

Antifungal activity of methanolic extracts of *Adansonia digitata* L. a globally endangered tree species

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Abstract — *The species of Adansonia digitata L. (Baobab) is an important multipurpose tree found to possess enormous range of medicinal properties. The present work has been under taken to study the antifungal activity of different extracts of A. digitata against pathogenic fungi. Antifungal activity of methanolic extracts of leaf, flower and fruit wall extracts of A. digitata has been analyzed to find out their activity against pathogenic fungi viz., Aspergillus and Penicillium. The activity of the extracts of different plant parts against both fungal strains was screened through agar well diffusion technique by using minimum inhibitory concentration (MIC) method. According to our observations, all the extracts of A. digitata exhibited antifungal activity against both the pathogenic fungi under study. Among the various extracts bark, seed, fruit wall extracts have shown more resistance towards the pathogenic fungi followed by leaf and floral extracts of A. digitata. Thus, based on our observations, the species A. digitata can be used as a potential source of antifungal agent for the treatment of various infectious diseases.*

Keyword — *A. digitata, methanolic extracts, pathogenic fungi, MIC.*

1. INTRODUCTION

The plant kingdom has provided a variety of compounds of known therapeutic properties, such as analgesics, anti-inflammatory etc. In recent years, antimicrobial properties of plant extracts have been reported with increasing frequency from different parts of the world [1]. Several works have demonstrated in laboratory trials that different parts of the plant, such as roots, leaves, flowers, seeds and bark possess inhibitory properties against bacteria, fungi and insects [2]-[4].

Fungi are ubiquitous in nature and are the main causative agents for many infectious diseases to

human as well as to animals and are becoming more resistant to conventional antimicrobial agents, thus making way for the search of new control strategies, so the utilization of natural antimicrobials may lead to an alternative therapy for traditional communities. Therefore, it is necessary to search for more effective and less toxic antifungal agents with fewer disadvantages [5]. Several species of *Aspergillus* and *Penicillium* are saprophytic and found to cause occasional pathogenicity to humans or domestic animals and in indoor environments cause allergy quite frequently due to the production of mycotoxins.

Medicinal plants are considered to be a valuable source for the discovery of new antifungal drugs and are used in traditional systems of medicine for the treatment of both human and animal mycoses [6]-[8]. There are many synthetic and natural product-based drugs available for treating fungal infections, but they are not consistently effective [9]-[11]. In developing countries, especially among rural populations, because of poverty and lack of access to modern medicine, traditional medicine remains a vital health resource in providing primary healthcare [12]. In folk medicine, plants are widely employed in the treatment of many ailments for the communities with inadequate conditions of public health and sanitation. The antimicrobial compounds produced by plants are active against plant and human pathogenic microorganisms [13].

Antibiotics have emerged as most important tools in the treatment of infectious diseases caused by microbes and have improved the human life, since their emergence. However, due to their continuous usage, disease causing pathogens have developed resistance towards commonly used antibiotics. And over the past few decades, antibiotics have lost potency or least effective against certain infectious diseases, and paved a way for the emergence of drug-

resistant bacteria. Now it has become essential to search for novel potent drugs to combat various infectious illnesses. Traditional medicine is one of the primary healthcare systems in many developing countries, which includes herbal medicine that employs application of drugs derived from natural origin, thus medicinal plants play a pivotal role in the prevention and treatment of many infectious diseases.

In view of the above, the present investigation has been taken up to study the antifungal activity of different parts of the tree species of *Adansonia digitata* L. (Baobab). It belongs to the family Bombacaceae, is a medicinally important and globally endangered with wide range of medicinal properties such as antibacterial, antioxidant, anti-inflammatory, analgesic, antipyretic, anti-dysenteric, anti-diarrhoea and excipient properties [14]-[18].

The present investigation is aimed at evaluation of *in vitro* antifungal activity of extracts of different parts of *A. digitata* against two disease causing pathogens viz., *Aspergillus* and *Penicillium*.

2. MATERIALS & METHODS

2.1. Plant Material

Collection of Plant material

The different parts of the plant, i.e., leaves, flowers, fruits and bark were collected from the tree growing at DKW College for Women, Nellore, Nellore District, and Andhra Pradesh, India. The plant material (leaves, flowers, fruit wall, seeds, and stem bark) was washed thoroughly with distilled water and was shade dried for 45 days. Each sample of the material was ground separately into fine powder and stored in air tight containers at ambient temperature until use. The hard fruit wall was broken to collect the fruit pulp and seeds. They were powdered and subjected to cold extraction using methanol in the shaking condition. The shade dried powder (25gm) was used for the extraction with 150 ml 80% methanol for 24 hours by Soxhlet equipment and filtered through 0.45 µm membrane filter. This filtrate was evaporated under reduced pressure and dried in a rotator evaporator at 55°C. Dried extracts were stored in screw cap bottles at -20°C separately and used as stock.

