

## ANTIMICROBIAL ACTIVITIES OF SYZYGIUM CUMINI LEAF AND BARK EXTRACTS

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### ABSTRACT

Screening of medicinal plants for bioactive compounds is useful to develop drugs with improved safety and efficacy. The available literature about *Syzygium cumini* revealed the multiple health benefits of this multipurpose tree. The aim of the present study was to investigate the antimicrobial activities of *Syzygium cumini* leaf and bark prepared using ethanol and methanol. The antimicrobial activities were evaluated by the disc diffusion method. Both leaf and bark extracts prepared using ethanol and methanol were found to be effective in inhibiting the growth of bacteria whereas the extracts were ineffective in inhibiting the growth of fungi.

**KEYWORDS:** Medicinal plants, *Syzygium cumini*, leaf and bark extracts, antimicrobial activities.

### INTRODUCTION

Drug resistance is a serious global problem, and spread of resistance poses additional challenges for clinicians and the pharmaceutical industry. Our nature has provided us with rich wealth of compounds and hence can be considered as a store house of remedies as they can cure all ailments of mankind. Traditional plants as a source of medicines in treating various diseases has been in use from ancient times.<sup>[1]</sup> Researchers are continuously engaged in studying the medicinal plants as they are rich source of novel drugs which form the basis in traditional medicine, nutraceuticals, pharmaceutical intermediates and lead compounds in

synthetic drugs.<sup>[2]</sup> Roughly 50,000 species of higher plants have been used medicinally. These herbs or plants and their active ingredients are used in traditional herbal remedies. The major benefits of using herbal medicines lie in their efficacy, low cost and low incidence of serious adverse effects.<sup>[3]</sup>

*Syzygium cumini* is native to the tropics and belongs to the family Myrtaceae. It has a worldwide distribution. It is commonly known as jamun, jambolan, black plum, Indian black berry etc. Plants belonging to this family are reported to be rich in volatile oils and as well for their use in medicine.<sup>[4]</sup> *Syzygium cumini* is well known for its anti-diabetic values.<sup>[5]</sup> The various parts of this plant have wide applications in traditional medicines throughout tropical and sub tropical regions.<sup>[6]</sup> The fruits of this plant have been used for a variety of ailments that includes diabetes, inflammations, cough, ring worm infections, dysentery etc.<sup>[6]</sup> As well, the other parts of this plant like - leaves, bark etc were found to have anti oxidant, anti bacterial, anti HIV, anti leishmanial and anti fungal activities.<sup>[7]</sup>

The main objective of the current study was to investigate the antimicrobial activities of leaf and bark extracts of *Syzygium cumini* prepared using ethanol and methanol.

## MATERIALS AND METHODS

### Samples and preparation of samples

#### Plant material

The plant (*Syzygium cumini*) leaves and bark were collected from Krishna University Dr MRAR PG Centre campus, Nuzvid. Leaves were washed and shade dried for one week. The dried leaves were then crushed into fine powder and then used for further study.

#### Solvent extraction

Solvent Extraction is the first step in the analysis of medicinal plants, because it is necessary to extract the desired chemical components from the plant materials for further separation and characterization. Leaf and Bark extracts were prepared by adding 0.5gm of dried powder into 10ml of organic solvents (ethanol & methanol) kept at room temperature for 24 hrs to 78 hrs. The filtrate was then collected by filtering the mixture using Whatman filter paper No.1 and stored at 4 °C until further use.

**Test organisms (source): Bacteria** – Bacteria isolated from soil by inoculating soil samples on Nutrient Agar medium were used as Test organisms. The soil sample was collected from local Government hospital to ensure the presence and growth of pathogenic bacteria.

**Fungi:** Standard fungal species available in the lab such as *Aspergillus niger* and *Aspergillus flavus* were used as Test fungi.

