fungi's clinically significant resistance to the lack of available antifungal medications is quickly becoming a global health issue, especially among people HIV-infected individuals who develop drug-resistant illnesses like oropharyngeal candidiasis. Taxonomical classification of antifungal drugs have been discussed in this review. Medicinal plants have significant pharmacological significance due to their active phyto constituents. The Ferula asafetida plant's primary active ingredients include resins, gums and essential oils Asafoetida plant possesses various pharmacological properties like antioxidant, antifungal, antiviral, antidiabetic, antispasmodic, and antiviral properties. Glycyrrhiza glabra plant contain phyto constituents such as Liquoritin, Glycyrrhizin, Iso-liquiritin, Glucose, Glycryerrhizic acid, starch. From the reported studies it was found that the plant glycyrrhiza glabra possesses various therapeutic and pharmacological properties like hypoglycemic, antiviral, antimicrobial, anti-ulcer a free radical scavenger cytotoxic and antitumor, antiallergic, hypoglycemic and, anti-inflammatory, and antioxidant,eczema, dermatitis, and skin eruptions. Karanji oil, derived from the plant P. Pinnata, contains flavonoids, steroids, triterpenes, diterpenes, fatty acids, ester compounds, disaccharides, and amino acids.

Keywords: Fungal Infection, Antifungal, Herbal Plants.

I. INTRODUCTION

1.1 Introduction of antifungal medicinal plant :-

The use of medicinal plants in treatment is an ancient practice. Infectious and non-infectious skin conditions have all been treated using medicinal herbs over the years. [1] Microscopically small filamentous fungi known as dermatophytes are drawn to keratin. They induce superficial lesions in humans known as dermatophytosis that affect the skin, nail or hair. Among the most prevalent types of superficial mycosis worldwide are affliction. Despite the immense potential for depending on the species responsible.[2] Natural antifungal agents might come from fungi, animals, or plants. Plant-based sources of antifungal are of significant therapeutic value. Those are is used to treat infectious illnesses.[3]

The use of medicinal plants in the form of powder, paste, etc. In traditional medicine practice of order to provide the basic health requirements of emergency nation, medicinal plants are crucial.[4]

According to the region or location of the disease, dermatophytosis-also known as tinea- is the most prevalent type of fungal infection.

The three different fungul genera Trichophyton, Microsporum, &Epidermophytosis are the most common cause of dermatophytosis. The alternations in the lesions include one or more circular patches that are frequently hypopigmented, sharply defined, dry, scaly, and slightly erythematous.[5]

Dermatophytosis, one of the most several fungul infections that can swiftly harm tissue, organs, and nerves affects roughly 20-25% of the world's population.

Approximately 30-50% of the world's population now dies from fungal infections, especially in tropical region, which has made the incidence of fungal diseases a serious health problems in recent years.[6]

Fungal infections are becoming more common at an alarming rate, which has increased the demand for novel antifungal drug that are highly effective and have better safety and toxicity profiles than the ones now available arise in some pathogenic fungi's clinically significant resistance to the lack of available antifungal medications is quickly becoming a global health issue, especially among people HIV-infected individuals who develop drug-resistant illnesses like oropharyngeal candidiasis.[7]

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The prevalence of herbal medications is mostly due to three factors-

1] The use and safety of medications and surgery are topics of considerable attention.

2] Many of the most prevalent illnesses cannot be properly treated by modern medicine.

3] It has been proved that many natural remedies have a greater impact that drugs or surgery without the negative side effect.

The characteristics that are typical of the rainfall, promote the spread of fungi diseases. Low economic status, such as crowding in institutions and household that are often large, low personal and public hygiene, the development is facilitated by a lack of education, unclean water sources and inadequate nourishment among young people Infected with fungus in our environment.[8] The current situation has led to research aimed at the identification of novel antifungal drugs from alternative sources, such as medicinal plants, as a result of the evaluation of multiple drug resistance in human pathogenic fungi and the absence of antifungal classes. The knowledge of medicinal plants functions is extremely limited.[9]

1.2 Advantages of herbal system of medicines :-

1] Less chance of adverse effect.

2] Extensive accessibility.

3] Combines well with chronic medication.

4] Low cost effectiveness increases their allure.

1.3 Fungi:-

"Fungi are a kingdom of heterotropic, primarily multicellular eukaryotic creatures that play an important role in nutrient cycling in environments.

