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# Formulation and Antifungal activity of *Ficus Racemosa Gel*

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**Abstract:**

Recent advance research in various plant extracts, aim to enhance safety and efficacy of drug molecules by formulating a convenient dosage form for administration and to achieve better patient compliance. Plant extract formulations having best pharmacological value and we can provide a safe and low cost medicine. It has no any side effect of adverse effect. These formulations are the most preferred approach in improving patient convenience, drug therapy and safety. In the present investigation, an attempt was made to formulate an antifungal gel of Ficus Racemosa by using the plant's root bark.The Ficus Racemosa root bark extract show excellent result in Antifungal Activity.

**KEYWORDS**: PHARMACOLOGICAL, SIDE EFFECT, DRUG THERAPY, ANTIFUNGAL ACTIVITY

## INTRODUCTION

The term medicinal plants includes numbers of plants with their unique and valuable nature which are used in the medicinal purpose. All the medicinal plants under goes in herbalism (herbology or herbal drug). Now a day any parts of plants like leaf, root, stem, bark, flower etc are used as herb.Plants have been described as a drug from prehistoric period. History described that before 4000 years ago unani hakims were used plant as drug to cure the disease. Treatment with medicinal plants has safe and useful with minimal side effects. The biggest advantages are anybody can get the plants without any cost.[1,2]

## Plant Profile

In the traditional system, the plant Ficus racemosa Linn (Udumbara) has numerous therapeutic benefits. Every portion of the plant has a medical purpose. Leaves have the ability to heal a variety of infections. It is well known that fruits can help with diarrhoea and constipation. Plant bark treats urinary tract issues, diabetes, asthma, leucorrhoea, ulcers, and dysentery. Many biological qualities, including antitussive, chemo preventive,

hepatoprotective, anti-inflammatory, anti-diuretic, and antipyretic, are associated with the traditional applications of udumbara. Numerous phytochemicals found in every part of the plant are what fight off invaders.Udumbara is one of the few widely described plants in the Vedic literature. It is very useful material for yogna (rituals) or homa. The twigs of plant are used as both brushes. Nalpamara (ksirivrkas) is one of the four sacred trees that should be planted around homes and temples. Large to medium-sized spreading, lactiferous, deciduous, evergreen Ficus racemosa Linn (Moraceae) trees can be found throughout most of India. Found in damp areas up to 1800 meters above sea level, it can be found in deciduous and evergreen forests. It's grown over the Deccan plateau, Khasia Mountain, Odisha, Karnataka, Kerala, Punjab, Rajasthan, and Chota Nagpur inaddition to the outer Himalayan peaks. Growing to a height of 10 to 16 meters, this deciduous tree can reach a medium level. It is grown and commonly found near water streams. The plant has oval or elliptical-shaped leaves. These are green in hue and range in length from 7 to 10 cm. December is when the leaves wither, and January through April is when they grow. Since the fruits and flowers of the plant are not distinguishable from one another, they are enclosed within the fruits. The pears- shaped fruits are edible. They develop in clusters that branch out of the main branch. They range in diameter from 2 to 5 cm. When the fruit is uncooked, it is green; as it ripens, it turns orange or dark crimson. The scent of ripe fruit is fragrant. The seeds are abundant and tiny, like grains. Bark has a soft, fractured surface and is 0.5 to 1.8 cm thick, irregular, and greyish brown in colour. The bark has fibers and a light brown color on its inner surface. It doesn't smell particularly, but it tastes like mucilage. Both vegetative and sexual propagation—using seeds—are options for growing the plant. In India, the term for the tree and its fruits is "atti" in the south and "gular" in the north. This plant is widely utilized in traditional drug to treat a wide range of illnesses. It works well as a drug for binge eating.[3,4,5]

