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Study on Antifungal Potential of Medicinal Plant Extracts against Candida Albicans

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ABSTRACT

The present investigation assessed the antifungal effects of selected medicinal plant extracts against Candida albicans, an opportunistic fungal organism associated with infections such as oral candidiasis. The growing occurrence of resistance to commonly used antifungal medicines has increased interest in alternative sources of antifungal agents. Medicinal plants contain diverse bioactive constituents, including alkaloids, flavonoids, tannins, and terpenoids, many of which are reported to possess antimicrobial properties.

Fresh leaves were collected, processed, and used for preparation of plant extracts by standard extraction procedures. Their antifungal activity was examined by the agar well diffusion technique on Sabouraud Dextrose Agar (SDA) plates inoculated with Candida albicans. Antifungal effectiveness was assessed from the diameter of the inhibition zone following incubation at 37°C for 24 hours.

Jatropha produced the largest inhibition zone among the tested extracts, measuring 22 mm. Colocasia esculenta produced a 15 mm zone, whereas Coriandrum sativum and Santalum album each produced a 14 mm zone. Other tested extracts displayed moderate activity or no detectable inhibitory effect. Differences in activity may be associated with variation in the phytochemical composition of the plants.

Overall, the findings indicate that selected medicinal plant extracts may possess useful antifungal activity and could be investigated further as complementary sources of agents against Candida albicans-associated fungal infections.

KEYWORDS

Candida albicans, antifungal activity, medicinal plants, plant extracts, agar well diffusion method, oral candidiasis, phytochemicals

1. INTRODUCTION

Candida albicans is an opportunistic fungal pathogen that can exist as part of the normal human microbiota. Under favorable conditions, particularly when host defenses are reduced, the organism can multiply and produce infection. It is an important cause of oral candidiasis, in which infection of the oral cavity may be associated with discomfort, inflammation, and other

complications. Factors such as prolonged antibiotic exposure, diabetes, immunosuppression, and inadequate oral hygiene can increase the risk of candidiasis.

Conventional management of fungal infections commonly relies on antifungal medicines, including drugs belonging to the azole and polyene groups. The occurrence of strains with reduced susceptibility to antifungal treatment can limit therapeutic effectiveness. In addition, adverse effects associated with some synthetic antifungal agents may restrict their prolonged use. These concerns have encouraged investigation of natural products as possible sources of antifungal compounds.

Medicinal plants have a long history of use in traditional systems of medicine. Their therapeutic effects are associated with a variety of secondary metabolites, including alkaloids, flavonoids, tannins, phenolic compounds, and terpenoids. Such constituents may contribute to antimicrobial and antifungal effects. Plant-derived preparations may also offer practical advantages related to availability and cost, although their safety and clinical effectiveness require appropriate evaluation.

The objective of the present study was to examine the antifungal activity of selected plant extracts against Candida albicans. The study particularly sought to identify plant extracts showing measurable inhibition of fungal growth and to compare their observed zones of inhibition.

2. MATERIALS AND METHODS

2.1 Study Area

The present study was conducted in the microbiology laboratory under aseptic conditions. The plant materials used in this study were collected from the herbal garden of Shri Krishna University and nearby surrounding areas. The selected plants were chosen based on their medicinal importance and availability.

2.2 Materials

The following materials were used during the experimental work:

- Sabouraud Dextrose Agar (SDA)
- Nutrient Agar
- Nutrient Broth
- Sterile distilled water
- Fresh plant leaves
- Sterile Petri plates
- Cotton swab

2.3 Instruments

The instruments used in the study include:

- Incubator
- Autoclave
- Centrifuge
- Laminar airflow chamber
- Microscope

2.4 Collection of Plant Material

Fresh leaves from different medicinal plants were obtained from the university herbal garden and surrounding locations. The collected material was washed thoroughly with distilled water to remove adhering dust and impurities and was subsequently air-dried at room temperature.

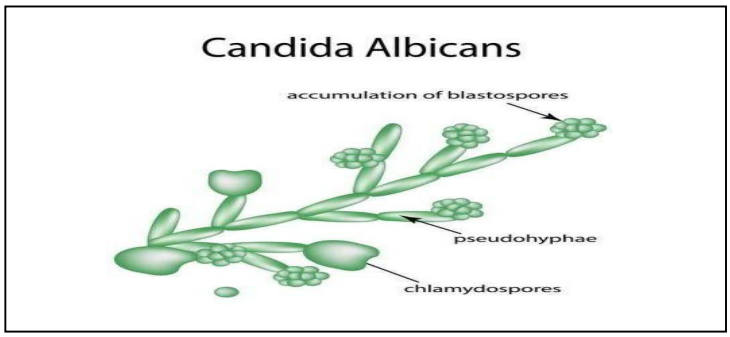
2.5 Preparation of Plant Extract

The cleaned plant leaves were cut into small pieces and ground into a fine paste using a mortar and pestle. The paste was filtered through muslin cloth to obtain the crude extract. The filtrate was then centrifuged to remove solid debris, and the clear supernatant was collected. The extracts were stored at 4°C for further use.