1.3.1 Type of fungi :-

1) chytridomycota
2) Zygomycota
3) Glomeromycota
4) Ascomycota

1.3.2 Fungal infection types:-

1) Superficial- Affected the skin

2) Deep infections – Affect the internal organs[10]

1.4 Medicinal values of plants:-

- Due to the existence of active Phytoconstituents, recent research on medicinal plants has revealed their significant pharmacological significance.
- Metabolic pathway produce medicinal compounds about 200000 different chemicals can be found in the plant world as a whole plant require these substances for upkeep, reproduction, healing, defense, and offensive.
- These plant are employed in part for the healing process as well as for their general nutritional worth. These dietary plants contain polyphenols and antioxidants in abundant in fruits, vegetables, and nuts.[11]

1.5 Plant having antifungal activity :-

Asafoetida :

Figure 1: Asafoetida

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Scientific classification

- Synonym – Hing o Kingdom – Plantae
- Subkingdom- Viridiplantae o Infra kingdom – Streptophyte o Superdivision – Embrophytes o Division- Tracheophyta
- Subdivision- Spermatophyta o Class – Magnoliopsida
- Order – Apiales o Family- Apeacaea o Genus – Ferula
- Species – Ferula asafoetida[12]

II. PHYTOCHEMICALS CONSTITUENTS OF THE FERULA ASAFOETIDA PLANT

The ferula Asafoetida plant has a variety of chemical components, including carbohydrates (68%), moisture (16%), protein (4%), lipid(1%), and minerals (7%), fibers(4%). The principal chemical components consisting of three major portions, including resins (40-64%) essential oil (10-17%), and gum (25-50%). Phosphoric acid Additionally, compound and diterpenes can be found in the F. Vanillin, 3,4-dimethoxycinnamyl-3-(3, 4-diacetoxyphenyl) acrylate, picealacetone C, and 7-oxocallitristic acid 39 are compounds found in the asafoetida plant.

Resin:

Coumarins, sesquiterpene Coumarins, ferulic acid and their esters, and other terpenoids are examples of resins. It also includes Umelliferone, taraxacin, feselol.

Gums:

It contains polysaccharides, glycoproteins, glucuronic acid, glucose, rhamnose, galactose, 1-arabinose, and so forth.

Volatile oil:

The sulfur-containing substance found in the volatile protein comprises 2-butyl-1-propenyl disulfide, 1-(methylthio) -2-propenyl disulfide and 2-methyl-2butyl-3-(methylthio) propanethioate, 2,3-dimethylthiirane, & dimethyl dipropyl disulfiefoetisulfide A&C, trisulfide, monoterpenes and other terpenoids that are volatile liable for biological processes.[13]

Structure of Active constituents:-

Ferulic acid **Umelliferone**

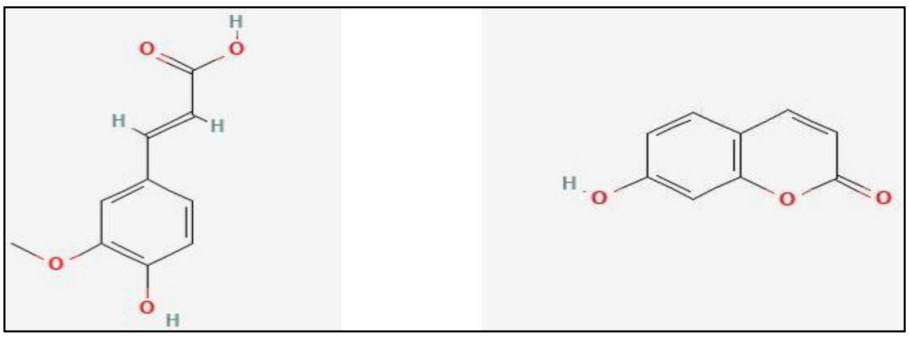

Figure 1:

Arabinose **Rhamnose**

Figure 2

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Pharmacological Action:-

Asafoetida has antioxidant activity and also helps to treat diabetes. It is useful in the treatment of cancer and ulcer. It has anthelmintic activity. It helps to enhance memory. Asafoetida has important role in viral and fungal infection. It has hepatoprotective activity, antifertility and antispasmodic activity. It is effective in diabetics activity as it has hypotensive activity.

