

# Antifungal activity of *Acacia catechu* bark extract against dermatophytes: An *in vitro* study

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## ABSTRACT

The objective of the study is to evaluate *in-vitro* antifungal activity of *Acacia catechu* against three human pathogenic fungi; *Trichophyton rubrum*, *Microsporum gypseum*, and *Epidermophyton floccosum*. *A. catechu* an evergreen tree which possess lots of medicinal value. It exhibits diverse pharmacological actions such as hepatoprotective, antibacterial, antifungal, anti-inflammatory, and antioxidant activity. The herbal extract was tested against various concentrations adopting agar well diffusion method. The antidermatophytic activity indicated that the extract was ineffective and did not show any activity.

**Keywords:** *Acacia catechu*, antifungal, dermatophytes, zone of inhibition

## Introduction

Dermatophytes are a group of filamentous fungi that cause infections of the skin. Diseases caused by dermatophytes include athlete's foot, ringworm, and nail infections. Dermatophyte infections in immune compromised patients can be quite severe.<sup>[1,2]</sup> Dermatophytes are fungi that require keratin for growth. The organisms colonize the keratin tissues and inflammation is caused by host response to metabolic by-products.<sup>[3-5]</sup> These infections are long lasting and are difficult to treat.<sup>[6]</sup>

The incidence of dermatophytic infections has increased in the past decades. Dermatophytes are responsible for serious human pathogenic disorders in various parts of the world. The incidence of these infections are more in tropical countries, their humid climate, population, and poor hygiene make an ideal condition for the growth of these organisms. Although control measures are available, they have limited effectiveness. Conventional antifungal agents such as chlorhexidine and imidazole derivatives have limited uses. Due to their common side effects such as hepatotoxicity, nausea, diarrhea and impotency, the use is restricted in pregnant and the young people.<sup>[7-9]</sup>

Dermatophytic infections can be treated either topically or systemically; the method chosen will depend on the type

of infection, the severity of the infection, and the patient's preferences.<sup>[10]</sup>

*Acacia catechu* commonly known as karungali in Tamil and khadira in Sanskrit is an evergreen tree with lots of nutritional and medicinal value. People in Kerala consume karungali water for relieving digestive disorders.<sup>[11-15]</sup> It exhibits diverse pharmacological effects such as antibacterial, antioxidant, hepatoprotective, anti-inflammatory, antiviral, analgesic, antipyretic, antiulcer, anticancer activity. The phytochemical constituents such as epigallocatechin, epicatechin, rutin, quercetin present in it produces antibacterial and antioxidant effects.<sup>[16-22]</sup>

Keeping this in view, this study was designed to evaluate the *in vitro* anti-dermatophytic activity of *Ficus racemosa* against *Microsporum gypseum*, *Trichophyton rubrum*, and *Epidermophyton floccosum*.

## Materials and Methods

### Plant material

*A. catechu* willd. bark (AAE/9007) was collected from Hosur, Tamil Nadu, and was authenticated by Dr. H. B. Singh, raw materials herbarium and museum, NISCAIR, New Delhi. The voucher specimen is preserved for further use in Green Chem Lab, Bengaluru.

### Ethanollic extraction

Barks were shade dried for a week. Dried barks were milled to fine powder. Powder was passed through 100 mesh sieve and stored in a sealed polythene bag. 2.5 kg of powdered *A. catechu* bark were extracted with 10 L of ethanol, at 65°C temperature, for 1 h, in a 20 L round bottom flask with Graham condenser attached. Condenser

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was cooled circulating with chilled water. After 1 h of extraction, round bottom flask was cooled to room temp and the extract was filtered and collected. The Marc was extracted repeatedly with 10 L of ethanol, twice. The extracts were filtered and collected. The combined extracts were evaporated to dryness under reduced pressure in a Buchi Rotary Evaporator (Switzerland) at 65°C, to obtain 150 g of powder extract. The w/w yield of the prepared extract was 6%. The extract was stored at 4°C until used.

## Fungal cultures

Three fungal pathogens used were procured from the Institute of Microbial Type Culture Collection (MTCC), Chandigarh, viz., *M. gypseum* MTCC No. 2819, *T. rubrum* MTCC No. 296, and *E. floccosum* MTCC No. 613 and are maintained in Sabouraud dextrose agar.

## Antifungal activity

### Well diffusion method

On sterile plates containing Sabouraud dextrose agar, the fungal cultures were swabbed. Wells of 6 mm diameter were bored in each plate. The wells were filled with varying concentrations of the sample. The plates were incubated at 28°C for 72 h for evaluation. The diameter of inhibition zones formed around the wells was measured in millimeter. The study was performed in duplicates for all the samples.<sup>[23]</sup>

## Results and Discussion

*M. gypseum* has been described as causing subcutaneous mycosis in humans and has been associated with opportunistic infections occurring in patients with human immunodeficiency virus.<sup>[24-26]</sup>

*E. floccosum* is an anthropophilic dermatophyte worldwide in distribution. Humans and animals act as a host for this dermatophyte and the infection spreads by contact. These dermatophytes affect the cornified layers of epidermis. Their infection is more aggressive in immune compromised individuals.<sup>[27-29]</sup>

*T. rubrum* is an anthropophilic saprotroph. They are usually restricted to the upper layers of epidermis, deeper infections may also occur. They manifest as both acute and chronic infections affecting men more commonly than women; these infections are known to form folliculitis which is characterized by foreign body giant cells and fungal elements. In patients with immune deficiency extensive granuloma formation is seen.<sup>[30,31]</sup>

The study shows that there is no significant antifungal activity while testing against three dermatophytes, in which the *M. gypseum*, *E. floccosum* is most commonly affecting human and animal (Table 1).

## Conclusion

Dermatophytoses are refractory to treatment, and the spectrum of antifungal for treating dermatophytoses is narrow. However, we suggest that *A. catechu* bark extract do not exhibit pharmacological

**Table 1: Antifungal activity of *Acacia catechu* against dermatophytes**

Micro organism	15 mg/ml	25 mg/ml	50 mg/ml
<i>Microsporum gypseum</i>	No activity	No activity	No activity
<i>Epidermophyton floccosum</i>	No activity	No activity	No activity
<i>Trichophyton rubrum</i>	No activity	No activity	No activity

effects and could not be employed in management of cutaneous infections.

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