

Antibacterial activity of leaf extracts of *Biophytum sensitivum* (L.) DC.

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Abstract

Biophytum sensitivum (L.) DC. (Oxalidaceae) is an ethnomedicinal plant used in folklore medicine. The main aim of this study demonstrates that the leaves extracts of *B. sensitivum* (methanol, chloroform, acetone, and petroleum ether) was evaluated for its antibacterial activity against several human pathogenic bacterial strains (*Bacillus subtilis*, *Staphylococcus aureus*, *Streptococcus pneumonia*, *Klebsiella pneumonia*, *Salmonella typhi*, *Proteus vulgaris* and *Escherichia coli*) by agar well diffusion method. All the extracts showed various levels of activity on different test organisms and their activity is quite comparable with the standard antibiotics. The acetone extracts showed remarkable antibacterial activity. This study fortifies that methanol and chloroform extracts found to be better antibacterial activity against all the test organisms than petroleum ether extract. The results from these investigations encourage that the plant extracts may be used as anti-infective agents.

Keywords: *Biophytum sensitivum* (L.), antibacterial activity, agar well diffusion method.

Introduction:

The frequency of life-threatening infections caused by pathogenic microorganisms has increased worldwide and is becoming an important cause of morbidity and mortality in immune compromised patients in developing countries¹. Many infectious microorganisms have developed resistance against many synthetic antibiotics due to the indiscriminate use of antimicrobial drugs² and sometimes they are associated with side effects³. There is an urgent need to discover an alternative new, more active, broad spectrum, and safer antimicrobial agents^{4&5}. Plant materials remain an important resource to combat serious diseases in the world. The pharmacological investigations of plants were carried out to find novel drugs or templates for the development of new therapeutic agents⁶. One of the most popular medicinal herb, *Biophytum sensitivum* (L.) DC. (Oxalidaceae) is a small annual plant, growing throughout the tropical regions of South Asia, Africa and Madagascar. It possesses a wide spectrum of medicinal properties namely antiseptic properties, asthma and phthisis⁷, including positive effects in inflammatory diseases, and diabetes⁸⁻¹⁰. The biological activity of the

plant shows hypoglycaemic¹¹, immunomodulatory¹², chemoprotective¹³, hypocholesterolemic¹⁴, apoptotic¹⁵, antiinflammatory¹⁶ and cell-mediated immune response¹⁷, antitumor¹⁸, repetitive action potentials¹⁹ effects on prostaglandin biosynthesis^{20 & 21}. The biochemical properties²² of the plant showed the presence of amentoflavone²³, 3', 8''-biapigenin²⁴, proanthocyanidins²⁵ and phenolic compounds²⁶. The present study was undertaken to investigate the antibacterial potentiality (*in vitro*) of dried leaves of *B.sensitivum* were tested against three Gram positive and four Gram negative human bacterial pathogens.

Materials and Methods:

Plant Materials

The leaves of *B. sensitivum* were collected from Trichy District, Tamil Nadu, identified and authenticated at the Biotechnology Department, Periyar University, Salem, Tamil Nadu, India. The leaves were washed with tap water, shade dried, and powdered.

Extraction Preparation

About 25 grams of plant material was separately extracted by percolation at room temperature in solvents (methanol,

chloroform, acetone and petroleum ether) for three days. The extracts were filtered by using filter paper than kept it for air dry and stored at 4°C until further use. The extractions were re-suspended in 1 ml of dimethylsulphoxide (DMSO) for antimicrobial activities.

Microorganisms Used

Three Gram positive bacterial strains *Bacillus subtilis*, *Staphylococcus aureus*, *Streptococcus pneumonia*, and four Gram negative bacterial strains *Klebsiella pneumonia*, *Salmonella typhi*, *Proteus vulgaris*, *Escherichia coli*. All the bacterial strains were obtained from clinical laboratories, Salem District, Tamil Nadu. The test organisms were prepared by inoculated a loopfull of culture in a 5ml of nutrient broth and incubated at 37 °C for 14 hours.

Antibacterial Activity

The antimicrobial activities of the extracts were evaluated by means of the agar well diffusion assay. The assay was carried out according to the method of Natarajan *et al.* (27) (2005) with some modifications. Approximately 25 ml of Müeller Hinton Agar (MHA) (HiMedia) were poured into sterile petri dish and allowed to solidify. About 100 µl of bacterial inoculums were poured then swabbed on the MHA media by using sterile cotton swab. In each of these plates five wells (5mm diameter) were punched into the agar by using sterile cork borer. Then 100 µl of each extract was separately added into wells and allowed to diffuse at room temperature. Equal volume of DMSO was served as negative control and standard antibiotic used as positive control. The plates were incubated for 24 hours at 37°C and the diameter (in mm) of clear zone of growth inhibition was recorded.

Results and Discussion:

The results of the antimicrobial activity by the agar well diffusion method of

B. sensitivum different extracts were presented in Table 1. All the extracts were inhibited growth of almost all the selected bacteria in the range of 7-25 mm. Among them acetone extract showed great activity against *B. subtilis* and moderated activity were reported against *S. aureus*, *S. pneumoniae* and *K. pneumonia*. The same extract showed least activity against *S. typhi*, *E. coli* followed by *P.vulgaris*. The methanol extract exhibited significant activity against *E. coli*, *P. vulgaris*, *S. pneumonia* followed by *K. pneumonia* and *S. aureus*. The remaining bacterial pathogens found to be least activity. The petroleum ether and chloroform extract showed moderate activity against all selected bacterial pathogens. The use of medicinal plants play a vital role in covering the basic health needs in developing countries and these plants may offer a new source of antibacterial, antifungal and antiviral agents with significant activity against infective microorganisms. The results of present investigation showed broad spectrum antibacterial activity against the tested bacteria. There are several investigators have proved the antimicrobial potentiality of some oxalidaceae members. Valasaraj *et al.*,²⁸ reported that the different concentrations (25, 12.5, 6.25 and 1.56 mg/ml) of 80% ethanol extracts of *Oxalis corniculata* were tested against four bacteria viz. *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* by the agar dilution method. Likewise, Raghvendra *et al*²⁹ have reported the antibacterial activity of various extracts of *O. corniculata* plant and showed significant antibacterial activity of methanolic and ethanolic extracts of the same against *Xanthomonas* and fourteen human pathogenic bacteria. The discovery of a potent remedy from plant origin will be a great advancement in bacterial infection therapies. The result of present investigation

Table 1: Antibacterial Activity of leaf extracts of *B. sensitivum*

S. No	Extracts Used	Organisms Tested (Diameter of inhibition zone (in mm))						
		<i>B. subtilis</i>	<i>S. aureus</i>	<i>S. pneumoniae</i>	<i>E. coli</i>	<i>K. pneumoniae</i>	<i>P. vulgaris</i>	<i>S. typhi</i>
1	Methanol	13	14	15	19	14	15	11
2	Acetone	25	14	12	11	14	8	10
3	chloroform	12	11	8	13	10	13	11
4	Pet. ether	13	11	7	12	10	10	9
5	DMSO	—	—	—	—	—	—	—
6	Streptomycin	21	22	18	—	12	13	15

highlights that the antibacterial potentiality of the extracts of *B. sensitivum*. Further phytochemical studies are required to isolate the types of compounds responsible for the antimicrobial effects. This study encourages the use of herbal extracts demonstrated that folk medicine can be used as effective modern medicine to combat pathogenic microorganisms.

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