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Antimicrobial Efficacy of Few Less Known Semi Arid Plants of Ballari, Karnataka, India

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A B S T R A C T

Role of plants as medicines is immense as known through ages. There are enormous plants documented for their antibiotic properties. The present investigation was taken up to study the antimicrobial effect of ethanol extract of four plants viz, *Senna italica* Mill (Caesalpinoideae), *Prosopis juliflora* (SW.) DC., (Mimosoideae), *Cressa cretica* L. (Convolulaceae) and *Schouwia purpurea* (Forssk.) Schwein. (Brassicaceae), extracts against clinical isolates causing skin infections namely Escherichia coli, *Klebsiella pneumoniae, Candida albicans, Pseudomonas aeruginosa,* and *Citrobacter* species. The *invitro* antimicrobial activities were performed by agar well method and broth microdilution method. Two concentrations i.e. 1 mg/ml and 0.5 mg/ml of all the five plants extracts were tested against the bacteria. All the four medicinal ethanolic plant extracts possess potential antibacterial property against *E.coli, Citrobacter, Klebsiella, Pseudomonas,* & *Candida* species. *Cressa cretica* exhibited high activity against *Klebseilla pneumoniae* with inhibition zone 1.8 cm followed by *Schouwia purpurea* and *Senna italica* with 1.7 & 1.6 cm, respectively, against *Citrobacter* species, followed by *Prosopis juliflora* 1.5 cm against *Pseudomonas aeruginosa.* Resistant organism was Klebseilla pneumonia with 0.8 cm inhibition zone at the 0.5 mg/ml concentration of Senna italica but it was sensitive at 1 mg/ml concentration. *Cressa cretica* since it is a halophyte can prove to be potent antimicrobial agent after detailed and systematic bioprospection studies. All the plants under test are growing under xerophytic conditions and have enormous amount of secondary metabolites which makes them eligible candidates for bioprospection studies.

Keywords

Immense, Xerophytic, Antimicrobial, *Pseudomonas, Cressa cretica, Prosopis juliflora*

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Introduction

Plants are the excellent boon gifted to the mankind which are the main source of survival for man including animals. Before the dawn of civilization the plants were being traditionally used as therapeutic agents for the treatment of diseases as evidenced in ancient literatures of Ayurveda, Unani, Homeopathy etc,. Plants no doubt are considered as an important source of new antibiotic agents since the time immemorial numerous plants

species are gaining attention with potential pharmacological properties. In the 20th century antibiotics are the remarkable therapeutic discovery which have proven significant effect on microbial infections, But due to increase in resistant pathogens against the antibiotics, only 1/3rd of infectious diseases are cured by these synthetic products. In order to fill this gap, the plants are being used as antibiotics, since they have enormous variety of secondary metabolites.

The present work was done to explore the antimicrobial property of very less known desert plants of Ballari distrct. Four plant species viz., *Cressa cretica* L. (Convolulaceae), *Prosopis juliflora* (SW.) DC. (Mimosoideae), *Schouwia purpurea* (Forssk.) Schwein. (Brassicaceae), *Senna italica* Mill (Caesalpinoideae). The human pathogens namely *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans*, *Pseudomonas aureginosa*, *Citrobacter* species were used for the study.

Materials and Methods

Chemicals and Reagents

All the chemicals purchased for the present study were of analytical grade.

Sample collection

The four plants *Senna italica* MILL, *Cressa cretica* L. *Prosopis juliflora* (SW.) DC., *Schouwia purpurea* (Forssk). Schweinf were collected from VSKU campus Ballari, and were identified by using state and local Floras Herbarium was prepared.

Stem and leaf of these plants were separated. Washed carefully with tap water, rinsed with distilled water, air dried for one hour and shade dried at room temperature.

Preparation of plant extract

The dried plants parts were ground by using mortar and pestle to make a powder. The extract of the samples were prepared by soaking 100gms of each powder sample in 300 ml of ethanol in 500 ml of conical flask and air tight them with aluminium foil and kept at dark place for 24 hours on rotary shaker. Later the extract was filtered and kept for evaporation for 2 days. Then dried extract was carefully collected, and preserved at 40°C in tight screw tube for further use.

