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Phytochemical and Antimicrobial Activity of Methanolic Leaf Extract of *Swertia beddomei* (Gentianaceae)

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The medicinal plant *Swertia beddomei* (Hook. f) of Gentianaceae was analyzed for phytochemical and antimicrobial properties. The methanolic leaf extract showed the presence of compounds such as flavonoids, saponins, phytosterols, phenols, glycosides, steroids and thiols and absence of alkaloids. The antimicrobial activity of methanolic leaf extract was tested against five bacterial and five fungal human pathogenic microbes. The antimicrobial activity showed response to all the microbial pathogens, the activity against bacterial pathogens is comparatively high than the fungal pathogens.

Key words: Antimicrobial activity, *Swertia beddomei,* Bacterial pathogens.

Most of the people in rural and urban areas of the world were depend on the medicinal plants for the treatment of infectious diseases. The Ayurvedic and Unani systems of medicines are widely used by the people of Indian subcontinent. Medicinal plants represent a rich source of antimicrobial agents (Mahesh and Satish, 2008). The use of plants as source of medicine is since from the dawn of civilization. The knowledge of these medicinal plants is diminishing very rapidly and is necessary to document the uses of these plants (Suresh *et al.,* 2006). A large number of plants in different location around the world have been extracted and semi-purified to investigate individually their antimicrobial activity (Dranghon, 2004). Researches have shown that all different parts of the plants which include; stem, root, flower, bark, leaves, etc. possess antimicrobial property.

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The presences of various chemical compounds in the plant parts are responsible for the resistance activity of the plant drugs to the pathogens. Among the different plant derivatives, secondary metabolites proved to be the most important group of compounds that showed wide range of antibacterial and antifungal activity (Ahmed *et al*. 2002, Rahman *et al*. 1999). Resistance to antimicrobial agents has become an increasingly important and pressing global problem, and is the main reason for an extended search for new drugs to treat microbial infections. The investigation of certain indigenous plants for their antimicrobial activity is therefore of utmost importance. This study is aimed at investigating the antimicrobial activity of *Swertia beddomei* against bacteria and fungi thereby establishing it as a potential antimicrobial agent.

MATERIAL AND METHODS

The leaves of *Swertia beddomei* was collected from Vellingiri Hills, Western Ghats during August, 2005. The plant was identified at the Herbarium Department of Botany, Kongunadu Arts and Science College, Coimbatore. The plant

was confirmed in Botanical Survey of India (BSI) Coimbatore by comparing with the type specimen.

Preparation of plant materials and extraction

The leaves were collected and air dried over period of tow weeks. 100g of each air dried leaves were used for extraction. Shade dried crude powder (50g) leaves of *Swertia beddomei* was extracted in Soxhlet apparatus separately. Sequential extraction was done with methanol for about 18hrs with each solvent. The extracts were evaporated below 40ºC and stored at 40ºC. The residue obtained was used for determination of antimicrobial activity after making different concentration.

Phytochemical study

The phytochemical components of the *Swertia beddomei* were screened for using the method of Harbone (1984) and Trease and Evans (1989). The components analyzed for alkaloids, flavonoids, tannins, phenol, glycosides, steroid and saponin.

Antimicrobial study

Screening for antimicrobial activity was carried out by disc diffusion method (Taylor, *et al.*, 1995).

Bacterial cultures

The strains of *Staphylococcus aureus*, *Escherichia coli*, and *Bacillus subtilis* were obtained from National chemical laboratory Pune and *Salmonella typhi* and *K. pneumania* were obtained from Calicut medical college, Kerala.

Fungal cultures

The following Fungal strains of *Aspergillus niger, A.flavus, A.fumigatus, Candida albicans and Penicillium chrysore* were procured from National Chemical Laboratory, Pune. Chloramphenicol (100 µg/ml) and acriflavine (6.3 mg/ml) were used as positive controls for bacteria and fungi respectively; MeOH/H_2O was the negative control.