Antifungal activity of Asafoetida:-

By using the disc diffusion method, the essential oils from 20 different spices were tested for their antifungal properties against aspargillus niger, candidates albicans, candida cylindracea, candida tropicalis, candida blank, candida krusei, candida glabrata, and saccharomyces cerevisiae. Except for mustard, all of the seeds oils had varying levels of fungicidal action when applied to test species,. Asafoetida all test fungus had their growth significantly slowed by oil the antifungal and allelopathic properties of the different Asafoetida methanolic extract concentration oleo-gum-resin against Trichoderma and pleurotus spp. Dual culture experiments appraised and harzianum on an agar surface. It showed fungistatic and fungicidal properties. Characteristics at the border between pleurotus species and T.harzianum more concentrated. Asafoetida seed essential oil has an antifungal impact on several plant pathogenic fungus, such as bipolaris sorokiniana, according to mostafa et al. A. niger, verticillium sp., fusarium graminearum, and fusarium solani using a completely random design the in vitro technique. The asafoetida seeds essential oil considerably slowed the growth when compared to controls of all fungi that have been tested total B.sorokiniana increase asafoetida seed essential oil inhibit, but inhibiting other species effects were highly roses dependent,. Deeb EI et al. (2012) assessed asafoetida's effectiveness against the development of blastocystis sp.invitro. In comparison to the antiprotozoan medication metronidazol, isolates of blastocystis sp. Subtypes in both oil and powder form. Asafoetida counts and viability of all tested isolates were deceased when it was taken in oil and powder form subtype 3 of blastocystis sp. The strength of the inhibitory action was highly reliant on the form, congratulation and the duration of asafoetida extract incubation the least concentration of asafoetida in both powder and oil form. It completely stopped blastocystis growth, and the largest percentage of development inhibition was 16 and respectively, 40mg/mL. Asafoetida has potential application for a powerful herbal alternative treatment photomechanicne of infection with blastocystis sp.[14]

Liquorice:

Figure 3: Liquorice

Scientific Classification-

- Synonym-Glycyrrhiza glabra
- Kingdom-Plantae
- Division-Angiospermae o Class-Dicotyledoneae o Order-Rosales
- Family-Leguminosae o Genus-Glycyrrhiza
- Species-Glabra Linn[15]

III. PHYTOCHEMICAL CONSTITUENTS OF LIQUORICE PLANT

The majority of biologically active substances are secondary metabolites and their derivatives, such as alkaloids, glycosides, flavonoids, and phenolics, saponins, adenosines and terpenes, anthraquinones, and essential oils, steroids and cannabis, sugars, carbohydrates, bitters, resins, essential oils, tannins, inorganic

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salts, and modest concentrations of nitrogenous components including proteins, individual amino acids, and nucleic acids are all present in liquorice extract. Triterpene saponins and flavonoids are the primary components that demonstrated widespread biological action, according to zhang and Ye, who claim that more than 400 chemicals have been identified from Glycyrrhiza species.

Flavonoids:

A total of over 300 flavonoids have reportedly been discovered in a variety of glycryerrhiza species. They include flavanones, chaconnes, isoflavanes, flavones and isoflavenes, which are flavonoid kinds that are frequently employed. Plus Isoflavonses liquiritin, liquiritigenin, Rhamnolliuiritin, liquiritin, apioside, gralbranin, glabrol, licofavanone, Isoliquiritigenin, neo-Iso-liquiritin, 7-methillicoricidin, licuraside, licochalcone A&B, liocflavone A&B, licoisoflavone, glyzaglabrin, &Hispaglabridin A&B, glabrone, licoricone, vanone, glabroisoflavanone, glabrone & gancaonin.

Saponins:

Triterpenoid saponins, or glycryerrhizin and glycryerrhizic acid, are the main chemical components of liquicorice and are what give it it's distinctively sweet flavor. They are found in the root plant glycryerrhiza.

Phenolic Compounds:

The phenolic components of glycryerrhiza species have been extensively studied liquiritin, Iso-liquiritin, liquiritin apio-side, isoprenoid-substituted flavonoids, or chromenes, coumarins, and dihydrostilbenes are the primary phenol compounds.

Coumarins:

Liqcoumarin, glabra-coumarone A & B, herniarin umbelliferon, and glycerin were among the coumarins isolated from G glabra.