**Fig 1.1: *Ficus Racemosa* Plant**

**Taxonomy** [7]

**Table 1.1: Taxonomy of Ficus Racemosa**

| | |
|---|---|
| **Kingdom** | Plantae |
| **Subkingdom** | Tracheobionta |
| **Superdivision** | Spermatophyta |
| **Division** | Magnoliophyta |
| **Class** | Magnolipsida |
| **Subclass** | Hamamelididae |
| **Order** | Urticales |
| **Family** | Moraceae |
| **Genus** | Ficus |
| **Species** | F .Racemosa |

**Vernacular Name Of Ficus Racemosa**

**Table 1.2: Vernacular Name of Ficus Racemosa**

| **Language** | **Name** |
|---|---|
| Sanskrit | Jantuphala, Jantukaphala, Hemadugdha, Yajnayoga |
| Hindi | Gular, Dumar, Umari, Panibhuj, Udumbara. |
| English | Gular fig, Cluster fig, Count fig, Redwood fig |
| Odia | Dimri, Dumbri or Dumber |
| Bengali | Udumbara, Dumur. |
| Telgu | Brahmamamidi, Atti, Bodda, Medi pandu |
| Gujarati | Goolar, Umbaro. |
| Manipuri | Heibong |
| Marathi | Umbar, Udumbara. |
| Urdu | Dumar |
| Konkani | Rhumbud |
| Kannada | Atti, Atti mara |
| Irula | Athi |
| Tamil | Malaiyinmunivan |
| Nepalese | Dumrii |

| | |
|---|---|
| Thai | Ma-dueruthumphon |
| Sinhalese | Attikka |
| Vietramese | Sung |

**Pharmacological Profile**[6,8,9]

It has various pharmacological activity like hypoglycaemic, hepato Protective,anti- tussive, Anti-ulcer/Gastro-protective, Wound Healing, Anthelmintic, Anti-diuretic Antidiarrheal, Chemo-preventive, Anticancer, Antibacterial, Anti-inflammatory, Memory Enhancing, Hypolipidemic, Renal Anticarcinogenic, Antifungal, Antipyretic, Antifilarial, Larvicidal, Antifertility, Angiotensin Converting Enzyme Inhibitor, Cardioprotective and Analgestic Activity.

**Topical herbal gel**

**Definition of gel**

According to I.P., Gels are consistent, semi-solid preparations that often comprise solutions or dispersions of one or more drugs with either hydrophilic or hydrophobic bases.Suitable gelling agents such as HPMC, Carbopol, and Sodium CMC, among others, are typically used in their preparation. Gel formulation involves the use of chemicals such as stabilisers, antimicrobial preservatives, and antioxidants. Since topical gel formulations are less oily and easier to remove from the skin, they offer an appropriate drug delivery method. They are meant to be applied topically to the skin or specific mucosal membranes for medicinal, preventive, or protective reasons. Gel production may be beneficial for a small number of inflammatory and wound diseases in dermatology. [11,12,13]

**Ideal Properties Of Herbal Gel**

- Smooth texture
- Non dehydrating
- Non-greasy
- Semisolid in nature
- Non irritating
- Do not alter membrane/skin functioning.

**Advantages**

- Optimal cutaneous and percutaneous drug administration is accomplished by the use of gels.
- Drug absorption problems in the gastrointestinal tract due to acidity in the stomach can be avoided.
- The ability of gels to prevent drug interactions and enzymatic activity with meals and beverages. When an oral pharmaceutical delivery method is not appropriate, they can be used in its place.
- They have a localized action with few adverse effects when applied topically to the skin for gradual and sustained absorption.

SKIN

The outermost layer of the body that covers and shields the surface from the environment is called the cutaneous membrane, or skin. The film of aqueous and soluble material that covers the skin's surface is what determines the pH of the skin, which ranges from 4 to 5.6. Protection against different unpleasant stimuli, such as radiation, microorganisms, and physical and chemical harm, is the primary physiological function of the skin. The human skin makes up over 16 % of the body weight, making it one of the most intricate and substantial organs in the body.

