

In-vitro Antibacterial Activity of Leaf and Root Extract of Cassia Fistula

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In - Vitro Antibacterial Activity of Ethanol Extracts of leaf and root of *cassia fistula* was studied. Five Gram-positive and 9 Gram-negative bacteria namely *Sarcina lutea*, *Bacillus megaterium*, *Bacillus subtilis*, *Streptococcus β-haemolyticus*, *staphylococcus aureus*, *Salmonella typhi*, *Shigella dysenteriae shigella boydii*, *shigella sonnei*, *shigella flexneri*, *shigella shiga*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella Pneumoniae* were tested. Both the Extracts were ineffective at concentration of 30 µg/disc but showed moderate to good activity at concentration of 200 µg/disc against the tested pathogens. The leaf extracts exhibited comparatively better activity displaying their zones of inhibitions 10-19 mm and largest zone was shown against *Shigella Dysenteriae* (19 mm). Whereas root extracts showed smaller zones of inhibitions (09-14 mm) indicating their lower sensitivity. From these findings it is indicative that *Cassia fistula* may have antibacterial principles that could be useful in microbial diseases.

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Key words: Antibacterial activity, Cassia fistula

Introduction

Microbial infection is a common health problem in Bangladesh. Peoples of rural areas usage different plant parts for the ailment of various bacterial infections.^{1,2} The medicinal plants continue to play an important role for the management of different microbial diseases. In recent years there has been a resurgence of scientific interest in the use of medicinal plants for the development of new phannacotherapeutic agents against different species of microorganisms including the resistance organisms.^{3,4} Effective, cheap and safe medicinal agents may appear as alternative potential source for controlling microbial infections particularly the resistant cases.

Cassia fistula Linn. called in local Bangla "Banderlathi" is a medium sized tree of about 10-15 meter tall. It is planted as an ornamental tree in homesteads and along the roadside. Leaves fall during cold weather and the early part of hot season. The leaflets are 4-8 pairs, opposite, dark-green and shining above. Flowers are bright yellow in colour, appears in graceful hanging clusters. The pod is 30-60 cm long, chambered within; black when ripe and seeds are 40-100 in each pod.⁵ Some investigators reported the medicinal values of this plant such as hypoglycemic properties of leaf, antibacterial and antifertility effects of seed extract.^{6,7,8}

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So far we know, no antibacterial work has possibly been done on leaf and root segments of this plant. The present work was objected to carryout scientific investigations on antibacterial activity of the leaf and root extracts of *Cassia fistula* against fourteen bacterial species in comparison with the modern commonly used antibacterial drug Cephadrine.

Methods

Preparation of the extracts

Fresh leaves and roots of *Cassia fistula* were collected from Rajshahi locality. Adhering dirt's were removed by washing and were cut into small pieces. The plant parts were dried at room temperature avoiding sunlight. The dried parts were then milled to form powder. Dry powder of leaves was soaked in ethanol (absolute alcohol) for 5 days in a glass container closed by glass cork with occasional shaking and stirring. But the dry powder of roots was extracted with hot ethanol for 72 hours using soxhlet apparatus. The extracts were filtered through cotton and filter paper and concentrated by rotary evaporator under reduced pressure (below 50°C) to afford semisolid masses (Table-1).

Antibacterial Screening

The ethanol extracts (semisolid masses) were examined for their antibacterial potency by disc diffusion method against fourteen bacterial species (5 Gram- positive and 9 Gram-negative).⁹ The bacterial specimens were collected from Microbiology Laboratory, Department of Pharmacy, Rajshahi University and Microbiology Department of Rajshahi Medical College, Rajshahi. The medium was (Nutrient agar, DIFCO, UK) poured into sterile petridishes and the inoculum was adjusted to contain 10^5 to 10^7 bacteria per ml. The extracts were dissolved in ethanol to obtain a concentration of 10 µg/µl. The discs (6 mm in diameter)

were prepared by sterile filter paper and dried in an oven to remove moisture. The solutions were applied on the dried filter paper discs by micropipette to obtain discs containing 30 and 200 µg of extracts in each disc. Cephadrine discs (30 µg/disc) were used as standard. The discs were then placed on the petridishes seeded with the bacterial inoculums over the medium and allowed to diffusion at 4°C for 5-6 hours. The petridishes were then incubated at 37°C for 18 hours and the zones of inhibitions observed were measured. The data were analyzed by using the Duncan's multiple range tests and Analysis of Variance (ANOVA) test.

Results

Table-1 shows the amount of extracts yielded from powder of leaf and root parts of *Cassia fistula* using ethanol as solvent. It was observed that 61.1 gm and 117.4 gm of extracts (semisolid masses) were yielded from leaf and root parts of *Cassia fistula* respectively.

