

## A REVIEW: - ANTIFUNGAL ACTIVITY OF SOME COMMON HERBAL PLANTS AND ITS ACTIVE CONSTITUENTS AGAINST RINGWORM

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### ABSTRACT:

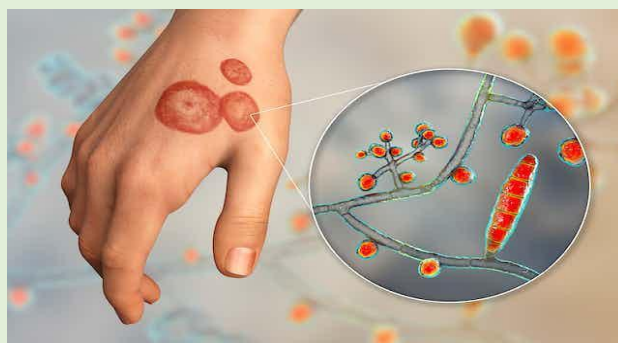
Although diversified mechanisms, such as mitosis, recombination, and the production of genes linked to oxidative stress responses, fungi can elude the immune system. Chronic fungal illnesses can result from these pathways. Even with the expansion of medical facilities, fungal infections continue to occur at a significantly high rate. The primary cause of cutaneous disorders is dermatophytes. Dermatophytes are also known as ringworm. Because of their attraction towards keratin, dermatophytes target keratinized tissues like nail, hair, and stratum corneum, resulting in dermatophytosis. Traditionally it has been possible to treat herbal plants using a variety of illnesses. However, the past few years have seen a lot of curiosity about the application of plant-based medicines to treat bacterial, fungal, and parasite infections. The plants that are most efficient against dermatophytes that have been found thus far.

**Keywords:** - Dermatophytes, ringworm, medicinal antifungal plants.

### INTRODUCTION

Two types of fungal infections are local and systemic. Fungal diseases are chronic illnesses caused by fungi that can avoid immune system responses by various means such as mitosis, expression of genes, recombination implicated in oxidative stress reactions.

#### Ringworm (Tinea capitis)



**Fig.1: Ringworm**

Depending on the region or location of the lesion, ringworm infection, also known as tinea, is the most prevalent type of fungal infection.

Ringworm infection represents the main cause of cutaneous diseases. Dermatophytosis is a relatively prevalent condition that can be fatal for elderly and immunocompromised individuals.<sup>2</sup> The age group between 20 and 31 years old has the highest occurrence of this illness.

Dermatophytes produce grey loops in the skin, cause the skin to scale, and hair abnormalities, hair loss, and nail looseness.<sup>3</sup> Microsporum, Epidermophyton, and Trichophyton are the most frequent causative agents whose reservoirs are human, animal and soil.<sup>4</sup> Heightened immediate, postponed, or mediating cell vulnerability can be brought on by dermatophytes. Within 30 days of infection, individuals possessing a healthy immune system experience an induced as a result of heightened vulnerability, which resolves on its own after 50 days.<sup>5</sup>

The distribution of dermatophytes varies globally. *Trichophyton rubrum* has been the most prevalent dermatophyte for the past 50 years, and mycosis is endemic and affects many children in poorer nations. Between 1980 and 1990, *Epidermophyton floccosum* was prevalent. With a prevalence rate of 31.4%, it is the most common dermatophyte in Iran among isolated dermatophytes.

The low standard of living in eastern and southern Europe has led to an upsurge in animal-friendly dermatophyte infection.<sup>6</sup>

### Dermatophytosis treatments include:

#### Topical antifungal therapy:

This useful medication is meant to address the majority of cutaneous dermatophyte infections that affect only the epidermis. Among the medications that work well for dermatophyte infections are tolnaftate, ciclopirox, butenafine, azoles, and allylamines.

#### Itraconazole or terbinafine:

Taken orally are typically the first-choice medications, and they should resolve the illness in two to three weeks. When treating tinea lesions, should be used for at least four weeks.