Anatomy And Physiology Of Skin

With a surface area of roughly 1.5–2 square meters in adults, the skin is the biggest organ in the body. The skin controls body temperature, shields us from germs and the environment, and allows us to feel touch, heat, and cold.

Skin has three layers:-

Epidermis: - It is the topmost layer of skin, establishes our skin tone and acts as a waterproof barrier.

Dermis: - Hair follicles, sweat glands, and strong connective tissue are found beneath the epidermis.

Subcutaneous tissue (Hypodermis):- The hypodermis, or subcutaneous tissue, is composed of connective tissue and fat. The pigment melanin is produced by unique cells called melanocytes, which give skin its colour. The epidermis contains melanocytes.

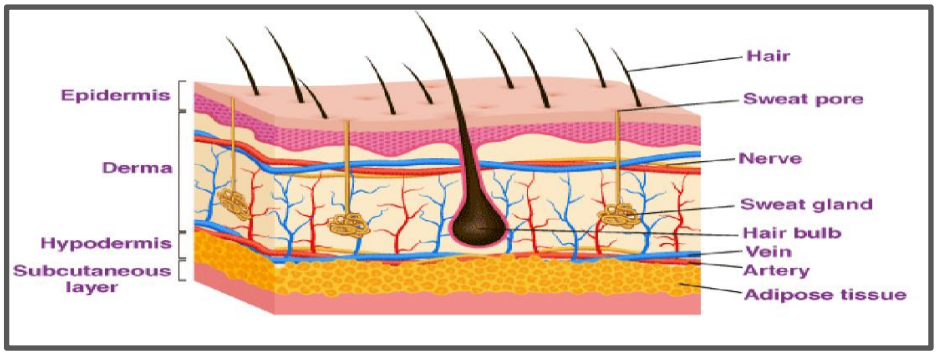


**Fig 1.2: Anatomy of Skin**

### Anti-Fungal Activity[7,10]

The kingdom of fungi contains a vast array of organisms with diverse life cycles, morphologies, and ecological niches. The full biodiversity of Kingdom Fungi is a little-known fact, nevertheless. Just 5% of the 1.5 million species thought to exist in this kingdom today are formally classified. Many fungus parasite humans, animals, plants, and other fungi. Together with the rice blast fungus, Dutch elm disease, and chestnut blight, other plant-infective fungi can also cause injury and losses to agriculture and forestry. Certain types of fungi can cause significant illnesses in people, many of which are fatal if neglected.

### Classification Of Fungal Infections

Animals, including humans, can contract mycoses from fungi. The tissue levels at which mycoses first colonized determine their classification. The foundation of the clinical nomenclatures for the mycoses.

1. Site-Based Classification.
2. Classification Based on Route of Acquisition.
3. Grouping according to Virulence.

## MATERIALS AND METHODS

### Collection And Authentication[5,6]

The fresh and good quality root bark of plant of Ficus racemosa were collected from the village of Remta, Barpali, Bargarh, Odisha, in the month of April 2023.The Indian Botanical Survey verified the plant's identity.

**Fig 3.1: Root Bark of Ficus Racemosa**

**Drying And Pulverization**

The collected root bark of *Ficus racemosa* was dried in shade at room temperature. Dring for several days for better grinding then dried bark was pulverized in a hand grinder (mechanical process to get a course powdered form) and stored.Sieves no. 22 and 44 are utilised for sieve analysis. Coarse powder was gathered using a sieve technique. To store the coarsely powder parts always used a tightly closed container for further study.

**Preparation of extracts**

**Hot extraction method**

Material

- Soxhlet apparartus (soxhletion)
- Condenser
- R B flask

Chemical

- Methanol
- Acetone
- Cholroform
- Petrolium ether

Methods [10]

About 100 gm of coarsely powdered drug was taken in RB flask of soxhlet apparatus and continuously hot extraction with increasing polarity solvent Petroleum ether, chloroform, acetone, methanol and water separately. After completion or colour change of solvent of soxhlation the extracts were separated and filtered by using filter paper and concentrated to a thick mass in a hot plate. The thick mass was stored in a container for further experiments.

