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Antibacterial and antifungal activities of *Polygonum chinense* Linn.

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ABSTRACT

The study was carried out to determine the antibacterial and antifungal activities of Polygonum chinense L. Whole plant was extracted by cold percolation method using organic solvents such as ethanol. Antimicrobial properties were analyzed against both bacteria and fungi using the disc diffusion method. The ethanol extract showed remarkable antibacterial activity against two gram-positive (Bacillus subtilis, Stapphylococcus aureus) and two gram-negative (Escherichia coli, Pseudomonas aeruginosa,) bacteria. The antifungal test showed significant activity against Aspergillus niger and moderate activity on Candida albicans, It can be used in the folk medicine at different parts of the world to treat many diseases including bacterial and fungal infections.

Key words: *Polygonum chinense* L., Whole plants extract, Antibacterial activity, MIC, Antifungal Activity,

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INTRODUCTION

The plant kingdom is a treasure house of potential drugs and there has been an increasing awareness about their importance of medicinal plants [3]. They are used locally in the treatment of infections caused by fungi, bacteria, viruses and parasites. Different plants have been used as a source of inspiration in the development of novel drug [14].Plants derived medicines are widely used because they are relatively safer than the synthetic alternatives, they are easily available and cheaper [8]. Many plants species have been evaluated for their antimicrobial activity in the past twenty years and since then efficacy of many medicinal plants in the treatment of many diseases have been put to test in many laboratories[[5, 15].

Polygonum chinense L. (Family: Polygonaceae) a large, rambling or erect herb or undershrub, up to 1.8 m. high, distributed all over India, ascending up to an altitude of *c.* 1,500 m. The leaves very variable, oblong-lanceolate to elliptic; flowers white or pink or purplish red, in cymose or corymbose inflorescence; nuts dull black. The species is widely distributed in the sub-tropical and warm temperate regions of Asia and is highly polymorphic. An extremely wide range of forms is included under this species; in the Western Ghats. The whole plant, either on its own or mixed with other herbs and it is used in the treatment of a wide range of ailments including diarrhoea, dyspepsia, and hemorrhoids [10].

To overcome this problem many works have been done which aim at knowing the different antimicrobial and phytochemical constituents of medicinal plants and using them for the treatment of microbial infections as possible alternatives to chemically synthetic drugs [1]. There are many reports on antimicrobial activities of several medicinal plant species including, *Polygonum multiflorum* [13], *Polygonum tinctorium* [7] and *Amorphophallus campanulatus* [11]. But there are no reports on antimicrobial activities on this valuable plant. Hence, the present

study was undertaken to determine the antibacterial and antifungal activities of ethanol extract of *Polygonum chinense* whole plant.

MATERIALS AND METHODS

Plant Materials Collection: The whole plants of *Polygonum chinense* L. were collected during January, 2011 from Western Ghats Nilgiris District, The plants were identified from Botanical Survey of India, Southern Circle Coimbatore, Tamil Nadu.

Plant Material Extraction: The whole plants were cut, air-dried powdered in a grinding machine and stored in an airtight container. The powdered dried whole plants (300 g) of the plant were extracted (cold) with ethanol (1.25 L) in flat bottom glass container, through occasional shaking and stirring for 15 days. The whole mixture was then filtered and the filtrate was dried in vacuum using a rotator evaporator to afford a blackish mass [16].

Organisms Collection: Antibacterial activity and minimum inhibitory concentration (MIC) were determined against two gram-positive bacteria (*Stapphylococcus aureus* (ATCC 6538P) and *Enterobacter aerogenes*) and two gram-negative bacteria (*Escherichia coli* (ATCC 8739), *Salmonella typhi* (ATCC 6539). Antifungal screening was carried out against two fungi (*Aspergillus niger* (ATCC 9029), *Candida albicans* (ATCC 2091). These organisms were collected from microbial type collection center, Chandigarh, India.

Paper disc diffusion method

The sterilized (autoclaved at 121 °C for 15 min) medium (40-50 °C) was inoculated (1 ml/100 ml of medium) with the suspension (105 cfu/ml) of the microorganism (matched to McFarland barium sulphate standard) and poured into a petridish to give a depth of 0.3-0.4 cm. The paper impregnated with the extract (25, 50 and 100 µg/ml in dimethyl formamide) was placed on the solidified medium. The plates were pre incubated for 1 h at room temperature and incubated at 37 °C for 28 h and 48 h for antibacterial and antifungal activities, respectively. Kanamycin (50 µg/disc) and ketoconazole (50µg/disc) was used as standard for antibacterial and antifungal activities respectively [18].

RESULTS AND DISCUSSION

Antibacterial Activity: The results representing antibacterial activity of ethanol extract of whole plant of *Polygonum chinense* L. presented in Table 1. The highest activity of plant extract was 2.23cm of zone inhibition found against *Bacillus subtilis* followed by 1.8cm of zone inhibition against *Stapphylococcus aureus* at the concentration of 100 µg/disc. And the lowest activity of plant extract was 0.93cm of zone inhibition observed against *Escherichia coli* at the concentration of 25µg/disc. In the comparison to reference standard kanamycin 50 µg/disc, the ethanol extract of *Polygonum chinense* whole plant showed significant antibacterial activity at 100 µg/disc. In the present experiment observed that the ethanol extract showed comparatively better antibacterial activity against the gram-positive bacteria than the gram-negative bacteria. Many authors reported antibacterial activity of different medicinal plant extracts and our present investigation supported the previous findings [11, 9, 6].

Table 1 Antibacterial and antifungal activity of *Polygonum chinense* L. whole plant extract on different microbes and their corresponding IZD

S.No	Microorganism	25 µg /Disc	50 µg /Disc	100 µg /Disc
1	*Bacillus subtilis*	1.4±0.80	1.73±1.00	2.23±1.28
2	*Stapphylococcus aureus*	1.06±0.61	1.36±0.78	1.8±1.07
3	*Escherichia coli*	0.93±0.5	1.26±0.73	1.46±0.84
4	*Pseudomonas aeruginosa*	0.96±0.55	1.26±0.73	1.53±0.88
5	*Aspergillus niger*	1.16±0.67	1.23±0.71	1.5±0.86
6	*Candida albicans*	0.83±0.48	0.93±0.53	1.2±0.69

Antifungal Activity: The antifungal activities of chloroform extract of *Polygonum chinense* L. whole plant and standard Ketoconazole (50 µg/disc) were determined at the concentrations of 25 µg/disc and 100 µg/disc against two pathogenic fungi (Table 1). The highest activity was 1.5cm of zone inhibition observed against *Aspergillus niger* followed by 1.2cm of zone inhibition against *Candida albicans* at the concentration of 100 µg/disc. And, the lowest activity was 0.83 cm of zone inhibition found against *Candida albicans* at the concentration of 25 µg/disc [1,11,9,2,12]. Different plant extracts have been reported for their antifungal properties which supports our present

findings. Overall, the chloroform extract of *Polygonum chinense* L. whole plant showed significant activity against all the tested pathogenic fungi [19,20,21,22, 23].

Habit of *Polygonum chinense* L.

CONCLUSION

The present study concluded that the chloroform and ethanol extract of *Polygonum chinense* L. The whole plants demonstrated a strong activity against *Bacillus subtilis*, *Stapphylococcus aureus*, *Pseudomonas aeruginosa*, *Aspergillus niger*. This investigation can be used in the folk medicine and source of antibacterial substances for

possible treatment of many diseases including bacterial and fungal infections. However, to know the extract mechanism of action of *Polygonum chinense* L. whole plant extract, further studies with purified fractions with bioactive compounds are warranted.

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