Essential oils and other compounds:

Naïf and Jaquier identified and reported the discovery of several secondary metabolites, including fatty acids, phenol, guaiacol, asparagines, glucose, sucrose, starch, polysaccharides, and sterols.[16]

Structure of Active Constituents:

Liquoritin **Glycyrrhizin**

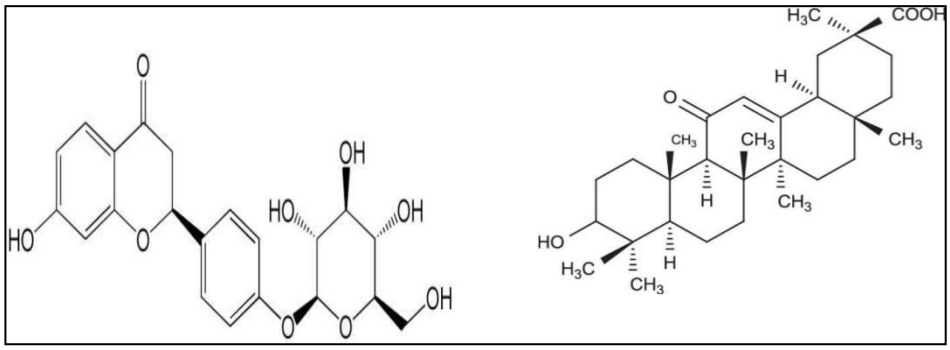

Figure 4:

Iso-liquiritin **Glucose**

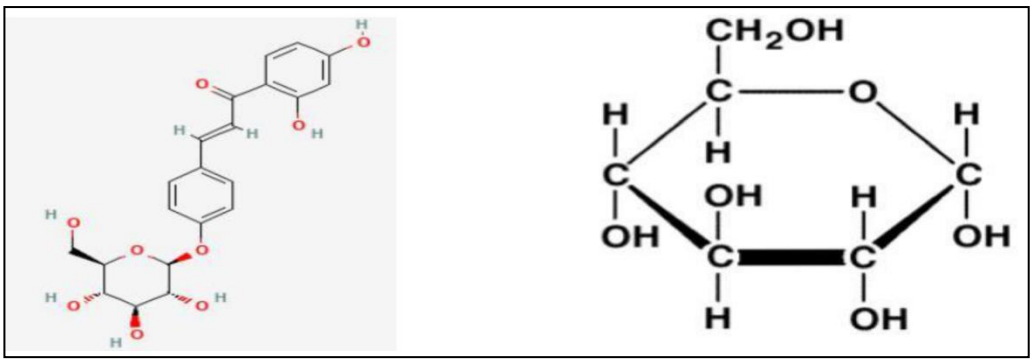

Figure 5:

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Pharmacological action of Liquorice:-

Numerous biological functions are displayed by Glycyrrhiza species, according to pharmacological research. The pharmacological properties of numerous Glycyrrhiza species are listed several pharmacological prossess, including hypo-cholesterolemic and hypoglycemic, anxiolytic, antiviral, antimicrobial preliminary, anti-ulcer a free radical scavenger cytotoxic and antitumor antiallergic, hypoglycemic and, anti-inflammatory, and antioxidant, hepatoprotective properties, eczema, dermatitis, and skin eruptions.[17]

Antifungal Activity of Liquorice:-

Liquorice extract with 80 percent methanol (OEL) we're discovered to have excessive fungicides effect towards the arthrinium saccharin M001 and the bacterium funicola M002, and there is primary compound was determined as glabridin (3-(2', 4'-dihydroxyphenyl) -8-dimethylpyrano [8, 7-e]chroman).Oil-based extract of liquorice (OEL) was effective against some bacteria, particularly those that were resistant to antibiotics bacilli that can withstand heat, such as the Bacillus & alicyclobacillus genera. Glabridin shown activity against filamentous fungus &yeast, as well as resistance-modifying activities against variants of candidate albicans that are resistant to drugs, with a minimum inhibitory concentration of 31.25-250 fatima A. et al. Measured micro gram/mL considering it's antifungal.[18]

Karanji Oil :-

Figure 6: Karanji Oil

Scientific Classification

- Kingdom - Plantae
- Subkingdom - Tracheobionta o Superdivision - Spermatophyta o Division - Magnoliophyta
- Class - Magnoliopsida o Subclass – Rosidae
- Order - Fabales o Family - Fabaceae
- Genus - Millettia Wight & Arn.
- Species - Millettia pinnata (L.) Panigrahi – pongame oil tree[19]

Phytochemicals constituents of Karanji oil:-

The plant P. Pinnata has been shown to contain a variety of chemical components for isolation, flavonoids and derivatives of them are of the most often used ingredients flavones are the byproduct of flavonoids. Chalcones of flavones, steroids, triterpenes, diterpenes, and sesquiterpenes. Additionally fatty acids, ester compound, disaccharides and amino acids found within this plant.