Cold Maceration

Determination of alcohol-soluble extractives

- A dry 250 ml conical flask was filled with approximately 4 grammes of the coarsely powdered drug.
- 90% alcohol is the solvent; fill a 100 ml graduated flask to the delivery mark. Rinse the weighing bottle clean, then transfer the washings and the remaining solvent into the conical flask.
- Shake the flask often for a full day after corking it. (Redaction) Fill a 50 ml cylinder with the filtrate. Transfer 25 millilitres of the filtrate to a thin porcelain plate that has been weighed and used to determine the ash values once enough filtrate has been collected.
- Dry completely in a water bath, then finish drying for six hours at 1050 degrees Celsius in an oven.

- Weigh right away after letting it cool in a desiccator for 30 minutes. Determine the extractive w/w % about the drug that has been air-dried.

Anti-Fungal Activity

In vitro antifungal activity was examined for petroleum ether, methanol, Acetone and Chloroform extracts. The agar disc diffusion technique was used to examine the antifungal activity of plant component extracts against three pathogenic fungus. Each refined extract was diluted in dimethyl sulfoxide, filtered through a sintered glass filter to sterilise it, and then kept in storage at 4°C. To compare the results, pure fungal strains were used as a standard antibiotic for determining the zone of inhibition. All of the extracts were tested for their ability to inhibit the growth of Aspergillus niger, Aspergillus clavatus, and Candida albicans. Nutrient agar tubes were utilised to generate four sets of dilutions, each consisting of 100, 200, 300, and 400 µg/ml of Ficus racemosa extract and 25, 50, 75 and 100 µg/ml of the reference drug griseofulvin, in double distilled water.Following three hours at 37 °C, Mueller-Hinton sterile agar plates were seeded with 108 cfu of indicator bacterial strains. When the fungi were kept at 28°C for 48 to 96 hours, the zones of growth inhibition adjacent to the discs were measured. On the agar surface surrounding the discs, the diameter of the disc and other inhibitory zones were measured to ascertain the sensitivity of the microorganism species to the plant extracts.

**Preparation Of Herbal Gel** [13,14,15]

**Formulations Of Herbal Gel**

**Table 3.4: Formulations of Herbal Gel**

| INGREDIENTS | FUNCTION | F1 | F2 | F3 | F4 | F5 |
|---|---|---|---|---|---|---|
| drug extract (ml) | Antifungal property | 2.5 | 4.5 | 6.5 | 8.5 | 10.5 |
| Carbapol 934 (gm) | Gelling agent | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| HPMC (gm) | Thickening agent | 1 | 1 | 1 | 1 | 1 |
| Methyl Paraben (ml) | Preservative | 3 | 3 | 3 | 3 | 3 |
| Propylene Glycol (ml) | Emollient | 5 | 5 | 5 | 5 | 5 |
| Sodium Benzoate (gm) | Preservative | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Triethanolamine | pH adjuster | q.s | q.s | q.s | q.s | q.s |
| Distilled water (ml) | Vehicle | 100 | 100 | 100 | 100 | 100 |

**Step 1 :- Preparation of gel base**

To prevent agglomeration, carbapol 934 (4.5 gm) was dissolved gradually over the course of an overnight in 50 ml of filtered water while stirring.

**Step 2 :- Gel formulation**

- Carbopol 934, soaked in distilled water with a base of 0.2% w/v sodium benzoate.
- Propylene glycol was combined with hydroxypropyl methylcellulose (HPMC) solution using a tissue homogenizer.
- Five milliliters of Methanolic extract of ficus racemosa root bark were added to an HPMC solution and homogenized. After being moved to the Carbopol solution, this drug solution was homogenized.
- Enough triethanolamine (q.s.) was added to balance the pH. After that, distilled water was added to raise the volume to 100 milliliters.
- The gel was kept at room temperature.