#### Combination of topical and oral antifungal medication:

Traditionally, Many ailments have been treated with the use of herbal plants. Herbal plants have also garnered a lot of interest recently because of the numerous advantages of their applications, including lower costs and fewer side effects. It has also been suggested that using plant-based products to treat bacterial, fungal, and parasite illnesses is a successful strategy.<sup>6</sup>

Additionally, some actions might be performed to create medications by determining the plant's active ingredients. Certain plants have already been demonstrated to possess antifungal qualities against fungi. These include, *Myrtus communis*, Ginger, black beans, licorice, *Narcissus tazetta*, aloe vera, thyme, dill, cilantro, onions, cilantro, henna and garlic. These plants include several microbially active chemicals, including, alkaloids, flavonoids, citronellol, tannins, geraniol, thymoquinone, and phenolic compounds. Their antifungal properties are also present. The purpose of this review article is to present medicinal herbs that possess anti-dermatophytosis capabilities.<sup>7</sup>

Medicinal the results provide information about the plant species botanical name, family, local name, and parts used that are used to treat ringworm. The article details certain plant species that were utilized in their formulations by these people for the treatment of dermatophytosis.<sup>8</sup>

**TableNo.:1 List of Plants**

Sr. No.	Botanical names	Family	Local names	Parts used	Mode of use
1	<i>Zingiber officinale</i>	Zingiberaceae	Ginger	ginger rhizomes	By extracting phytochemicals from rhizomes which is useful in dermatophytosis.
2	<i>Allium cepa</i>	Amaryllidaceae	Onion	Onion bulb, onion skin.	Gel from red onion extract useful in fungal infection
3	<i>Allium sativum</i>	Amaryllidaceae	Garlic	Garlic bulb	By applying crushed garlic with olive oil on infected area
5	<i>Quercus leucotrichophora</i>	Fagaceae	Oak	Oak bark	extracts from oak bark have antifungal potential.

6	<i>Glycyrrhiza glabra</i>	Fabaceae	Licorice	Roots and rhizomes	licorice for a very long time to treat fungal infections, most notably ringworm. This is due to the fact that of all the herbs, licorice has the highest concentration of antifungal chemicals.
7	<i>Anethum graveolens</i> L.	apiaceae	Dill	Dill Seeds	Essential oil and extracts from dill seeds have very good antifungal activity.
8	<i>Thymus vulgaris</i>	Lamiaceae	Thyme	Thyme leaves	Extraction of thyme oil for treatment of dermatophytosis.
9	<i>Aloe barbadensis</i>	Liliaceae	Aloevera	leaves.	apply gel directly to the affected area.
10	<i>Ocimum sanctum</i> Linn.	Lamiaceae	Tulsi	Leaves	Consuming tulsi juice or applying crushed tulsi leaves on affected area
11	<i>Capparis spinosa</i>	Capparidaceae	Kapari	leaves, aerial parts	A good treatment for fungal infection is camphor water.
12	<i>Anagallis arvensis</i>	Primulaceae	Scarlet pimpernel.	aerial parts	Extracts from aerial parts of this plant used to treat fungal infection.
13	<i>Ruta chalepensis</i>	Rutaceae	Arruda	aerial parts	<i>Ruta chalepensis</i> aerial component extract exhibits antifungal action against dermatophytes.
14	<i>Heracleum persicum</i>	Apiaceae	Golpar	The fruits and leaves	Applying leaves extract on infected Part.
15	<i>Cinnamomum camphora</i>	Lauraceae	Kapoor	Leaves	Leaf oil used topically.
16	<i>Curcuma longa</i> Linn	Zingiberaceae	Turmeric	Rhizome	Apply fresh rhizome paste or juice directly to the affected regions.
17	<i>Punica granatum</i> Linn.	Punicaceae	Pomegranate	Leaves and peel extract.	leaves crushed with water to form a paste, then administered topically.
18	<i>Piper nigrum</i> Linn.	Piperaceae	Black pepper	Fruits/seeds	Water-infused seed paste applied topically.
19	<i>Jatropha curcas</i> Linn.	Euphorbiaceae	Physic nut	Aerial parts	Juice of the aerial part administered directly to the affected areas.
20	<i>Piper betle</i> linn.	Piperaceae	Pan	Leaves	After boiling in coconut or mustard oil, the leaves are sifted. In addition to using the fresh leaf juice, filtration is applied topically.