RESULTS AND DISCUSSION

The phytochemical study of methanolic leaf extract of *Swertia beddomei* (Table 1) showed the presence of compounds such as flavonoids, saponins, phytosterols, phenols, glycosides, steroids and thiols and absence of alkaloids. The presence of these alkaloids is responsible for the antimicrobial activity of the plants. In the antibacterial study the methanolic leaf extract of Swertia *beddomei* was tested against five bacterial strains such as *E. coli, K. pneumonia, S. typhi, S. aureus* and *B. subtilis.* The inhibitory effect of the plant extract was compared with the control. The experiment was carried out at 50%, 75% and 100% concentration on methanolic leaf extract. Results as zone of inhibition (mm) were shown in Table 2. *Aspergillus niger, A. flavus, A. fumigatus, Candida albicans* and *Penicillium chrysore* were the fungal strains selected for the study.

Microorganisms have been developing resistance to many antibiotics due to the indiscriminate use of antimicrobial drugs. In addition, antibiotics are sometimes associated with adverse effect in the host. Therefore there is a need for alternative antimicrobial drugs for the treatment of infectious diseases. This only leads to the screening of the locally available medicinal plants for their antimicrobial properties. Thus medicinal herbs represent a rich source from which novel antibacterial and antifungal chemotherapeutic agents may be obtained (Rates, 2001).

The methanolic leaf extract of *Swertia beddomei* showed more antibacterial activity than fungal pathogens. The inhibitory effect of the plant extract increased with the corresponding increase in the concentration. However, the maximum inhibition was found to be present in all three negative bacterial strains *E. coli, K. pneumoniae* and *S. typhii* than the positive bacterial strains, *S. aureus* and *B. subtilis*

Table 1. The preliminary phytochemical study on the Petrolium ether and Methanolic leaf extracts of *Swertia beddomei*

Test	Methanol
Alkaloids	-
Flavonoids	+
Phenols	+
Steroids	+
Glycosides	+
Tannins	+
Thiols	-
Saponins	-
Fatty acids	+

- = Absence; + = Presence,

Table 2. Antibacterial activity of methanolic leaf extract of *Swertia beddomei*

Organisms	Concentrations (µg/ml/Disc)				
	C(mm)	50(mm)	75(mm)	100(mm)	MIC (mg/ml)
Bacterial Stains					
E. coli	15	8.1	11	14.2	3.0
K. pneumania	12	5.8	9.2	11.8	3.0
S. typhi	11	6.9	9.1	11	3.0
S. aureus	12	6.2	9.1	12.3	3.0
B. subtilis	15.3	9.5	11.3	14.8	3.0
Fungal Stains					
Aspergillus niger	16	6.8	9	13.2	3.0
A.flavus	11	6.5	9	10.8	3.0
A.fumigatus	13	6.2	8.1	10.2	3.0
Candida albicans	12.3	7.2	9.4	11.3	3.0
Penicillium chrysore	14	8.3	10	12.8	3.0

Swertia beddomei exhibited a more or less similar positive result on *E. coli* and *B. subtilis*. The zone of inhibition was less in both species on *S. typhi*. The leaf extract of *S. beddomei* showed maximum inhibitory activity against *S. aureus* where as the methanolic extract of *Swertia beddomei* moderately inhibited the activity of *B. subtilis* and *S. aureus* (Ramesh *et al.,* 2002). In contrast, the present study showed high anti bacterial activity in methanolic extract. There are several reports stating that other *Swertia* species extracts exhibits anti bacterial activity (Awsthi *et al.,* 2005). The presence of tannins in the plant extract had been shown to form irreversible complexes with proline rich proteins which would result in the inhibition of cell wall protein synthesis of microbes. This could explain the mechanism of antibacterial activity. The anti bacterial effect might be due to the individual susceptibility of the organisms to the plant extracts (Audu *et al.,* 2000).

In general the methanolic leaf extract of *Swertia beddomei* is highly resistance to the bacterial pathogens than the fungal pathogens. This may be due to the presence of the chemical compounds such as flavonoids, tannins and saponins. This result is in accordance with the findings of Suresh and Nagarajan, 2009.

Plants can produce antifungal compounds to protect themselves from biotic attack that could be essential for fungi resistance (Wojtaszek, 1997). These results suggest a potential importance for the use of active constituents from this plant as leads to develop new drugs for the treatment of fungal infections.

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