3. ANTIFUNGAL ACTIVITY

Antifungal activity of the extracts of *A. digitata* was tested using MIC method. The test organisms were supplied by the Department of Microbiology, Kakatiya Medical College, Warangal. For the present study *Aspergillus* and *Penicillium* were used. These organisms were sub cultured on nutrient agar slants and stored at 4°C in a refrigerator until use for screening antifungal activity.

For well diffusion method, the (5x10⁵ cells (CFU) of the test fungal strain) culture (0.1ml) was

swabbed on top of the solidified medium and allowed by drying for 15 min. Wells were punched in the nutrient agar plates using sterile cork borer. 100µl of crude extract in DMSO was added into the wells and plates were incubated at 37°C for 72 hrs.

4. DATA ANALYSIS

The experiment was repeated thrice with three replicates. Zone of inhibition (ZI) was measured with Hi media antibiotic scale. Sensitivity of organisms to antimicrobials was quantified by the minimum concentration required to inhibit their growth (minimum inhibitory concentration, MIC). The values expressed were obtained from three independent experiments.

5.1. FIGURES AND TABLES

Table-1: Antifungal activity of methanol extracts of different parts of *A. digitata*

Test Organism	MIC (in mm)				
	Leaf extract	Floral extract	Fruit wall extract	Seed extract	Bark extract
<i>Aspergillus</i>	15.92	8.75	12.40	12.0	42.0
<i>Penicillium</i>	18.25	12.80	24.50	32.0	43.0

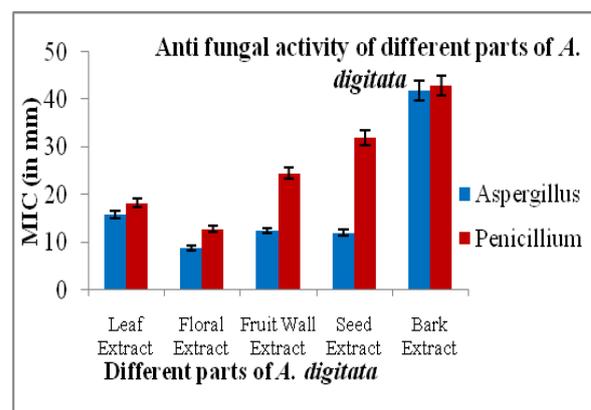


Fig.1: Showing antifungal activity of methanol extracts of different parts of *A. digitata*.

6. RESULTS AND DISCUSSION

In the present investigation, antifungal activity of methanol extracts of leaf, flower and fruit wall of *A. digitata* has been studied to find out their activity against pathogenic fungi viz., *Aspergillus* and *Penicillium*. The results obtained from the investigations on extracts of stem, leaf, flower, bark and seed are presented in **Table-1** and **shown in Fig.1**.

It is evident from our results that the methanol extracts of all the plant parts of *A. digitata* have shown inhibiting activity against both the pathogens tested. Among the various extracts bark, seed, fruit wall extracts have shown more resistance towards the pathogenic fungi followed by leaf and floral extracts of *A. digitata*.

Antifungal activity of many plant species have been investigated and found to be useful [19], [20]. The advantage of phytomedicine is that they make use of plant extracts in the treatment of many infectious diseases because of possession of a combination of different secondary metabolites that may work in synergism to inhibit growth of phytopathogenic fungi, thus help in alleviation of infections [21].

A. digitata is a multipurpose tree species known to be rich in secondary metabolites and found to possess enormous range of medicinal properties [22], [23]. In our present study we found that methanol extracts of different parts such as leaves, flowers, fruit wall, seeds, and stem bark of *A. digitata* showed antifungal activity against both pathogenic fungi tested. Thus, in present scenario there is an urgent need to investigate plants as many as possible in order to find out their potential against disease causing pathogens.

7. CONCLUSION

Based on our present investigation, it can be concluded that the extracts of different parts of the globally endangered tree species *A. digitata* showed resistance against pathogenic fungi viz., *Aspergillus* and *Penicillium*, hence may be employed in the synthesis of antimicrobial compounds used in the treatment of various infectious diseases.

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