### 1. Ginger:

The ancient spice plant known as ginger (*Zingiber officinale* Roscoe) is frequently utilised in herbal remedies, Ayurvedic treatments, and traditional Chinese medicine. It belongs to Zingiberaceae family. Ginger is a popular home remedy for a number of health conditions, including heart difficulties. Coughing, colds, and digestive disorders. Shogaol and gingerol are among the antifungal substances found in ginger root.<sup>9</sup>

Shogaol and gingerol are among the antifungal substances found in ginger root. The phytochemicals included in the rhizome are what give it its antibacterial and antifungal qualities. The chemicals included in ginger extract and essential oil are called oleoresins, which are polyphenolic ketones.<sup>10</sup>



**Fig. 2: Ginger**

### 2. Allium cepa:

Onion (*Allium cepa*) contains antifungal properties. It belongs to the family (Amaryllidaceae). Fungi growth can be inhibited by onion extracts. Additionally, onion extracts may be useful in the treatment of viral and bacterial infections. Onion's antifungal properties could be caused by its phytochemical components.

Total amount of phenolic compounds (kaempferol and quercetin).<sup>11</sup>



**Fig.3: Allium cepa**

### 3. Garlic:

Garlic (*Allium sativum*) which is a member of the Alliaceae family. Garlic possesses antifungal qualities. Garlic contains an active component called allicin, which is sulphur-containing and prevents the growth of germs and fungi.<sup>12</sup>

Garlic's primary ingredient, allicin, is responsible for the majority of its biological properties, including its bactericidal, antifungal, and antiviral properties. The Allicin is a strong antifungal that works extremely well against *Candida albicans* when it is pure. Show that the inhibitory activity of the garlic ethanol extract was higher. Similar to previous results, the ethanolic extract of garlic has more antifungal activity against the test

organisms than do the aqueous extracts. Furthermore, every extract of garlic at higher concentrations demonstrated that an increase in concentration also results in an increase in the antifungal action.<sup>13</sup>



**Fig.4: Allium sativum**

#### **4. Henna:**

Henna (*Lawsonia inermis*) which belongs to family *Lythraceae*. has long been used to treat fungus-related infections. The primary component of henna leaves, fraxetin, showed strong antifungal activity against dermatophyte species in ethanol extract of leaves and acetone. These extracts can be developed as a substitute for treating dermatophytosis.<sup>14</sup> Research has demonstrated that henna paste exhibits antifungal properties against dermatophytes species and isolates of *Candida*. This plant's leaves include antibacterial, antifungal, analgesic, anti-inflammatory, and antipyretic properties.<sup>15</sup>



**Fig. 5: Lawsonia inermis**

#### **5.Oak:**

Oak (*Quercus leucotrichophora*) which belongs to the family *Fagaceae*. *Quercus leucotrichophora*, a native of the Himalayan region, is an evergreen tree commonly referred to as Banj oak. In traditional Asian medicine, the *Quercus* genus has been used to cure inflammatory conditions, infections, and skin issues. *Quercus* extracts, particularly the bark extract, include antibacterial substances such as castalagin, vescalagin, gallic acid, and ellagic acid.



**Fig.6: Quercus leucotrichophora**

## 6. Licorice root:

Licorice root (*Glycyrrhiza glabra*) belongs to the legume family. Iran is famous for its extensive research on licorice as a medicinal plant. Licorice root is widely used in the food and pharmaceutical industries due to its flavoring and medicinal properties. Its extracts have demonstrated strong fungicidal action against phytopathogenic fungi, a property mostly ascribed to the phenolic chemicals flavonoids, isoflavonoids, and chalcone. Capable of lowering inflammatory levels. Licorice can help reduce mouth inflammation because of its anti-inflammatory properties. Consequently, it can be applied to the treatment of periodontitis and gingivitis<sup>17</sup>.

