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## In vitro Antibacterial Activity of Water and Ethanolic Extract of Senna (*Cassiaangustifolia*)

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### Abstract

**Introduction:** Traditional medicines become main source of primary health in different part of Sudan as result of cost effectiveness and viability of antibiotic in addition of antibiotic resistance and their side effect

**Method:** water and ethanolic *Cassiaangustifolia* leaf, pod extract were screened for in vitro antibacterial activity against *Escherichia coli*, *K. pneumoniae*, *S. typhoid* and *Staphylococcus aureus* by disc diffusion method.

**Result:** leave and pod extracts showed variable effect on the tested organisms. Ethanol leaves extract exhibit considerable result to tested bacteria, whereas water leaves extract had low activity to tested bacteria except *K. pneumoniae*. Ethanolic pod extract showed same result to the most tested bacteria while water pod extract had lowest activity compeer to other extract.

**Conclusion:** The results obtained in the present study indicate that the leaves and pod extracts of *Cassiaangustifolia* had potential antibacterial activity against tested fungi.

**Keywords:** *Cassiaangustifolia*, Antibacterial activity, Leave and pod extracts, Disc diffusion method.

### Introduction

Herbal medicines have become an integral part of the primary health care system of many nations <sup>(1)</sup>; thousands of species in Sudan are known to have medicinal value and the use of different parts of several medicinal plants. Sudanese folk medicine represents a unique blend of different cultures of Islamic, African and Arabic traditions. <sup>(2)</sup>

Investigation of different plant extracts throw traditional medicinal plants as potential sources of antimicrobial agents old as mankind and increasing in the past two decades <sup>(3)</sup>. In recent time wealth of medicinal plants and the traditional herbal medicines have become an integral part of the primary health care system of many nations. <sup>(4)</sup>

Effort for looking to plant as antimicrobial source to facing microbial infection resurgence scientific interest to use of medicinal plants for the development of phannaco therapeutic of new natural or semi-synthetic antimicrobial drug against different species of microorganisms including the resistance organisms. <sup>(5, 6)</sup> *Cassia senna* belonging to family Fabaceae, also called Leguminosae or bean and pea family, is the third largest family of angiosperms after Orchidaceae (orchids) and Asteraceae (daisies, sunflowers), and second only to Poaceae (grasses) in terms of agricultural and economic importance. <sup>(7)</sup>

*Cassia senna* widely found in Sudan, Pakistan, Sri Lanka, Tropical Africa, Egypt, India and Bangladesh. It is an ayurvedic plant with huge medicinal importance; the parts of this plant used medicinally

are the leaves and the pods. Both the leaf and pods are used in many over-the-counter pharmaceutical preparation.

The medicinal properties of *Cassia* species are due to their contents of hydroxyanthraquinone derivatives. Senna is a strong purgative that should be taken in proper dosage otherwise it may lead to gripping and colon problem.<sup>(8)</sup> leaves is externally applied on healing wounds, sores, itch, cutaneous diseases, bone fracture, fever, ringworm, skin diseases and throat infection.

Pharmacological investigations showed that *C. occidentalis* leaf extracts considered as antimicrobial,<sup>(9, 10, 11, 12, 13)</sup> anticarcinogenic,<sup>(13)</sup> activity and lyses thrombus as streptokinase.<sup>(14, 16)</sup> Astringent, cathartic, depurative, anthelmintic, cholagogue, expectorant and febrifuge, useful for leprosy, leukoderma, jaundice, typhoid fever, tumors<sup>(17)</sup>

The aim of the present paper was to investigate the antimicrobial activity of *Cassia senna* against some pathogenic bacteria.

### Materials and Methods

**Plant Material:** The leaves and pods of Senna (*Cassiaangustifolia*) were collected from Khartoum state in the month of March 2013

#### Preparation of the extracts:

Ten grams of fresh leaves and pods of Senna (*Cassiaangustifolia*) will shade dried at room temperature (32 – 35 °C) to constant weight over a period of 5 days. The dried leaves and pod were ground into powdered using a mortar and pestle. 5 g of the powdered leaves and pod were separately extracted in 100ml conical flasks with 100 ml of hot distilled water (aqueous extract), and 100ml ethanol (ethanolic extraction). The conical flasks were plugged with rubber corks, then shaken at 120 rpm for 30 min and allowed to stand at room temperature for 5 days while water (aqueous extract) just 10 minute, the with occasional manual agitation of the flask using a sterile glass rod at every 24 hour. The extracts were separately filtered using sterile Whatman no. 1 filter paper, the resulting filtrate.