## RESULT AND DISCUSSION

Extraction

Hot extraction method

The coarsely powdered root bark of *Ficus racemosa* were extracted by using a Soxhlet apparatus with Petroleum ether, chloroform, acetone and methanol. The final extracts were concentrated and dried whose percentage yield has been shown in table 5.1. The results of extractive values showed, the methanolic extract has higher quantity of extract (51.19 %) in comparison to other solvent extracts.

Table 4.1: Extractive values of root bark of *Ficus racemosa* by Hot Extraction.

| Sl. No. | Solvent used | Percentage of extract (% w/w) |
|---|---|---|
| 1 | Petrolium Ether | 1.20 |
| 2 | Chloroform | 2.95 |
| 3 | Acetone | 5.27 |
| 4 | Methanol | 51.19 |

**Cold Maceration Method**

The coarsely powdered root bark of *Ficus racemosa* were extracted by cold maceration method by using alcohol and chloroform water. The results of extractive values showed, the alcohol soluble extract has higher quantity of extract (51.19 %) in comparison to water soluble extract. The extractives have been shown in following table.

Table 4.2: Extractive values of root bark of *Ficus racemosa* by Cold maceration.

| Sl. No. | Solvent used | Percentage of extract (% w/w) |
|---|---|---|
| 1 | Alcohol | 52.46 |
| 2 | Chloroform Water | 21.38 |

**Antifungal Activity**

In vitro antifungal activity was examined for petroleum ether, methanol, Acetone and Chloroform extracts. Antifungal activity of plant part extracts against three pathogenic fungi were investigated by the agar disk diffusion method. Each purified extracts were dissolved in dimethyl sulfoxide, sterilized by filtration using sintered glass filter, and stored at 4°C. For the determination of zone of inhibition, pure fungal strains were taken as a standard antibiotic for comparison of the results. All the extracts were screened for their antifungal activities against *Candida albicans*, *Aspergillus niger*, and *Aspergillus clavatus*. The sets of four dilutions (100, 200, 300, 400 µg/ml) of *Ficus racemosa* extract and standard drug griseofulvin (25, 50, 785, 100 µg/ml) were prepared in double distilled water using nutrient agar tubes. Mueller-Hinton sterile agar plates were seeded with indicator bacterial strains (108 cfu) and allowed to stay at 37º C for 3 hours. The zones of growth inhibition around the disks were measured after 48 to 96 hours for fungi at 28°C. The sensitivities of the microorganism species to the plant extracts were determined by measuring the sizes of inhibitory zones (including the diameter of disk) on the agar surface around the disks.

The methanolic extract of *Ficus racemosa* showed the antifungal activity against *Candida albicans*, *Aspergillus niger*, and *Aspergillus clavatus*. The highest zone of inhibition of petroleum ether, chloroform and Acetone extract of *Ficus racemosa* showed at a concentration of 400µg/ml.