Glabridin was found to possess noteworthy fungicidal properties against 10 different types of phytopathogenic fungi. The antiviral, antibacterial, and antifungal effects of licorice are well-established<sup>18</sup>



**Fig. 7: Glycyrrhiza glabra**

## 7. Dill :

This study proved the potential of Dill (*Anethum graveolens* L.) essential oil as a source of environmentally friendly anti-inflammatory drugs. Dill herb belongs to the Apiaceae family. A broad-spectrum antifungal agent, dill seeds can stop the growth of a variety of fungi. Food preservation using dill (*Anethum graveolens* L.) essential oil as an antifungal agent (in vivo).

The culinary sector mostly uses the fragrant herb dill as a flavouring agent. It has also been used to treat a number of illnesses. There are a lot of reports on its biological activity in the literature.<sup>2</sup>



**Fig. 8: Anethum graveolens L.**

### **8 Thyme:**

Antibacterial properties of pure thymol and thyme essential oil (*Thymus vulgaris* L.) as reference materials were evaluated against different mold species isolated from wet environments. There is a broad spectrum of fungicidal activity in thyme essential oil. It is a member of the Lamiaceae family.<sup>21</sup> *Thymus vulgaris* essential oil (TVEO) is used as an active component in the treatment or prevention of cutaneous inflammatory illnesses, as well as an antifungal agent in aromatherapy. Thyme essential oil has antibacterial properties. Thymol, p-cymene,  $\gamma$ -terpinene and linalool are the main compounds of thyme oil. Thyme essential oil has a broad spectrum of bactericidal action.<sup>22</sup>



**Fig.9: Thymus vulgaris**

### **9. Aloe Vera:**

Aloevera (*aloe barbadensis*) has antifungal properties. Which belongs to the family Liliaceae. Aloe vera has been used as a famous medicine all over the world since ancient times. Due to its numerous therapeutic benefits, this plant is utilised in Ayurvedic, Unani, homoeopathic, and allopathic treatment.<sup>23</sup> The plant's abundant supply of minerals and vitamins are readily absorbed by the body, while the gel prevents fungal growth. It is used to treat fungal infections, including ringworm, dandruff, jock itch, and athlete's foot. Gel of aloevera and its derivatives are anti-inflammatory, anti-viral, anti-bacterial, and antifungal. Aloe vera is known to have no negative responses or side effects.<sup>24</sup>



**Fig.10: Aloe vera**

### **10.Tulsi:**

Hinduism places a high value on the Indian basil plant known as tulsi (*Ocimum sanctum*). Tulsi means "the incomparable one" in its name. Numerous ailments, including fever, the common cold, sore throats, and respiratory issues, can be treated with tulsi. Its qualities include antiedematous, antimicrobial, bactericidal, and anti-inflammatory. It belongs to the family lamiaceae. Ayurveda has utilised tulsi, sometimes referred to as holy basil, for its therapeutic benefits. Tulsi is a useful treatment for fungal infections because of its immunomodulatory and antifungal.<sup>25</sup>Tulsi, commonly referred to as holy basil, is highly valued for its therapeutic qualities. It is a great treatment for any fungal infection because of its strong antifungal and immunomodulatory properties. Fungal infections can be helped by applying tulsi oil topically or consuming tulsi tea.<sup>26</sup>



**Fig.11: Tulsi**

### **11.Kapari:**

Kapari also known as *Capparis spinosa* or capari bush possess antifungal activities. It has been demonstrated that plant extracts inhibit the growth of several fungus.

Moreover, studies have demonstrated the hepatoprotective, antioxidant, antibacterial, analgesic, antitumor, and anti-inflammatory properties of *Capparis spinosa* extracts.<sup>27</sup>*C. spinosa* is regarded as a potentially useful medicinal plant due to its abundance of bioactive ingredients, which include carotenoids, glucosinolates, alkaloids, tocopherols, and polyphenols, as revealed by phytochemical study of the plant. Our research focuses on determining the presence of polyphenols in various plant parts and their antibacterial properties. It has now been established that capers are a model for the extraction of bioactive substances. It is also known for its rich phytochemicals, whose potential uses in medicine and food are worth explore.