2.6 Candida albicans

2.6.1 Introduction:

Candida albicans is an opportunistic pathogenic yeast that forms a part of the normal microflora of humans. It is commonly found in the oral cavity, gastrointestinal tract, skin, and genital mucosa without causing any harm under normal conditions. However, when the host immune system is weakened or the normal microbial balance is disturbed, Candida albicans can proliferate excessively and lead to infections collectively known as candidiasis.



2.6.2 Mode of Infection

Infection caused by Candida albicans generally occurs due to endogenous overgrowth rather than external transmission. Various predisposing factors contribute to its infection, including prolonged use of broad-spectrum antibiotics, immunosuppression, diabetes mellitus, hormonal imbalance, and poor hygiene. These conditions disrupt the normal microbial flora, allowing *Candida albicans* to multiply rapidly and invade host tissues.



2.6.3 Distribution in Human Body

Candida albicans is commonly present in the following parts of the human body:

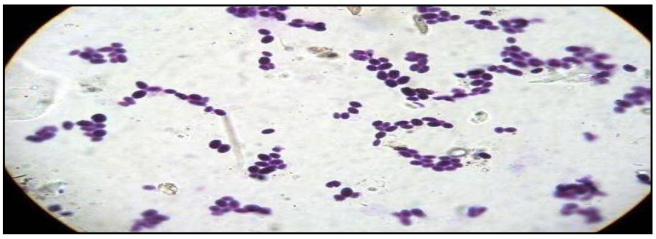
- Oral cavity (leading to oral thrush)
- Gastrointestinal tract
- Skin, especially moist areas
- Female genital tract (causing vaginal candidiasis)
- Bloodstream and internal organs in severe systemic infections

2.6.4 Diseases Caused by Candida albicans

- Oral candidiasis (thrush)
- Vulvovaginal candidiasis
- Cutaneous candidiasis
- Invasive/systemic candidiasis (in immunocompromised patients)

2.7 Isolation and Identification of *Candida albicans*

Candida albicans culture was obtained from the microbiology laboratory and maintained on *Sabouraud Dextrose Agar (SDA)* medium. The fungal culture of *Candida albicans* was subcultured and preserved under suitable laboratory conditions. The organism was identified

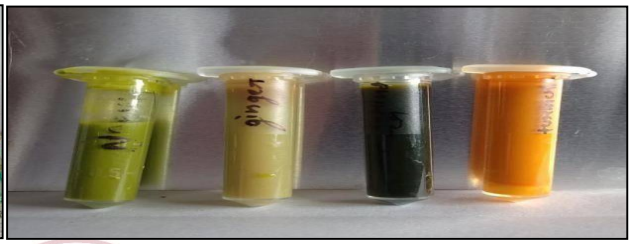


based on colony morphology and microscopic examination using standard microbiological method.

2.8 Antifungal Activity (Agar Well Diffusion Method)

Antifungal activity was tested by the agar well diffusion technique. SDA plates were prepared and inoculated with Candida albicans using a sterile cotton swab. Wells were created in the agar with a sterile cork borer, after which the respective plant extracts were introduced into the wells. The inoculated plates were incubated at 37°C for 24 hours. Following incubation, activity was assessed by measuring the diameter of the clear zone surrounding each well.





2.9 Statistical Analysis

The antifungal activity was expressed in terms of the diameter of the zone of inhibition (in millimeters). The results obtained were compared to determine the effectiveness of different plant extracts.

3. RESULTS

The antifungal activity of different plant extracts against *Candida albicans* was evaluated using the agar well diffusion method. The effectiveness of each extract was determined by measuring the diameter of the zone of inhibition (in mm) after incubation.

Table 1: Antifungal Activity of Plant Extracts

S. No.	Plant Name	Zone of Inhibition (mm)	Plant Photo	Plate Photo	Activity Level
1.	*Jatropha*	22 mm			High

2.	*Colocasia esculenta*	15 mm			Moderate
3.	*Coriandrum sativum*	14 mm			Moderate
4.	*Santalum album*	14 mm			Moderate

3.1 Explanation of Results

The experimental observations demonstrate that the tested plant extracts differed in their ability to inhibit Candida albicans. Jatropha showed the largest measured inhibition zone, with a diameter of 22 mm. Colocasia esculenta, Coriandrum sativum, and Santalum album produced moderate inhibition, with measured zones of 15, 14, and 14 mm, respectively. Ruta graveolens, curry leaves, and Moringa oleifera showed comparatively lower activity, while some extracts produced no observable inhibition.

The differences observed among the plant samples may be related to variation in the type and concentration of bioactive phytochemicals present in the extracts. Constituents such as alkaloids, flavonoids, and phenolic compounds may contribute to the antifungal response, although the present experiment did not separately identify or quantify the individual active compounds.

4. CONCLUSION

The present investigation showed that the medicinal plant extracts examined in this study were not equally effective against Candida albicans. Jatropha produced the greatest zone of inhibition at 22 mm, while Colocasia esculenta, Coriandrum sativum, and Santalum album showed moderate inhibitory responses. Other tested plants displayed lower or undetectable activity.

The observed antifungal effects may be associated with bioactive constituents such as alkaloids, flavonoids, tannins, and phenolic compounds. The findings support further investigation of medicinal plant extracts as potential sources of complementary antifungal agents. However, purification and characterization of active constituents, toxicity assessment, and appropriate clinical studies are necessary before therapeutic claims can be established.

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