

Antimicrobial Activity of Different Parts of *Prosopis cineraria*

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Abstract: Objective: The Antimicrobial activity is the potential to inhibit the growth of microbes such as bacteria and fungi. The present study was carried out to investigate the antimicrobial activity present in the leaves, stem and pods of *Prosopis cineraria*. Methods: The Agar well diffusion method was used to test the antimicrobial activity of various parts of *Prosopis cineraria*. Four fungal and four bacterial strains were used as test microbes. Results: The study was revealed that all the three parts of the plant *Prosopis cineraria* showed the inhibitory zone against the microorganisms. The highest zone of inhibition was showed by *P. cineraria* pods against *P. funiculosum* (16 ± 0.92 mm) and by *P. cineraria* leaves against *S. griseus* (20 ± 1.10 mm). Conclusion: The antimicrobial activity found in the various parts of the plant may be due to the presence of secondary metabolites isolated from the plant such as flavonoids and steroids.

Keywords: Antimicrobial Activity, *Prosopis cineraria*, Microorganisms

1. Introduction

Medicinal plants have been known for millennia and are highly esteemed all over the world as a rich source of therapeutic agents for the prevention of diseases and ailments. [1] According to the World Health Organization, most populations which can not afford the products of Western pharmaceutical industries, still rely on traditional medicines for their psychological and physical health requirements [2, 3, 4]. *Prosopis cineraria* is a species of flowering tree in the pea family, Fabaceae. It is a multipurpose tree of desert in Western Rajasthan and is regarded as the backbone of rural economy. Since all the parts of the tree are useful, it is called kalptaru. It is also known as the 'wonder tree' and the 'king of desert' [1]. It is an important component of desert Ecosystem of India as biomass producer and as Leguminous tree it enriches desert soil, fixes atmospheric nitrogen and provides a green coverage [2] Plants have always been a source of natural product for the treatment of various diseases. About 70–80% of the world populations, particularly in the developing countries, rely on non-conventional medicine in their primary

healthcare as reported by the World Health Organization [3] Plants and plants products used as medicine from the ancient time. Interest in plant derived drug increases mainly due to the increasing use, and misuse of existing antibiotics which increases the development of resistance in microbes. This poses the need for search and development of new drugs to cure diseases [4]. plants may offer a new source of antibacterial, antifungal and antiviral agents with significant activity against infective microorganisms [5].

2. Material and Methods

2.1. Microorganisms Used

Clinical laboratory bacterial isolates of *Streptomyces griseus*, *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and fungal isolates viz. *Aspergillus niger*, *Fusarium oxysporium*, *Penicillium notatum* and *Trichoderma reesei* were collected from the stock cultures of Microbiology Laboratory, SMS Medical College Jaipur, India.

2.2. Collection of Sample

The plant material was collected from chimanpura, Jaipur.

Transported in bags and dried at room temperature. Each of the dried plant parts of *Prosopis cineraria* viz. Leaves, Stem and Pods were powdered weighed and defatted separately in soxhlet apparatus.

2.3. Preparation of Extract

The crude methanolic extract was obtained by macerating 30 g of dried plant powder in 95% methanol and kept on a rotary shaker for 24 h. The extract was filtered, centrifuged at 5000 g for 15 min. and was dried under reduced pressure. The extract was stored at 4°C in airtight bottles.

2.4. Determination of Antifungal Assay

Anti fungal activity of the experimental plant was investigated by agar well diffusion method (Bonjar et al, 2005). The yeasts and saprophytic fungi were subcultured onto Sabouraud's dextrose agar, SDA (Merck, Germany) and respectively incubated at 37°C for 24 h and 25°C for 2-5 days. Suspensions of fungal spores were prepared in sterile PBS and adjusted to a concentration of 10⁶ cells/ml. Dipping a sterile swab into the fungal suspension and rolled on the surface of the agar medium. The plates were dried at room temperature for 15 min. Wells of 10 mm in diameter and about 7 mm apart were punctured in the culture media using sterile glass tube. 0.1 ml of several dilutions of fresh extracts was administered to fullness for each well. Plates were incubated at 37°C. After incubation of 24 h bioactivities were determined by measuring the diameter of inhibition zone (in mm). All experiments were made in triplicate and means were calculated.

2.5. Determination of Antibacterial Assay

In vitro antibacterial activity of the crude methanol extract was studied against gram positive and gram negative bacterial strains by the agar well diffusion method (Perez et al, 1990). Mueller Hinton agar no. 2 (Hi Media, India) was used as the bacteriological medium. The extracts were diluted in 100% Dimethylsulphoxide (DMSO) at the concentrations of 5 mg/mL. The Mueller Hinton agar was melted and cooled to 48 - 50°C and a standardized inoculum (1.5×10⁸ CFU/mL, 0.5 McFarland) was then added aseptically to the molten agar and poured into sterile petri dishes to give a solid plate. Wells were prepared in the seeded agar plates. The test compound (100 µl) was introduced in the well (6 mm). The plates were incubated overnight at 37°C. The antimicrobial spectrum of the extract was determined for the bacterial species in terms of zone sizes around each well. The diameters of zone of inhibition produced by the agent were compared with those produced by the commercial control antibiotics, streptomycin. For each bacterial strain controls were maintained where pure solvents were used instead of the extract. The control zones were subtracted from the test zones and the resulting zone diameter was measured with antibiotic zone reader to nearest mm. The experiment was performed three times to minimize

the error and the mean values are presented. The photographs of antimicrobial activity against all the microbes is given in Figure 1.