Flavones:

They are the most often isolated components from P. Pinnata. This plant contains chemicals of the flavone class in every part of it. It was thought that karanjin was the first substance to be isolated from this vegetation. Simple flavones, glycosidated isoflavones, glycosidated flavones, and chromanoflavones flavones with changed structures, prenylated isoflavones, isofuranoflavone rings like pterocarpans, rotenoids, and coumestan. It also includes quercetin, kanugin, luteolin, etc.

Flavens:

Nearly every components of the species contains flavans, particularly the leaves. The class contains only two non-flavanone compound:pongaflavanol and pongagamone E, which are both derivatives of flavan-4-ol.

Chalcones:

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The chalcone class comprises twenty-five compounds, of which furanochalcones and chromenochalcones are the predominant type. It also includes ponganine x, ovalitenone, etc.

IV. MISCELLANEOUS COMPOUND

All section of this plant were also said to contain a number of other chemicals. Sesquiterpene, diterpene, and triterpene are the three type of terpenoids.[20]

V. STRUCTURES OF ACTIVE CONSTITUENTS

Karanjin **Quercetin**

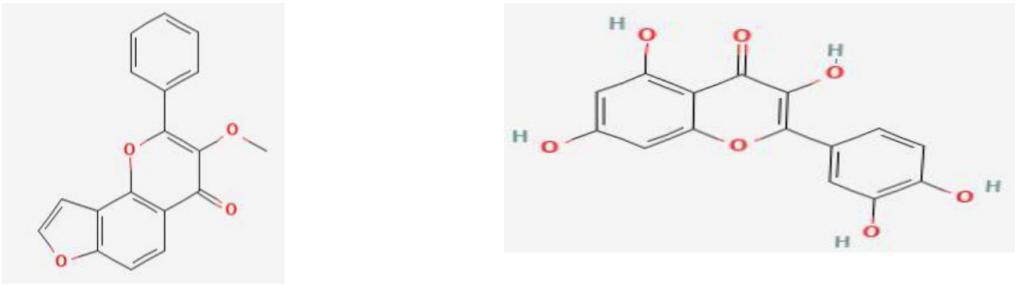

Figure 7:

Pharmacological Action of Karanji Oil:-

According to reports, a 70% ethanolic extract of P. Pinnata leaves exhibits strong anti-inflammatory properties against the acute, subacute, and chronic stages of without causing any adverse effect on the stomach mucosa. Those additionally noted the extract's significant anti-pyretic properties against pyrexia caused by Brewer's yeast. P. Pinnata plant shows anti-plasmodial activity against plasmodium falciparum. This plant have antioxidant and antidiarrhoeal activity. P. Pinnata have anti-ulcer activity and It has antifungal and anti-hyperglycaemic activity. [21]

Antifungal Activity Karanji Oil:-

Assessment of the antifungal and antibacterial properties of various pongamia pinnata oil concentrations against aspergillus niger, A. Fumigatus, both Pseudomonas aeruginosa and staphylococcus aureus was completed by wagh and colleagues using this MIC, or minimum inhibitory concentration, as well as the dryweight approach. Molecular oil analysis using gas chromatography and mass spectrometry/gas chromatography (GC-MS) demonstrated the presence of fat. They recommend the utilization of this plant's fatty oil for plant development produced antibacterial medications.

VI. CONCLUSION

Antifungal medicinal plants have been used for centuries to treat skin conditions, including dermatophytosis, a common fungal infection affecting 20-25% of the world's population. These plants, derived from fungi, animals, or plants, have significant therapeutic value and are crucial in traditional medicine practices. They have been used due to their safety, lack of effective antifungal drugs, and potential for natural remedies without negative side effects. Fungi diseases are spread through factors like rainfall, low economic status, lack of education, unclean water sources, and inadequate nourishment. Further research is needed to identify novel antifungal drugs from alternative sources, such as medicinal plants, to address the growing global health issue of fungal infections. From the above investigation, it has been concluded that herbal plants such as asafoetida,Liquorice and karanji oil are useful to treat fungal infections without any side effects.

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