| Table 5.5: Antibacterial activity of different extract of *Ficus Racemosa* | | | | |
|---|---|---|---|---|
| **Treatment** | **Dose** | **Zone of inhibition (mm)** | | |
| | | ***C. albicans*** | ***A. niger*** | ***A. clavatus*** |
| **Negative Control (DMSO + microorganism)** | - | - | - | - |
| **Positive Standard (griseofulvin + microorganism)** | 25 µg/ml | 14 ± 0.23 | 16 ± 0.13 | 12 ± 0.33 |
| | 50 µg/ml | 08 ± 0.14 | 20 ± 0.36 | 07 ± 0.29 |
| | 75 µg/ml | 11± 0.29 | 21 ± 0.32 | 07 ± 0.51 |
| | 100 µg/ml | 16 ± 0.11 | 22 ± 0.18 | 09 ± 0.23 |
| **PFR** | 100 µg/ml | 0 | 0 | 0 |
| | 200 µg/ml | 03 ± 0.18 | 0 | 03 ± 0.12 |
| | 300 µg/ml | 05 ± 0.36 | 03 ± 0.38 | 06 ± 0.14 |
| | 400 µg/ml | 06 ± 0.26 | 05± 0.33 | 07 ± 0.49 |
| **CFR** | 100 µg/ml | 0 | 0 | 0 |
| | 200 µg/ml | 03 ± 0.16 | 0 | 0 |
| | 300 µg/ml | 06 ± 0.24 | 04 ± 0.35 | 03 ± 0.19 |
| | 400 µg/ml | 09 ± 0.38 | 08 ± 0.32 | 07 ± 0.43 |
| **AFR** | 100 µg/ml | 0 | 0 | 01± 0.35 |
| | 200 µg/ml | 03 ± 0.46 | 07± 0.37 | 05± 0.47 |
| | 300 µg/ml | 07± 0.19 | 09± 0.42 | 07± 0.24 |
| | 400 µg/ml | 10 ± 0.19 | 11 ± 0.74 | 08 ± 0.36 |
| **MFR** | 100 µg/ml | 02± 0.28 | 03± 0.18 | 02± 0.42 |
| | 200 µg/ml | 05 ± 0.26 | 09± 0.31 | 04± 0.27 |
| | 300 µg/ml | 09± 0.17 | 12± 0.62 | 07± 0.54 |
| | 400 µg/ml | 12 ± 0.39 | 15 ± 0.44 | 09 ± 0.26 |
| **PFR: Petroleum ether of *Ficus racemosa*, CFR: Chloroform extract of *Ficus racemosa*, AFR: Acetone extract of *Ficus racemosa*, MFR: Methanol extract of *Ficus racemosa*** | | | | |

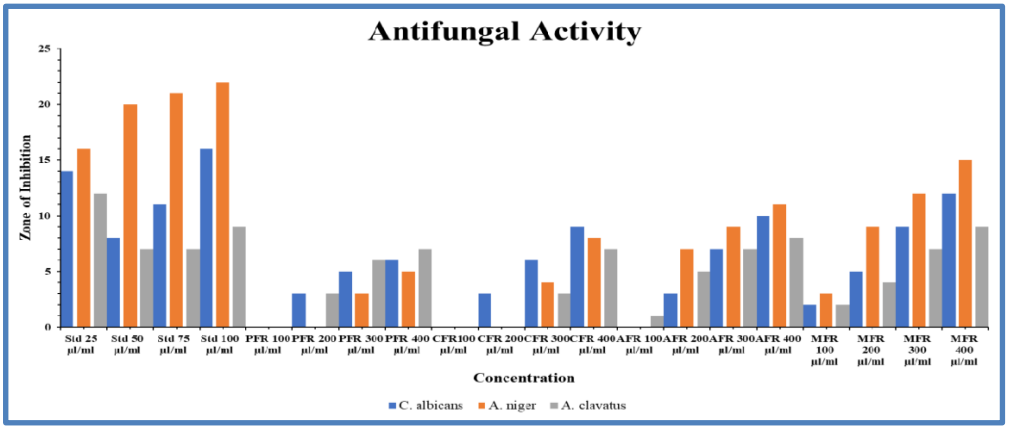


Fig 4.1: Antifungal activity of *Ficus racemosa*

## CONCLUSION

The Ficus Racemosa root bark extract show excellent result in Antifungal Activity. formulations are the most preferred approach in improving patient convenience, drug therapy and safety. In the present investigation, an attempt was made to formulate an antifungal gel of Ficus Racemosa by using the plant's root bark. This Ficus Racemosa antifungal gel is very effective in treat the fungal infections.

Hance it is prove as a very good effective safe and easy available antifungal gel which can available in very low price and able to serve the patients with most benefit.

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