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A COMPARATIVE ANALYSIS OF ANTIMICROBIAL ACTIVITY OF DIFFERENT PARTS OF *PROSOPIS CINERARIA* AGAINST SELECTED BACTERIAL SPECIES

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Abstract – The antibacterial activity of the methanol and aqueous extracts of the leaf, bark and seeds of *Prosopis cineraria* was evaluated by the disc diffusion method. For antibacterial activity, aqueous and methanol extracts were tested for its antibacterial activity against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa.* The study revealed that all the three plant parts extracts of *Prosopis cineraria* showed the inhibitory zone against all the three test microorganisms. Moderate antibacterial activity was observed in the methanol extracts (100 mg/ml, 200 mg/ml and 300 mg/ml) against pathogenic microorganisms when compared with the standard Chloramphenicol (1%). Out of two extracts, methanol extract showed significant activity against *S. aureus* followed by *E. coli* and *P. aeruginosa.*

INTRODUCTION

Plants are considered the most important source of medicines. Plants play a valuable role in the basic health requirement of the population in the developing countries. According to the WHO most population which cannot confer the products of western pharmaceutical industries, still depends on traditional medicines (Khandewal *et al*., 2017). The medicinal plants used as a wellspring of antibacterial, antiviral and antifungal ingredients which are deedful (conative) against different micro-organisms and which are infamous to human health (Kuchana *et al*., 2014). Dominant medicines are extracted from different parts of bioactive plants such as leaf, stem, seeds, bark, flowers and roots. Different chemicals agents of the plants such as terpenoids, tannin and flavonoids have antibacterial activity against a wide range of micro-organisms (Kuchana *et al*., 2014). The *Prosopis cineraria* is a species of flowering plant in the pea family, Fabaceae. It is a tree of desert in Western Rajasthan and is respected as the groundwork of rural economy. Since all the parts of *Prosopis cineraria* are useful, plant is called "Kalptaru". It is known as the 'wonder tree' and 'king of desert' (Owlabi *et al*., 2007). *Prosopis cineraria* is a valuable factor of desert ecosystem of India as energy producer and leguminous tree, it fixes nitrogen of atmosphere and produced a green coverage (O,Salie *et al*., 1996). Therefore, during the present study, background information of *Prosopis cineraria* was collected from in and around Jhunjhunu District, Rajasthan.

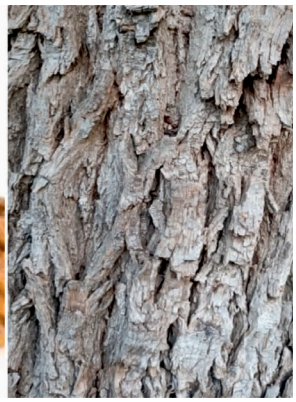
Prosopis cineraria (family- Fabaceae, subfamily-Mimosaceae) is a small to moderate sized tree to be found in various parts of India such as – Rajasthan, Gujarat, Haryana, Uttar Pradesh, Andhra Pradesh and Tamil Nadu (Puri and Kumar, 1995). *Prosopis cineraria* is used in pregnancy as a preservation against miscarriage (Marwat *et al*., 2011; Nandkar, 2000). The smoke of *Prosopis* leaves is beneficial for eye troubles. It is known as possess anthelmintic, antifungal, antibacterial, antiviral, anticancer and other pharmacological properties (Malik and Kalidhar, 2007). It is also described that aqueous extract of bark and leaves applied externally to treat skin disease (Sharma and Kumar, 2011) vandalizes wound and promotes healing (Nagori and Solanki, 2011).

In the present work, we extended the study to screen the antibacterial activity of methanol and aqueous extracts of the leaf, bark and seeds of *Prosopis cineraria* against three different bacteria strains *Staphylococcus aureus*, *Escherichia coli* and


Prosopis cineraria


P. cineraria leaves


P. cineraria seeds


P. cineraria bark

Pseudomonas aeruginosa.

MATERIALS AND METHODS

Plant material collection

Fresh plant material such as- leaves, bark and seeds were collected randomly from the Chhau village of Jhunjhunu district, Rajasthan from the natural stands. Plant materials were washed, dried at room temperature, crushed to fine powder and stored until future use.

Preparation of Extracts

Aqueous extract

Air dried powdered samples of 10g, 20g and 30g were placed in a conical flask containing 100 ml of distilled water plugged with cotton and kept on a rotary shaker for 3 hours. The extracts were filtered by watchman no. 1 filter paper and centrifuged at 5000 rpm for 15 minutes. The supernatant was collected and the solvent was evaporated to make volume one fourth of its original volume. The extracts were stored at 4 °C after cooling at room temperature in the airtight bottles.