Bacterial strains

Following bacterial strains were used in this study belonging gram positive and gram negative species Viz., *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans*, *Pseudomonas aeruginosa*, *Citrobacter* species. All the microbes were generously provided by the Department of pathology, Vijayanagara Institute of Medicinal Science Ballari, Karnataka. All the cultures were sub cultured on nutrient broth (6.5mg / 500ml) and stored at 4°C for further study.

Antibacterial assays: Agar well method

The ethanol plant extract of *Senna italica* mill, *Cressa cretica* L. *Prosopis juliflora* (SW.) DC, Schouwia purprea (Forssk.) Schweinf. Were tested by agar well method. Different concentration of the extracts (0.5mg/ml and 1mg/ml) was prepared by reconstituting with ethanol. The test microorganisms were seeded into the respective medium by Agar well method with the 24 hours cultures of bacteria growth in nutrient broth, make 3 wells (equidistance wells) by using sterile cork borer on the agar, the plant extracts with different concentrations were loaded into the wells, the control was loaded with double distilled water. The antibacterial assay plates were incubated for 24 hours at 31°C, the diameter of the

inhibition zones were measured in mm. The experiment was performed in triplets to minimize the error and mean values are presented.

Results and Discussion

The antimicrobial activity of four plant extract is represented in Fig 1,2,3, & 4

Results obtained in the present study revealed that the tested four medicinal ethanolic plant extracts possess potential antibacterial property against *E.coli*, *Citrobacter*, *Klebsiella*, *Pseudomonas*, & *Candida* species. All the four plant extracts, showed activity against all the pathogens. *Cressa cretica* exhibited high activity against Klebseilla pneumonia with inhibition zone 1.8 cm followed by *Schouwia purpurea* and *Senna italica* with 1.7 & 1.6 cm, respectively, against *Citrobacter* sps.,. followed by *Prosopis juliflora* 1.5 cm against *Pseudomonas aeruginosa*.

The ethanolic plant extracts of the *Cressa cretica* at 1 mg/ml concentration has inhibited *Klebsiella* efficiently (1.8 cm), followed by *Psuedomonas* (1.75 cm), *Citrobacter* (1.6 cm), E-coli (1.45 cm), Candida (1.4). And at 0.5 mg/ml concentration has inhibited *Psuedomonas* efficiently (1.55 cm), followed by E-coli (1.35cm), *Klebsiella* (1.2 cm), *Citrobacter* (1.15 cm), Candida (1 cm).

The highest inhibition zone was observed by *Prosopis juliflora* at 1 mg/ml concentration against Pseudomonas and *Citrobacter* (1.5 cm) followed by E-coli (1.25 cm), Candida (1.2 cm), *Klebsiella* (1.1 cm). And at 0.5 mg/ml concentration has shown significant activity against *Citrobacter* (1.45 cm) followed by pseudomonas (1.25cm), E-coli (1.15 cm), *Candida* (1.1 cm), *Klebsiella* (0.9 cm).

Schouwia purpurea at 1 mg/ml concentration inhibited *Citrobacter* efficiently (1.7 cm), followed by *Candida* (1.55 cm), E-coli (1.4 cm), *Psuedomonas* (1.3 cm), *Klebsiella* (1.25 cm). And at 0.5 mg/ml concentration *Citrobacter* (1.25 cm), followed by Candida and *E.coli* (1.2 cm), *Psuedomonas* (1.15 cm), *Klebsiella* (1.05 cm). The highest inhibition zone observed by *Senna italica* at 1 mg/ml concentration against *Citrobacter* (1.6 cm) followed by *Candida*, *E.coli*, *Pseudomonas* (1.5 cm), *Klebsiella* (1.1 cm). And at 0.5 mg/ml concentration has inhibited E-coli (1.3 cm), *Citrobacter* and Pseudomonas (1.2 cm), Candida (1.05 cm), *Klebsiella* (0.8 cm). The highest antibacterial activity against *Klebsiella* at 1 mg/ml concentration is 1.8 cm by *Cressa cretica* and least activity shown by *Prosopis juliflora* against *Klebsiella* measured (1.1 cm). The highest antimicrobial activity against pseudomonas at 0.5 mg/ml concentration is 1.55 cm by *Cressa cretica* and least activity shown by *Senna italica* against *Klebsiella* (0.8 cm).