**Test organisms:** Tested bacteria were isolated from different clinical specimens, samples were isolated and identify according to standard laboratory methods.<sup>(18)</sup> Isolated bacteria include: (*S.*

*typhoid*, *Escherichia coli*, *K. pneumoniae* and *Staphylococcus aurus*)

#### Antibacterial sensitivity testing

Antibacterial susceptibility testing of antibiotics was performed by disc diffusion method.<sup>(18)</sup> For susceptibility testing, a suspension from one-day-old bacterial cells of each isolate was prepared agar broth (2 ml) equivalent to the McFarland turbidity standard; the suspensions were spread on to the surface of the Mueller Hinton agar with sterile cotton swabs. The plates were briefly dried and then the antibiotic disks of *Cassiaangustifolia* were added to each plate and incubate over night at 37 °C. The inhibition zone diameters measured in millimeters, with a ruler. Resistance determined by a zone of growth inhibition diameters. Greater zones of complete growth inhibition indicated the presence of susceptible strains. The procedure repeated for cultures that were defined as resistant.

### Result

*Senna* leaves and pods extract exhibit variable activity against tested bacteria *Escherichia coli*, *K. pneumoniae*, *S. typhoid* and *Staphylococcus aurus*.

Leave ethanol extract showed remarkable result against *Escherichia coli*, *K. pneumoniae*, *S. typhoid* and *Staphylococcus aurus* with (10mm, 13mm, 12mm, 7mm) respectively. (figure.1)

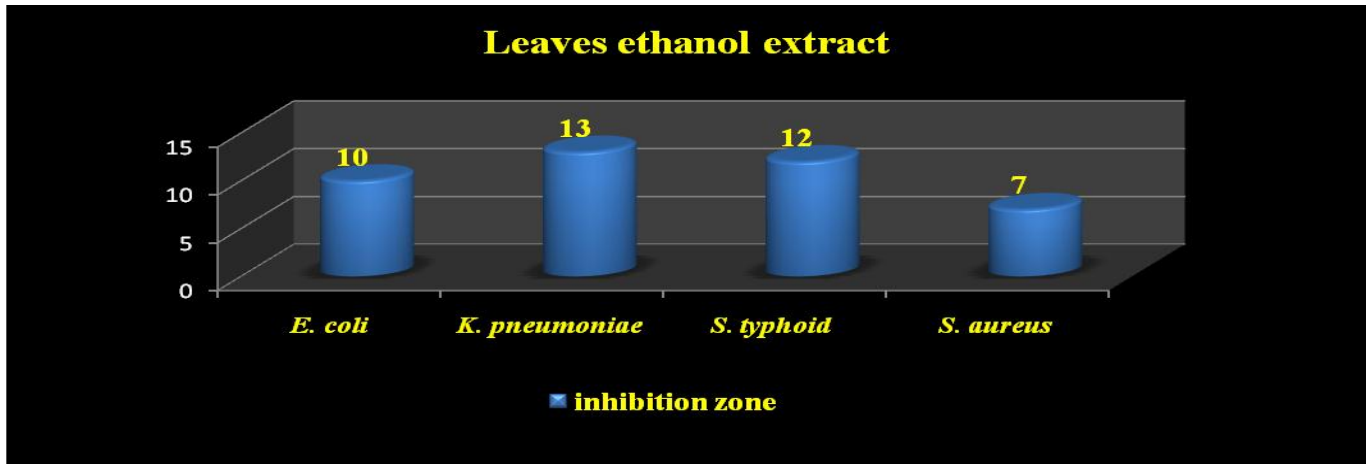
*K. pneumoniae* showed the highest result to leave water extract with (8.1mm), other tested bacteria had same result. (figure.2)

Susceptibility of *Escherichia coli*, *S. typhoid* and *Staphylococcus aurus* to pods ethanol extract showed same result with (6, 5, 5mm). (figure.3)