Methanol extract

Air dried powdered samples of 10g, 20g and 30g were placed in a conical flask containing 100 ml of methanol, plugged with cotton and kept on a rotary shaker for 3 hrs. The extracts were filtered by watchman no. 1 filter paper, centrifuged at 5000 rpm for 15 min. The supernatant was collected and the solvent was evaporated to make volume one fourth of its original volume. The extracts were stored at 4 °C after cooling at room temperature in the airtight bottles.

Antibacterial activity testing

Disc diffusion method

Antibacterial activity of the crude aqueous and methanol extracts were studied against gram positive (*Staphylococcus aureus*), gram negative (*Escherichia coli, Pseudomonas, aeruginosa*) bacterial strains by the disc diffusion method. Each plant extracts was tested at three different concentrations (100 mg/ml, 200 mg/ml and 300 mg/ml) to see their inhibitory effects against microbial pathogens. Sterile paper disc (6 mm in diameter) prepared from whatman no. 1 filter paper. The inoculated plates were incubated at 37 °C for 24 hrs. and the antibacterial activity was assayed by measuring the diameter of the inhibition zone for the three test micro-organisms.

RESULTS AND DISCUSSION

The antibacterial activity of plant extracts was analysed according to their zone of inhibition against the test microorganism. The plant extracts exhibited their antibacterial activity against both gram negative and gram positive bacteria. Table 1 shows the bacterial growth inhibition of aqueous and methanol extracts of the *Prosopis cineraria* plant. The plant extracts showed their activity against all three selected bacterial pathogens. Out of the two extracts, methanol extract was found to be more potent against all the three test microbial pathogen.

The methanolic extract of *Prosopis cineraria* **leaves** showed highest inhibition zone 20 mm in 300 mg/ml concentration against *S. aureus* followed by *E. coli* 16 mm and *P. aeruginosa* 15 mm. The **Bark extract** showed highest inhibition zone 17 mm in 300 mg/ml concentration against *E. coli* followed by *S. aureus* (16

Table 1. Antibacterial activities of methanol and aqueous extracts of *Prosopis cineraria*

Name of the Plant material	Name of the bacterial strain	Concentration of plant extracts (mg/ml)	Zone of inhibition (mm)		
			Methanol	Aqueous	Synthetic drug (Chloramphenicol)
Leaves	*Staphylococcus aureus*	100	11	9	20
		200	16	11	
		300	20	14	
	Escherichia coli	100	10	8	17
		200	12	10	
		300	16	13	
	Pseudomonas aeruginosa	100	9	8	15
		200	10	10	
		300	15	13	
Bark	*Staphylococcus aureus*	100	12	10	20
		200	13	11	
		300	16	14	
	Escherichia coli	100	12	11	17
		200	14	12	
		300	17	13	
	Pseudomonas aeruginosa	100	10	9	15
		200	12	11	
		300	14	12	
Seeds	*Staphylococcus aureus*	100	14	10	20
		200	15	11	
		300	18	14	
	Escherichia coli	100	13	10	17
		200	14	12	
		300	17	13	
	Pseudomonas aeruginosa	100	12	9	15
		200	13	11	
		300	16	13	

mm) *and P. aeruginosa* (14 mm). The **Seeds extract** showed highest inhibition zone18 mm in 30mg/ml concentration against *S. aureus* followed by *E. coli* and *P. aeruginosa*17 mm and 16mm respectively. In the present investigation the methanolic extracts of *Prosopis cineraria* leaves showed highest activity and lowest activity was showed by Bark extract. Over all *Staphylococcus aureus* showed highest inhibition zone against plant extracts.

Aqueous extract of leaves, Bark and Seeds showed low antibacterial activity compared to methanol extracts of *Prosopis cineraria*. The higher antibacterial activity of methanol extracts indicates the higher concentration of bioactive compounds such as flavonoids, total phenolic content and volatile oils, which are all found in more abundant amount in *Prosopis cineraria*.

CONCLUSION

In present study the leaf, bark and seeds extracts of *Prosopis cineraria* exhibited antibacterial activity against *Staphylococcus aureus*, *Escherichia coli and Pseudomonas aeruginosa*. Out of two extracts, methanol extract showed significant activity against *S. aureus* followed by *E. coli* and *P. aeruginosa.* Plants are valuable source of medicinal agents, these medicinal agents are used for the treatment of various diseases. Much attention has been paid towards plant based products which are extracted and isolated from plants. Natural products are considered much important as antibacterial agents as they have fewer side effects when compared to commercially available products. There is an urgent need to identify newer chemical entities that are effective against resistant pathogens.

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