In recent years, the anti-microbial properties of medicinal plants have been increasingly reported in different parts of the world. It is expected that plant extracts demonstrating target sites other than those used by available anti-microbials will be active against drug resistant microbial pathogens (Rechab S. odhaiambo *et al.,* 2015).

A large number of constitutive plant compounds have been reported to have anti-microbial activity the well-known Phenols, saponins, Glycosides and unsaturated Lactones. Phytochemical analysis of ethanolic extracts of four plants viz., *Senna italica* MILL, *Cressa cretica* L., *Prosopis juliflora* (SW.) DC, *Schouwia purpurea* (Forssk.) Schweinf revealed presence of alkaloid, Tannins, Saponins, Flavonoids and sterols.

Fig.1

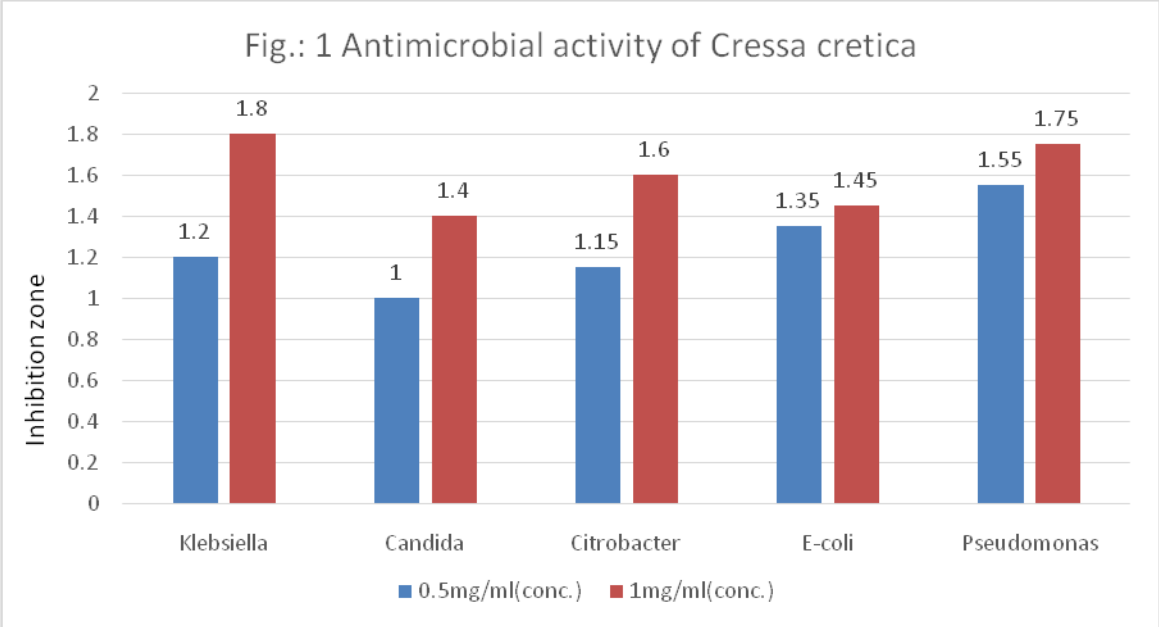


Fig.: 1 Antimicrobial activity of Cressa cretica
Inhibition zone
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1.2
1.8
1
1.4
1.15
1.6
1.35
1.45
1.55
1.75
Klebsiella
Candida
Citrobacter
E-coli
Pseudomonas
0.5mg/ml(conc.)
1mg/ml(conc.)