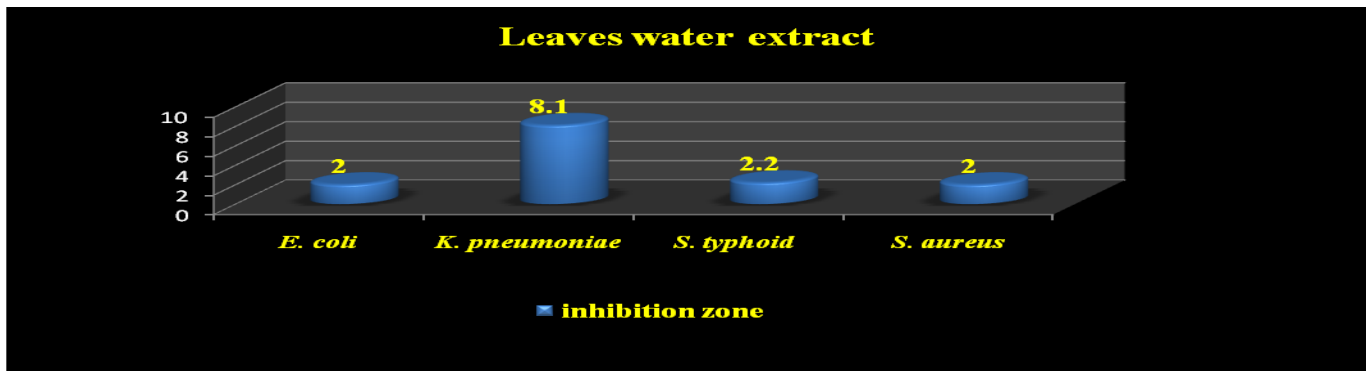
Pod water extract exhibit variable result to *Escherichia coli*, *K. pneumoniae*, *S. typhoid* and *Staphylococcus aurus* with (1.1, 6, 0,1mm) respectively. (figure.4)

Our result showed that *K. pneumoniae* the most susceptible bacteria to *senna* extract.

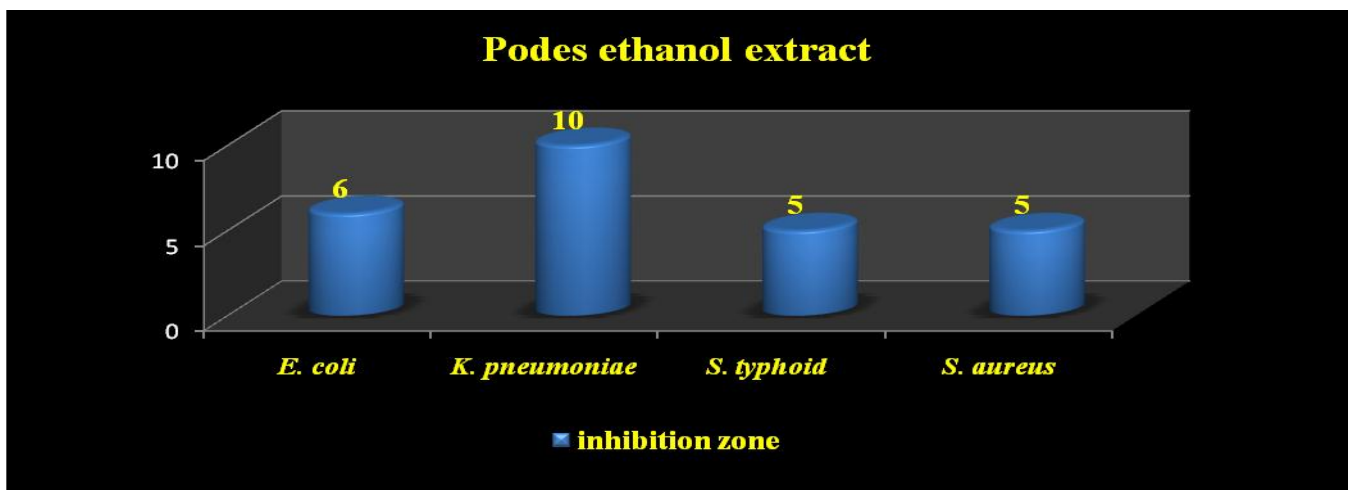
(figure.1) Antimicrobial activity of *Senna* leaves ethanol extracts against human pathogens bacteria.



