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Antibacterial activity of *Cassia angustifolia* (Vahl.) leaf extracts grown in three different soil treatments

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Abstract

The present study was carried out to determine the potential antimicrobial agent from leaf extracts of medicinal plant *Cassia angustifolia* against *Escherichia coli* (gram-negative) and *Staphylococcus aureus* (gram-positive). The antimicrobial effect of extracts in solvents of acetone, methanol including aqueous extracts of leaf powders grown in three different soil treatments. In treatment-I, the plants are grown in normal soil without any addition. Treatment-II, plants are grown in soil added with heavy metals in a ration of cadmium 10 ppm, chromium 20 ppm and nickel 16ppm and finally in treatment-III in addition to the above heavy metals, 1% of calcium hydroxide was added to the soil and was grown up to productivity levels. The zone of inhibition of extracts was compared with that of standard of ampiciline. The results showed that the remarkable inhibition of the bacterial growth was shown against the tested organisms. All the above leaf solvent extracts exhibited antibacterial activity against Gram-positive bacteria. *Staphylococcus aureus* shown more inhibition than *Escherichia coli* in all the three soil treatments.

Key-Words: *Cassia angustifolia*, Leaf extracts, Antibacterial activity, *Staphylococcus aureus*, *Escherichia coli*

Introduction

Cassia angustifolia is an important medicinal plant belongs to the family Caesalpinaceae, commonly known as senna or cassia senna for its anthraquinone, glycosides and laxative action. Senna is a small perennial under shrub below 1m in height with ascending branches, native of Yemen south Arabia (part of Pakistan). Senna largely grown on red loams, alluvial loam soils. Senna is sun loving crop and it requires bright sunshine for its successful growth. The leaves are compound and pinnate. The leaflets are opposite; leaf length is about 2.5-5cm, 3-8cm width. The fully grown leaves are bluish green colour, ovate, lanceolate. The flowers are bright yellow in color and arranged in an auxiliary, erect many flowered racemes. The pods contain 5-7 seeds that are dark brown in colour. The leaves and pods contain sennosides used for their laxatives properties. The plant contain sennosides A, B, C & also D, Beta sterol (0.33%) flavanols, koemferol, koempferin and isorhamnetin. Senna mainly used for habitual constipation, it increases the peristaltic movement of the colon which results in soft and bulky faces.¹

The leaves and pods are used in many over the counter pharmaceutical preparation. It is recognized by British and USA Pharmacopoeias. The leaves are useful in habitual constipation.² Senna is a strong purgative that should be taken in proper dosage otherwise it may lead to gripping and colon problem.³ The leaves containing sennosides are efficient sources of health teas⁴ and are considered as astringent, cathartic, depurative, antihelmintic jaundice typhoid fever, tumors.⁵ Scientific studies have proven that number of plants used in human ethno medical practices have pharmacological activity and may also be useful as ethnobotanical practice.⁶ The wide usage of the above plant is the reason for conducting the present research and further to investigate the antimicrobial activity of the leaf extracts, which adds another advantage to the plant users.

Material and Methods

Plant material source

Cassia angustifolia seeds were procured from the CIMAP, Hyderabad. The seeds were sown in earthen pots in Green house of Botanical Garden, Department of Botany, Osmania University, Hyderabad.

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Preparation of plant extracts

The extraction of the *Cassia angustifolia* was carried out using known standard procedures. The plant material were dried in shade and powdered in a mechanical grinder. The powder (0.250mg) of the plant material was initially defatted with methanol, acetone and aqueous solutions of 15ml in each. The solvents soaked for 3days is filtered with whattman filter paper (no.1). The extracts were kept in sterile bottles, under refrigerated conditions until further use.⁷

Antibacterial assay

Diffusion method

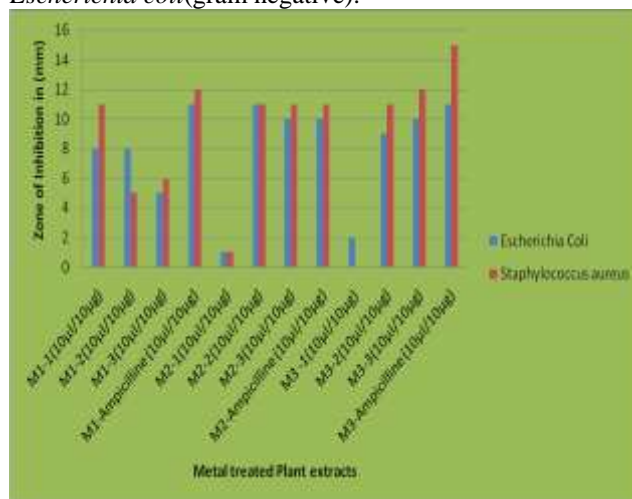
Antimicrobial activity was carried out using disk-diffusion method. Petri plates were prepared with 20ml of sterile nutrient agar media (NA media). The test cultures were swabbed on the top of the solidified media and allowed to dry for 10min. The tests were conducted at three different concentrations of the crude extracts with three replicates. The loaded discs were placed on the surface of medium and left for room temperature for compound diffusion, negative control was prepared using respective solvent. Streptomycin (10ug/disc) was used as positive control. The plates were incubated for 10 hours at 37°C. Zone of inhibition was recorded in millimeters and the experiment was repeated by three replicates.⁸

Results and Discussion

The *Cassia angustifolia* leaf powder extracts of three different treatments i.e., normal, heavy metal and Ca(OH)₂ treated soils extracted in solvents of Methanol, Acetone and aqueous solution shown inhibition zones. In normal soils, leaf powder extracts in methanol, acetone solvents shown more inhibition when compare to aqueous extracts. In heavy metal treated plants, the methanol and aqueous extracts shown more inhibition than acetone. Whereas in Ca (OH)₂ treated plants, aqueous extracts shown more inhibition than methanol and acetone. The inhibition percentage of *Escherichia coli* and *Staphylococcus aureus* is shown in graph-1. The overall results shown that the *Staphylococcus aureus* shown more inhibition

than *Escherichia coli* in three treatments of soils. The methanol solvent shows more inhibition in all the treatments. The zone of inhibition in millimeter is clearly explained in the table-1.

Plant based traditional medicinal system continues to play an essential role in health care with about 80% of the worlds inhabitants relying mainly on traditional medicines for their primary health care. Medicinal plants would be the best source to obtain a variety of drugs, therefore plants should be investigated to better understand their properties, safety and efficacy. Most of the drugs today are obtained from natural sources or semi synthetic derivatives of natural products and used in the traditional systems of medicine. The situation has forced to search new antimicrobial substances in various sources like medicinal plants. The plant *Cassia angustifolia* leaves shown antimicrobial activity in acetone, methanol and aqueous solutions. The methanol solvent shows more inhibition in *Staphylococcus aureus* (gram positive) than *Escherichia coli*(gram negative).



Graph 1: Showing the inhibition effect on bacteria in three differently treated soils

Table 1: Showing the zone of inhibition in mm in three extracts

S/No	Leaf Extracts	Name of Bacteria's	1-Acetone	2-Methanol	3-Water	Ampicilline (10µl/10µg)
1.	Normal	<i>Escherichia Coli</i>	8	8	5	11
		<i>Staphylococcus aureus</i>	11	5	6	12
2.	Heavy metal treated	<i>Escherichia Coli</i>	1	11	10	10
		<i>Staphylococcus aureus</i>	-	11	11	11
3.	Ca(OH) ₂ treated	<i>Escherichia Coli</i>	2	9	10	11
		<i>Staphylococcus aureus</i>	-	11	12	15

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