### Antimicrobial activity

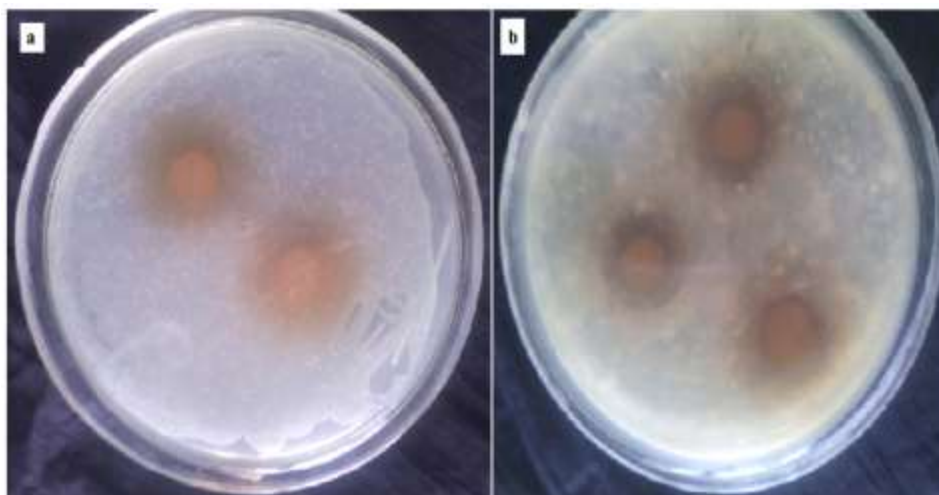
The ethanolic and methanolic extracts of leaf and bark were tested for the antimicrobial activities against soil bacteria and fungi such as *Aspergillus niger* & *Aspergillus flavus*. Antimicrobial activity was carried out by Disc diffusion method. Whatman filter paper (No. 1) was cut into small discs and the discs were incubated in the corresponding extract for 1 hour before placed onto the petriplate. The plates were incubated for overnight to study antibacterial activities and for a period of 72 hrs to study anti fungal activities.

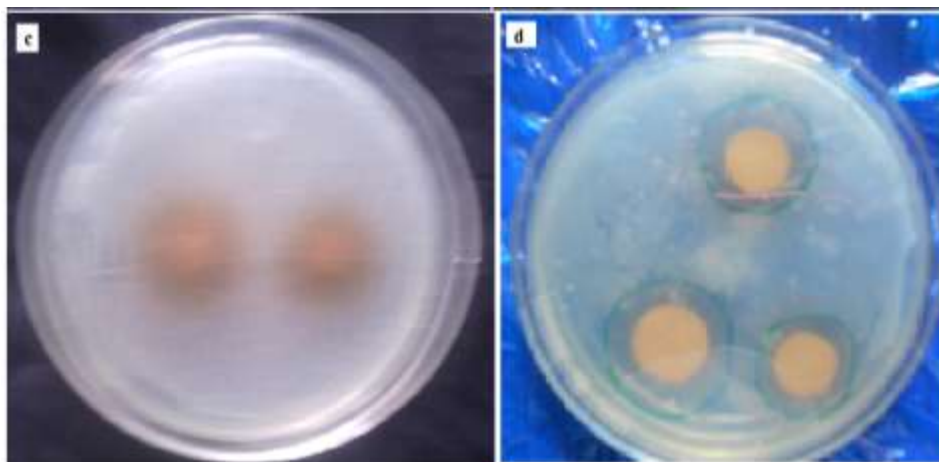
The antimicrobial activity was observed in terms of zone of inhibition around the disc produced by respective extract.

## RESULTS

### Antibacterial activity of *Syzygium cumini* leaf and bark extracts

Leaf and Bark extracts of *Syzygium cumini* prepared in solvents (ethanol and methanol) were tested for the antibacterial activity against soil bacteria. The antibacterial activity of the extract was assessed by the presence or absence of zone of inhibition. Both leaf and bark extracts of *S. cumini* exhibited significant antibacterial activity as is evident by a clear zone of inhibition around the discs (Fig. 1).



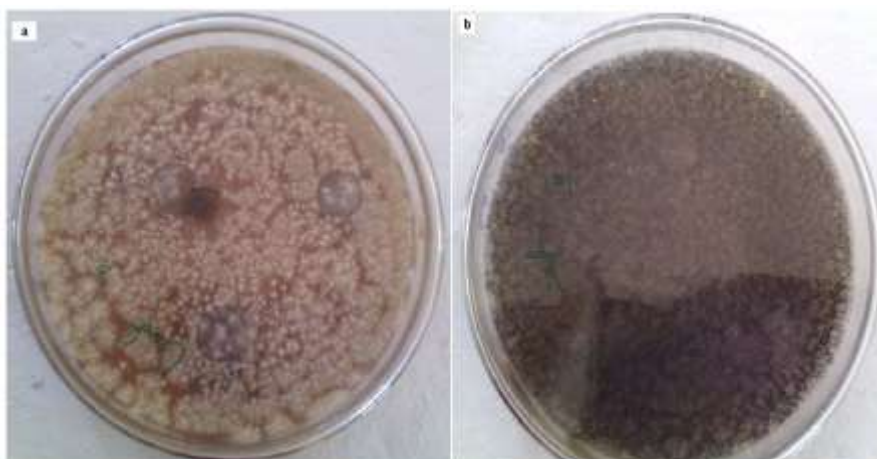


**Fig. 1** Anti bacterial activities of *S.cumini* leaf and bark ethanolic & methanolic extracts

a) antibacterial activity of ethanolic extract of *Syzygium cumini* leaf b) antibacterial activity of methanolic extract of *Syzygium cumini* leaf c) antibacterial activity of ethanolic extract of *Syzygium cumini* bark d) antibacterial activity of methanolic extract of *Syzygium cumini* bark