Fig.2

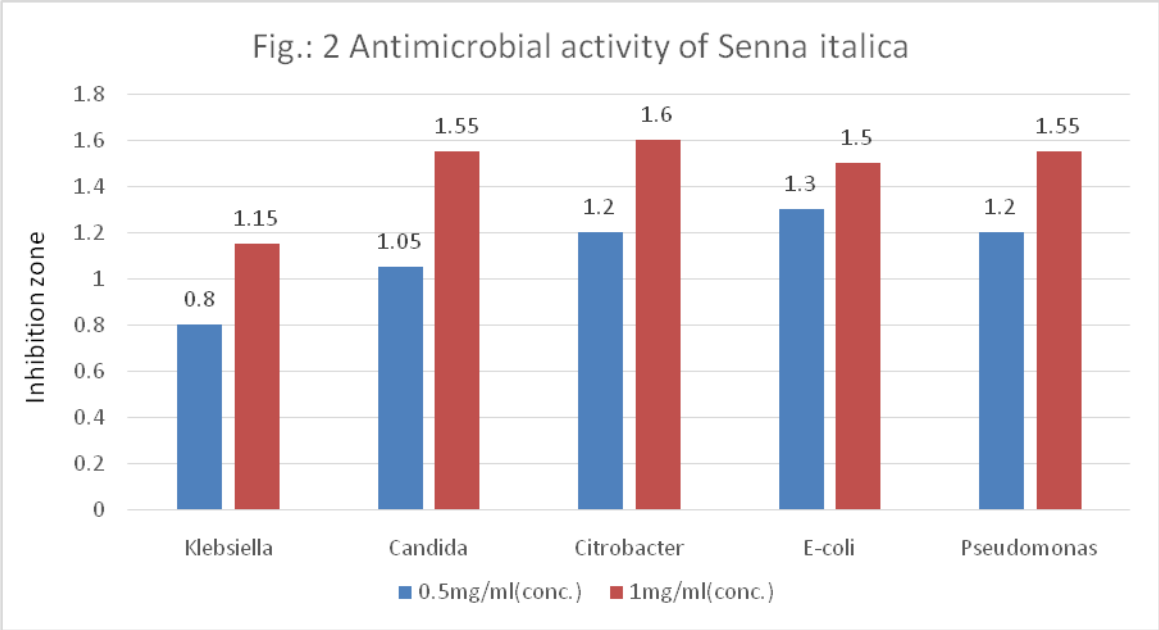


Fig.: 2 Antimicrobial activity of Senna italica
Inhibition zone
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.8
1.15
1.05
1.55
1.2
1.6
1.3
1.5
1.2
1.55
Klebsiella
Candida
Citrobacter
E-coli
Pseudomonas
0.5mg/ml(conc.)
1mg/ml(conc.)