**Fig.12: Capparis spinosa**

### 12.Scarlet pimpernel :

Scarlet pimpernel, or *Anagallis arvensis*, is a medicinal plant with a long history of use as an antiseptic. The best inhibitory effect against *Candida albicans* was produced by the methanolic extract of *Anagallis arvensis*.<sup>29</sup>

The traditional use of *Anagallis arvensis* as an anti-inflammatory agent is supported by its antibacterial properties and lack of genotoxic effects. Additionally, *Anagallis arvensis* has antibacterial, molicial, antioxidant, anti-inflammatory, anti-*Leishmania*, antiviral, cytotoxic and spermatogenic effects. features.<sup>30</sup>



**Fig.13: Anagallis arvensis**

### 13.Arruda :

It is also known as *Ruta chalepensis*. It belongs to the family Rutaceae. *Ruta chalepensis* essential oil has strong antifungal properties. *Chalepensis* plant extract has a 90-100% inhibitory effect against *Microsporumcanis*. The study also showed that the following plants showed 90-100% inhibition against *Microsporumcanis*: *Pistacia chinensis*, *Anagallis arvensis*, *C. spinosa* and *J. canis. Regia*. When the essential oil was isolated during the blooming developing phase, a high level of antifungal activity was detected. Also *Ruta chalepensis* possesses anti-inflammatory, antibacterial, and anti-cancer properties.<sup>31</sup> Eight bacterial and nine fungal species were tested to determine the antibacterial and antifungal properties of the essential oils. Further research on the antimicrobial properties against specific *Candida* yeasts produced noteworthy findings.<sup>32</sup>



**Fig.14: Ruta chalpensis**

#### **14.Golpar:**

Golpar, or *Heracleum persicum*, possesses antifungal qualities. It belongs to the Apiaceae family. Two fungi are susceptible to the antifungal action of *Heracleum persicum*.

Numerous other possibly beneficial characteristics of *Heracleum persicum* include: growth enhancer, anti-inflammatory, immunomodulatory, analgesic, cytotoxic, antioxidant, antidiabetic, hypercholesterolaemia, anticonvulsant, and antibacterial.<sup>33</sup>



**Fig.15: Heracleum persicum**

#### **15.Kapoor:**

Kapoor (*Cinnamomum camphora*). Belongs to family Lauraceae. The essential oil of cinnamon miller has antifungal properties.

Moreover, *Cinnamomum camphora* leaves reduce the symptoms of atopic dermatitis. It may lessen fungus virulence characteristics such as the development of biofilms and hyphae<sup>34</sup>. A hardwood species endemic to China, *Cinnamomum camphora*, possesses potent antifungal properties.

The minimum inhibitory concentration of camphor is 0.125-0.35 mg/ml<sup>35</sup>.



**Fig.16: Cinnamomum camphora**

### **16.Turmaeric :**

Turmeric, or *Curcuma longa*, possesses antifungal characteristics. It has been used to treat dermatophytes in traditional Thai medicine. It has been demonstrated that turmeric oil exhibits antifungal action against *Microsporiumgypseum* and *Trichophyton rubrum*. Being rich in antioxidants, Turmeric is rich in antioxidants that may protect cells from harm caused by free radicals. In addition to posing a threat to cells, unstable free radicals are implicated in the development of chronic disorders such as cancer and cardiovascular disease

Turmeric, or *Curcuma longa* L., belongs to the Zingiberaceae family and is extensively used to treat tinea, ringworm, rash, and itching. Curcumin is the main bioactive component of turmeric and has many pharmacological properties. They have antibacterial, antiviral, renoprotective, cardioprotective, antioxidant, anticancer, anti-osteoarthritis, antidiarrheal and neuroprotective properties.<sup>37</sup>



**Fig.17: Curcuma longa**

### **17.Pomegranate:**

Pomegranate (*punica granatum* linn). of family punicaceae. Pomegranate fruit peel hydroalcoholic extract has demonstrated efficacy against *Trichophyton mentagrophytes*, *T. rubrum*, and *Microsporiumcanis*, three dermatophyte fungus.<sup>38</sup>

Punicalagin, the primary component of pomegranate extract, is a significant chemical with antifungal and antibacterial activity. 21 distinct pomegranate genotypes were examined to determine the amount of punicalagin ( $\alpha$  and  $\beta$ ).<sup>39</sup>



**Fig. 18: Pomegranate**

### **18. Black pepper:**

Black pepper (*Piper nigrum* Linn.) Belongs to Piperaceae family. The essential oil of black pepper has strong antifungal qualities.