#### **Antifungal activity of *Syzygium cumini* leaf and bark extracts**

Leaf and Bark extracts of *Syzygium cumini* prepared in solvents (ethanol and methanol) were tested for the antifungal activity against *Aspergillus flavus* and *Aspergillus niger*, the fungal strains that are available in the lab. The antifungal activity of the extract was assessed by the presence or absence of zone of inhibition. Lack of clear zone of inhibition around the discs indicates that the ethanolic and methanolic extracts of *Syzygium cumini* do not possess antifungal activities (Fig. 2).



**Fig. 2** Antifungal activities of *S. cumini* leaf and bark ethanolic and methanolic extracts

a) antifungal activity of ethanolic & methanolic extracts of *Syzygium cumini* leaf and bark against *Aspergillus flavus* b) antifungal activity of ethanolic & methanolic extracts of *Syzygium cumini* bark against *Aspergillus niger*.

## DISCUSSION

Antibiotic resistance is a major concern. The frequent use and misuse of drugs resulted in the development of resistance among microorganisms against drugs. Plants are gaining the attention of researchers as low cost alternatives to industrially produced antibiotics owing to their rich wealth of medicinal compounds. Hence development of new agents from plants could be useful in meeting the demand for new antimicrobial agents with improved safety and efficacy. Plant derived drugs are also occupying a major share in various health systems *viz.*, Ayurveda, yoga, unani, siddha, homeopathy and naturopathy, except allopathy.<sup>[8]</sup> Plant derived metabolites have been of great interest to mankind since long time due to their pharmacological relevance.<sup>[9]</sup> As per WHO's report more than 80% of the world's population are relying on plants to meet their primary health care needs.<sup>[10]</sup>

The current work is mainly focused to find out the antimicrobial activity of ethanolic and methanolic extracts of *S. cumini* leaf and bark. Most of the available literature shows the antidiabetic nature of compounds isolated from *S. cumini*. But *Syzygium cumini* is also a good resource of bioactive compounds due to its content of various phytochemicals. In support of this our study focused on the extraction of antimicrobial compounds from the leaf and bark of *S. cumini* using ethanol and methanol. In our study, we found that both ethanolic as well as methanolic extracts of *Syzygium cumini* leaf and bark were efficient in inhibiting the growth of bacteria present in the soil sample. Gowri and Vasantha have reported antimicrobial activity of *S. cumini* leaves in methanol extract due to presence of tannin and other phenolic compounds.<sup>[11]</sup> The antibacterial activity with *Syzygium cumini* seeds ethanolic extracts that decreased blood sugar level in alloxan induced diabetic rats was also reported.<sup>[12]</sup> Shylaja et al.<sup>[13]</sup> reported that ethanolic extracts of leaves and seeds of *Syzygium cumini* showed maximum inhibitory activity against the gram positive bacterial strains. The Antibacterial, antifertility, antioxidant and antidiabetic activities with *S. cumini* extracts prepared using various parts of the plant were reported by Perumal Samy et al.<sup>[14]</sup>, Rajasekaran et al.<sup>[15]</sup>, Nikhat et al.<sup>[16]</sup>, Nikhat et al.<sup>[17]</sup>, Prince et al.<sup>[18]</sup>

The leaf and bark extracts of *Syzygium cumini* prepared using ethanol and methanol did not exhibit significant antifungal activity. Elfadil et al.<sup>[19]</sup> also reported that *Syzygium cumini* leaf extracts prepared using methanol, water and petroleum ether didn't exhibit significant antifungal activity.

From our observation, it was clear that *S. cumini* extract was active in inhibiting the growth of bacteria.

## CONCLUSION

*Syzygium cumini* is widely used for the treatment of various diseases especially diabetes and related complications. The plant harbors many pharmacologically important compounds. Most of the work with jambolan was carried out with seeds as potential antidiabetic agents but attention is also needed with regard to the pharmacological potential of the other parts of the plant. The current work is carried out to show the antimicrobial activities of the leaf and bark of *S. cumini*. From our results, it was clear that ethanolic and methanolic extracts of *S. cumini* leaf and bark were effective in inhibiting the growth of bacteria compared to fungi.

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