Crude ethanol extracts of the leaf and root parts of *Cassia fistula* were tested against 5 Gram-positive and 9 Gram-negative bacteria at concentrations of 30 µg and 200 µg/disc and compared with standard antibiotic cephradine. It was found that at the concentration of 30 µg/disc both the extracts were ineffective against the tested pathogens. Whereas, the same extracts showed moderate to good activity exhibiting their zones of inhibition 10-19 mm and 09-14 mm, respectively, against the tested bacteria at concentration of 200 µg/disc. The leaf extract exhibited maximum zone of inhibition against *Shigella dysenteriae* (19 mm). Both the extracts were not active against *Staphylococcus aureus*. But the root extract was also ineffective against *Salmonella typhi*, *Shigella dysenteriae* and *Pseudomonas aeruginosa* (Table 2). The standard cephradine was found to have pronounced

effect (zone of inhibitions 25-30 mm) at concentration of 30 µg/disc.

Table I: Weight of extracts from powdered leaves and roots of *Cassia fistula* using ethanol as a solvent

Plant Part	Amount of powder used	Extraction process	Yield extract (gm)
Leaf	1.5 kg	Cold	61.1 gm
Root	1.5 kg	Hot	117.4 gm

Table II: Antibacterial activity of the ethanol extracts of leaf and root segments of *Cassia fistula* and standard cephradine (C)

Test organisms	Diameter of zone of inhibition (in mm)				Cephradine 30 µg/disc
	Leaf extract		Root extract		
µg/disc	30	200	30	200	30 µg/disc
Gram positive:					
<i>Sarcina lutea</i>	00	11	00	09	26
<i>Bacillus megaterium</i>	00	13	00	12	27
<i>Bacillus subtilis</i>	00	11	00	10	28
<i>Strep. β-haemolyticus</i>	00	10	00	10	28
<i>Staphylococcus aureus</i>	00	00	00	00	25
Gram negative:					
<i>Salmonella typhi</i>	00	10	00	00	30
<i>Shigella dysenteriae</i>	00	19	00	00	26
<i>Shigella boydii</i>	00	11	00	12	27
<i>Shigella sonnei</i>	00	16	00	14	25
<i>Shigella flexneri</i>	00	17	00	13	27
<i>Shigella shiga</i>	00	13	00	14	30
<i>Escherichia coli</i>	00	10	00	10	28
<i>P. aeruginosa</i>	00	11	00	00	28
<i>K. pneumoniae</i>	00	10	00	10	26

Strep. = *Streptococcus*, *P.* = *Pseudomonas*, *K.* = *Klebsiella*

Discussion

Bacterial infections are rapidly becoming resistant to conventional drugs like Methicillin and Vancomycin-resistant *Staphylococcus aureus* (MRSA/VRSA). Scientists are now engaged to explore new antibacterial principles from plant source. In the present study, leaf extract exhibited most promising activity but the root part showed comparatively less activity against the tested pathogens. The results of the present study are in well agreement with the results of some workers. Abo *et al.*, (1999) revealed that pods of *Cassia fistula* exhibited significant antibacterial activity when compared to that of ampicillin.¹⁰ Howlader *et al.*, (1992) reported that crude ethanol extracts of pericarp, stem bark and leaves of *Sapium indicum* were found to be effective against the bacteria *Bacillus subtilis*, *Staphylococcus aureus*, *Salmonella typhi*, *Vibrio cholerae* and *Shigella species*.¹¹ Rouf *et al.*, (1992) revealed that defatted extract of *Polygonum orientale* demonstrated pronounced antibacterial effect against *Staphylococcus aureus*, *Vibrio cholerae*, *Bacillus pumilus* and *Escherichia coli*.¹² It also showed comparable activity against *Bacillus subtilis*, *Sarcina lutea* and *Shigella dysenteriae* when compared with standard antibiotic as control (Streptomycin and Nalidixic acid). The aqueous and methanolic extracts of *Thunningia sanguinea* root as well as seven fractions obtained by PTLC from methanol extracts have been shown to possess varying degree of antimicrobial activity (Ohiri and Uzodinma, 2000).¹³ Hatano *et al.*, (1999) showed that methanol extract of *Cassia tora* seed exhibited potent antibacterial effects on methicillin-resistant *Staphylococcus aureus*.³ These observations correlate the findings of the present study.

On the bases of above studies it can be concluded that *Cassia fistula* may play a beneficial role in the management of bacterial

infections. However, detailed study may be needed for this purpose.

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