It has been demonstrated that the n-hexane extract of black pepper essential oil exhibits strong antifungal properties<sup>40</sup>. Additionally, antifungal activity against *Candida* spp. has been shown, and its impact on virulence factors and clinical isolates resistant to antifungals has been assessed. Furthermore, a new study emphasises the potential of *P. nigrum* seed extracts as antioxidants, antibacterials, and antimutagens.<sup>40</sup>

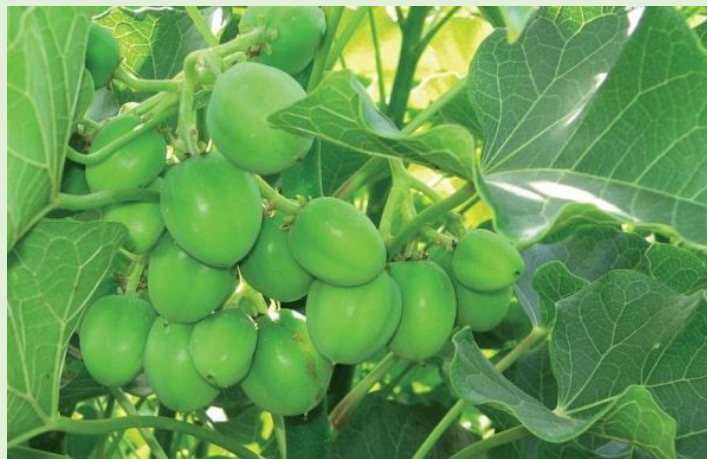


**Fig.19: Piper nigrum**

### **19. Jatropha curcas:**

*Jatropha curcas* commonly known as physic nut linn. It is a member of the Euphorbiaceae family. *Fusarium solani* is very sensitive to the antibiotics of *Jatropha* oil. The fatty acid content of *Jatropha* oil affects its anti-inflammatory properties.<sup>42</sup> Through phytochemical analysis, the extract of the thick stem of *Jatropha curcas* was found to contain saponins, steroids, tannins, glycosides, alkaloids, and flavonoids. These compounds inhibit the growth of bacteria and fungi, demonstrating the broad-spectrum antimicrobial ability of the plant and its potential use in the treatment of microbial infections.<sup>43</sup>

Major fungal diseases such as *Fusarium oxysporum*, *Pythium melanogaster*, *Trichoderma theobromans*, *Fusarium semitectum*, *Colletotrichum capsici* and *Colletotrichum gloeosporioides* are the main fungal diseases against bread seeds. Sugar has antibacterial properties.<sup>42</sup>



**Fig.20: Jatropha curcus**

### **20.Piper betel:**

Also known as piper betle linn. Of family piperaceae. Several chemical components with antifungal activities are present in it, such as hydroxychavicol, chavibetol, betal-phenol, and other phenolic compounds<sup>44</sup>. Pongpech and prasertsilpe discovered that P.betle gel slowed the development of ringworm causing dermatophytes.<sup>45</sup>

Eugenol also shows effective antifungal properties in the betel leaf. Numerous more advantages of piper betle include: Skin lightening, cutting down on hyperpigmentation How to avoid halitosis enhancing voice production gum strengthening treating coughing, asthma, congestion, indigestion, and constipation.<sup>44</sup>



**Figure 1: Piper betel**

**Fig.21: Piper betel.**

## **CONCLUSION**

Many known side effects are associated with common drugs used to treat fungal infections, particularly those that are taken systemically. Many fungal species have developed drug resistance to widely used medications, and this resistance has primarily increased in the last few years. Medicinal plants are important sources of potent medicinal and antifungal compounds that can be used to treat a range of illnesses, including infections caused by fungi.

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