3. Results and Discussion

Preliminary screening of antimicrobial potential was evaluated by using Agar well diffusion method on different extracts of dried plant parts of *Prosopis cineraria* presented in Table 1 respectively. Methanolic extract shows significant results on all pathogens whereas no activity was recorded by other extracts.

The methanolic extract of *P. cineraria* pods showed highest activity to the (fungal strains) *P. funiculosus* (16±0.92 mm) followed by *Fusarium oxysporum* (12 mm), *T. reesei* (8 mm) and no activity was observed against *A. niger*. The lowest activity was showed by stem against *Fusarium oxysporum* (4 mm) followed by *T. reesei* (10 mm), *P. funiculosus* (12mm). No activity was observed against *A. niger* by any of the part of the plant *P. cineraria*. In the present investigation the methanolic extract of *P. cineraria* (Table 1) leaves showed highest activity to the bacteria *S. griseus* (20mm) followed by *S. aureus* (18mm), *E. coli* (14mm), *B. subtilis* (10mm). Lowest activity was showed by stem to *S. aureus* and *S. griseus*, as there is no activity was observed and to *E. coli* (13 mm) was followed by *B. subtilis* (10mm).

Amongst all the fungal species *P. funiculosus* is most susceptible (16±0.92 mm) to methanolic extract of Pods of *P. cineraria* and *T. reesei* (14±0.83) to methanolic extract of leaves of *P. cineraria* while amongst all the bacterial species *S. griseus* (20±1.10) is most susceptible to methanolic extract of leaves of *P. cineraria*. Significant development of a satisfactory chemical assay for the drug has been long compared by previous lack of knowledge of the precise active principals of the drugs [8]. $P < 0.05$; $**P < 0.001$ compared with the Standard; $P < 0.001$

Table 1. Antimicrobial activities of methanolic extracts of *P. cineraria*.

Test organisms	Plant parts and inhibition zones of growth inhibition (mm)			Standard C/K
	Leaves	Stem	Pods	
Fungi				
<i>T. reesei</i>	14±0.83	10±0.53	8±0.47	20
<i>P. funiculosus</i>	11±0.61	12±0.77	16±0.92	20
<i>A. niger</i>	NA	NA	NA	20
<i>Fusarium oxysporum</i>	8±0.81	4±0.11	12±0.21	20
Bacteria				
<i>E. coli</i>	14±0.88	13±0.81	16±0.92	22
<i>S. aureus</i>	16±0.92	NA	12±0.77	22
<i>B. subtilis</i>	10±0.53	10±0.53	13±0.81	22
<i>S. griseus</i>	20±1.10	NA	10±0.53	22

Abbreviations- C=Ciprofloxacin, K= Ketoconazole
IZ = Inhibition zone (mm) excluding the diameter of disc (6mm) Mean± SE,
NA= No Activity, Values are the mean ± SEM (n = 3 replicates in each group). * $P < 0.05$; $**P < 0.001$ compared with the Standard; $P < 0.001$



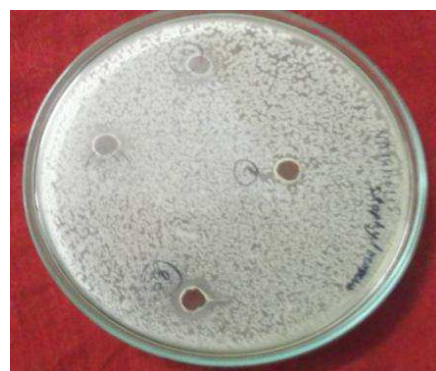
A



E



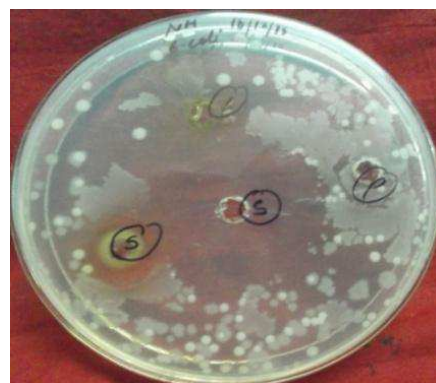
B



F



C



G



D



H

Abbreviations: L- Leaves, S-Stem, P-Pods.

Figure 1. Photographs of antimicrobial activity of Methanolic extracts of different plant parts of *P. cineraria* L.

4. Conclusion

The plant based, traditional medicine systems continues to play an essential role in health care, with about 80% of the world's inhabitants relying mainly on traditional medicines for their primary health care [9]. Recently, much attention has been directed towards extracts and biologically active compounds isolated from various plant species. Different extracts from traditional medicinal plants have been tested to identify the source of the therapeutic effects. Some natural products and other bioactive compounds have been approved as new antibacterial drugs, but there is still an urgent requirement to identify novel compounds that are active towards pathogens with high resistance.

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