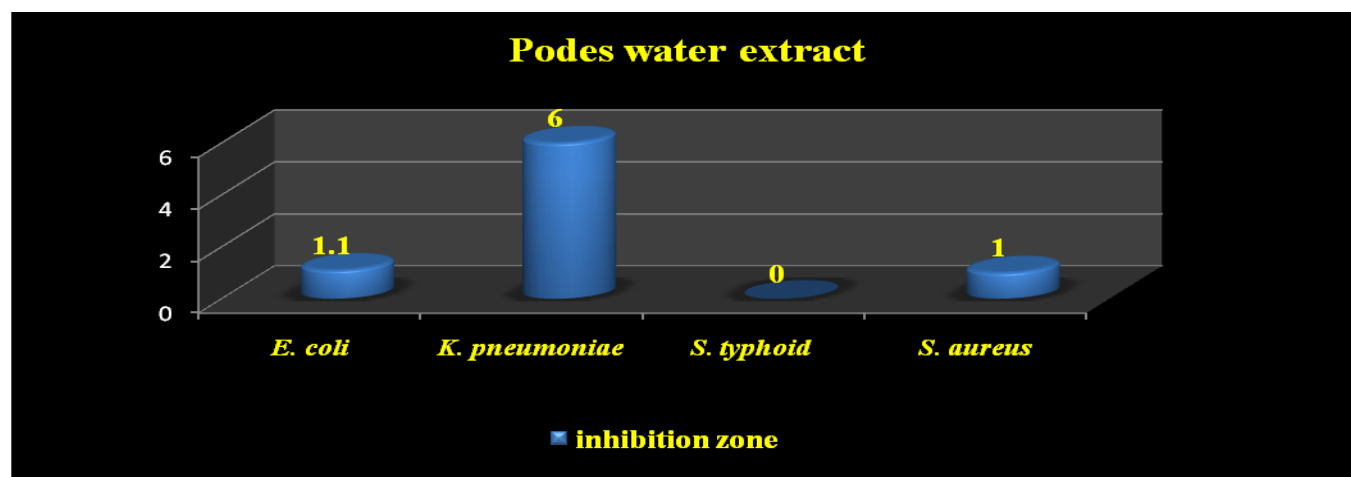
(figure.2) Antimicrobial activity of *Senna* leaves water extracts against human pathogens bacteria



(figure.3) Antimicrobial activity of *Senna* pods ethanol extracts against human pathogens bacteria.



(figure.4) Antimicrobial activity of *Senna* pods water extracts against human pathogens bacteria



## Discussion

The present study investigated antimicrobial activity of aqueous, ethanolic leaf and pods extract of *Cassiaangustifolia*, extracts were screened against human pathogenic bacteria (*S. typhoid*, *E. coli*, *K. pneumoniae* and *S. auras*) to check antibacterial activities by agar well diffusion method.

The antimicrobial potential of *Cassiaangustifolia* was detected according to their size of inhibition zone against tested organisms.

Both the ethanolic and aqueous extracts of each sample showed significant antimicrobial activity in terms of zone of inhibition against all the tested microbial strains except pod water extract with *S. typhoid*.

Various publications have documented the antibacterial activity of *Cassiaangustifolia*; researcher investigated different pathogenic microorganisms like *P. aeruginosa*, *K. pneumoniae*, *P. vulgaris*, *P. mirabilis*, *S. epidermidis*, *A. fumigatus* and *C. albicans*. However, investigations have already been done on *E. coli* (19, 20, 21) and *S. aureus*. (19)

Ethanolic extract Recorded a significantly higher antimicrobial activity compeer to aqueous extracts. Similarly to Gnanavel *et al.*, (2012) (22) reported that, Plant extracts of *Cassia angustifolia* possesses prospective broad spectrum antimicrobial potency against the test organisms and the greatest antibacterial activity was detected from the ethanol extract. Our result also in correlation with Sood *et al.*, (2012) (23) carried out the antibacterial activity in the leaf extracts of *Moringa* against several pathogenic microorganisms founded that, Ethanolic extract great antibacterial activity than aqueous extract. On the other hand vedpriya and his colleagues supported aqueous extracts as superior extract activity

they reported water extracts was found to be most active than corresponding organic extracts. (21)

Our results showed remarkable variations in the effectiveness of the leaves extract against *E. coli*, these differences in the plant extracts activities may be due to spatial and temporal variations of the plants.

In previous studies, for leaves extract, *E. coli* was found to be sensitive (19, 20) and in some experiments resistant. (21)

Kabuki *et al.*, (2000) (24) evaluated the *in vitro* antimicrobial activity of *Cassiaangustifolia* extracts antimicrobial activity and reported, *Cassiaangustifolia* had greater activity against gram +ve bacteria than G-ve bacteria. In contrast, According to our results study revealed that, *Staphylococcus auras* had lowest inhibition result compeer to other tested gram negative bacteria.

## Conclusion

Ethanol, water extracts of *Senna (Cassiaangustifolia)* leaves and buds were tested against different bacteria strains (*E. coli*, *salmonella spp*, *Klebcella* and *s. aureus*) that cause major bacterial infection in Sudan.

Disc diffusion method was used to detect *in vitro*- antibacterial activity of *Senna*; our study showed that *Senna* bud and leaves had considerable effects against the tested bacterial strains. All tested bacteria had variable sensitivity to *senna* leaves and bud extract except *salmonella spp* with leave water extract.

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