Fig.3

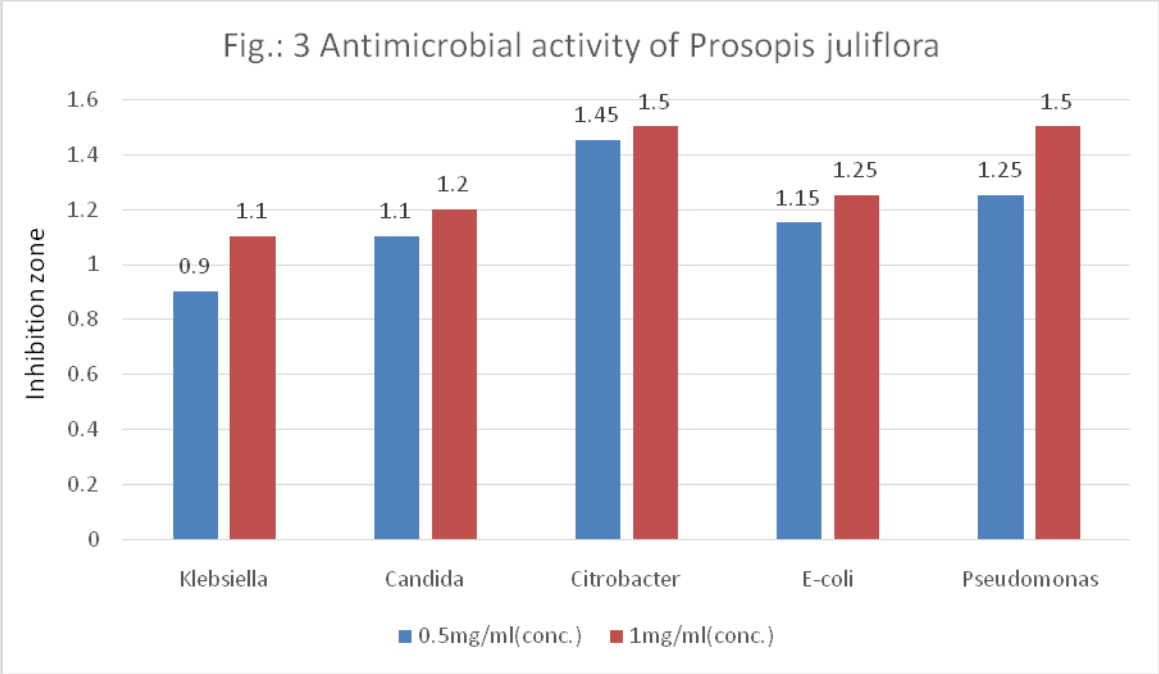
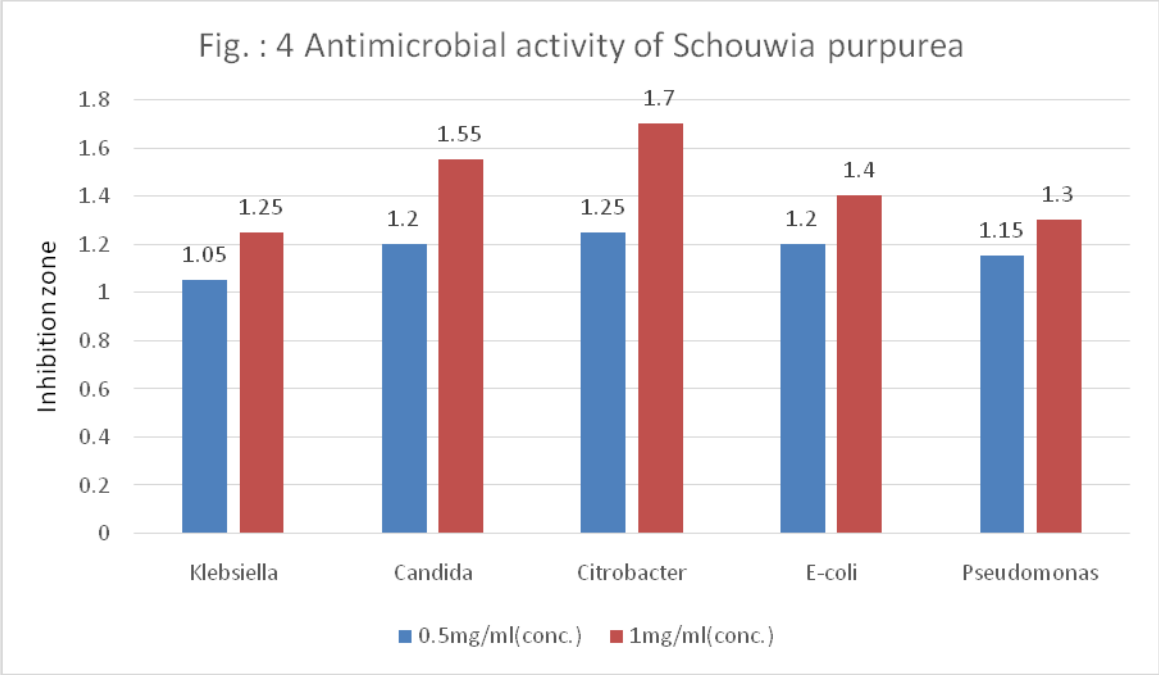


Fig.4



The presence of these phytochemicals compounds have been known to possess medicinal activities particularly anti-microbial activity (Gronhaug *et al.,* 2008). These phytochemical compounds were detected due to the ability of the solvent to dissolve into the solution. Similar report have also been reported by (Kawo *et al.,* 2009).The variation

in inhibition of zones may be due to the geographical location and seasonal variations of plants that affects its active constituents and chemical composition, which may be induced by many factors like climate, soil, propagation method, and etc. Ethanol has the stronger extraction capacity which it could have produced important number of anti-microbial substances therefore this study followed similar tendency (Akinyemi *et al.,* 2005; Abu Shanab *et al.,* 2006). In this regard higher the concentration of phytochemicals in the ethanolic extract may have been responsible for a relatively higher anti-microbial activity.

The results of present investigation clearly indicated that the antibacterial and antifungal activity vary with the species of the plants and solvent used for extract. Thus the study ascertains the value of plants used in Ayurveda, which could be considerable interest to the development of new drugs.

The above result is compared with the reports given by Adeyanju Olesla *et al.,* (2011) of the leaf extract of cassia arereh Del. And also in the leaf and root extract of *Senna italica*.

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