Antimicrobial activity of different solvent extracts of *Biophytum Sensitivum* and its Phytochemical Analysis

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Abstract: **The agar diffusion method was used to examine the antibacterial activity of different solvent extracts of *Biophytum sensitivum* tested against *Escherichia coli, Pseudomonas aeruginosa*, *Klebsiella pneumonia*, and *Staphylococcus aureus*. For qualitative phytochemical investigation, several solvent extracts of the complete *Biophytum sensitivum* plant were investigated. The minimum inhibitory concentration (MIC) of *Biophytum sensitivum* ethanol extract had significant antimicrobial effectiveness against *Escherichia coli* (152 µg/ml), and *Pseudomonas aeruginosa* (165 µg/ml). The ethanolic extract showed (198 µg/ml and 207 µg/ml) antimicrobial activity against *Klebsiella pneumonia* and *Staphylococcus aureus* respectively. The lowest antibacterial activity was found in hexane extract with MIC (412 µg/ml) of *Biophytum sensitivum.***

***Index Terms- Biophytum sensitivum*, antimicrobial activity, agar diffusion method, Phytochemical analysis**

INTRODUCTION

In recent years, herbal products have gained popularity in industrialized countries as well as a number of other nations. According to the World Health Organization, 80 percent of people worldwide currently utilize herbal medicine for various kinds of primary healthcare. (Mazid et al. 2012). In ethnomedicine, a lot of the plants are utilized to treat a variety of illnesses. Antimicrobial drugs either eradicate or prevent the growth of microorganisms.

Disinfectants are antimicrobial chemicals used on no-living items or outside the body parts.

Microorganisms play an important role in the manufacture of bioactive small molecules from natural resources for the prevention of several diseases and the creation of effective medications.

Numerous medications have caused microbes to become resistant, which presents a substantial therapeutic issue in the management of infectious diseases. The overuse of commercially available antimicrobials, which are routinely used to treat illnesses, led to the development of the bacteria' tolerance (Lewis and Ausubel, 2006). In order to find new antimicrobial chemicals, researchers were motivated to investigate in other sources, particularly herbal resources.

MATERIALS AND METHODS

Plant material:

A taxonomist from Yeshwant Mahavidyalaya, Nanded-431602, Maharashtra, recognized and verified the plant *Biophytum sensitivum* that was acquired from the Bhokar region of the District of Nanded.

Preparation of Plant extracts:

Whole *Biophytum sensitivum* plants were collected and allowed to dry in the shade. Using a mixer grinder, the dried, complete plant was turned into a fine powder. The Soxhlet apparatus and a variety of solvents, including water, ethanol, chloroform, ethyl acetate, and hexane, were used to extract from the fine powder the plants. The extracted substance was then concentrated and used for different experiments.

Preliminary Phytochemical analysis:

A standardized approach was used to perform phytochemical analysis on whole plant extracts of *Biophytum sensitivum* using several solvent extracts. (Yadav and Agarwala, 2011).

Test microorganisms:

Escherichia coli (MTCC-739), *Pseudomonas aeruginosa* (MTCC-2453), *Klebsiella pneumonia* (MTCC-2653), and *Staphylococcus aureus* (MTCC-96) were used as test organisms in the current study. They were obtained from the culture collection center at the school of life sciences at S. R. T. M. University in Nanded, Maharashtra. For the current experiment, the obtained cultures were repeatedly subcultured.

Antimicrobial activity by agar diffusion method:
The antibacterial efficacy of several *Biophytum sensitivum* solvent extracts was assessed using the agar diffusion method. For spreading agar media, a subcultured microbial suspension (100 µl) was prepared. Various concentrated varied extracts were used to measure antimicrobial activity (Magaldi et al. 2004). The plates were filled with the sample and then left to allow for an hour to enable the extract to disperse. The plates were maintained in an incubator for 24 hours at 37°C, and the inhibitory zone was measured in millimeters (mm). Results are compared with those of conventional antibacterial drugs.

RESULTS AND DISCUSSION

All of the extracts from the *Biophytum sensitivum* contained saponin, phenols, tannins, glycosides, terpenoids, flavonoids, alkaloids, and coumarins, according to a preliminary phytochemical examination. With the exception of the chloroform extract's lack of saponins, glycosides, and coumarins and the extract from ethyl acetate's absence of saponin. The results of the phytochemical analysis are displayed in Table 1. A higher degree of biological activity derives from the presence of a high concentration of phytochemicals in the plant. The antibacterial properties of various solvent-based extracts of *Biophytum sensitivum* are displayed in Table 2. The ethanol extract of *Biophytum sensitivum* had the highest antimicrobial activity with MIC (152 µg/ml) against the *Escherichia coli*, (165 µg/ml) against the *Pseudomonas aeruginosa*, (198 µg/ml) against the *Klebsiella pneumonia* and (207 µg/ml) against the *Staphylococcus aureus*. The various extracts of *Biophytum sensitivum* tested against *Escherichia coli* and showed considerable MIC results in water extract (233 µg/ml), chloroform extract (321 µg/ml), ethyl acetate extract (346 µg/ml), hexane extract (412 µg/ml). The results were compared with standard Cephalosporins as reference compounds with MIC (51 µg/ml). The different extracts of *Biophytum sensitivum* were checked against the *Pseudomonas aeruginosa* and exhibited significant MIC values in water extract (266 µg/ml), chloroform extract (289 µg/ml), ethyl acetate extract (308 µg/ml), hexane extract (358 µg/ml). The obtained results were compared with Cephalosporins with MIC (45 µg/ml). The individual extract of *Biophytum sensitivum* was checked against *Klebsiella pneumonia* and found impressive MIC values in water extract (229 µg/ml), chloroform extract (275 µg/ml), ethyl acetate extract (376 µg/ml), hexane extract (389 µg/ml). The different solvent extract of *Biophytum sensitivum* was evaluated against *Staphylococcus aureus* and found impressive MIC values in water extract (265 µg/ml), chloroform extract (344 µg/ml), ethyl acetate extract (284 µg/ml), hexane extract (267 µg/ml). The gentamicin (33 µg/ml) was used as a standard compound.
A considerable inhibitory zone may also be caused by the variety of phytochemicals present in the extract. The presence of different flavonoids, alkaloids, terpenoids, phenols, saponins, and coumarins has bactericidal properties (Kalidindi *et al*, 2015). According to various scientific studies, high concentrations of phytochemicals and bioactive compounds are thought to have a stronger potential for treating a variety of pathogenic bacteria. Numerous plants and their various portions of them have historically been used to treat a variety of chronic illnesses, such as gastrointestinal problems, urinary tract infections, skin conditions, and various respiratory issues., etc. (Alzoreky and Nakahara, 2003). Several chronic illnesses caused by various bacteria may be prevented and managed with the use of plant-based remedies. Many societies still employ ethnomedicines to treat illnesses and overcome obstacles without creating negative side effects. The inclusion of several phytoconstituents, including alkaloids, flavonoids, coumarins, saponins, polyphenols, tannins, and terpenoids, is what gives herbal preparations their therapeutic effects. (Bhalodia and Shukl, 2011). The presence of secondary metabolites prevents the growth of harmful microorganisms causing serious diseases (Gurnani et al., 2016). The microorganisms are resistant to many antibiotics that are very harmful to humans. The researchers are finding an alternative to commercial antibiotics to prevent harmful infections against a variety of microorganisms using plant-based medicines (Khan et al., 2013). The higher concentration of crude extracts sometimes may cause cytotoxicity in humans hence the dose-dependent values are determined using in vitro cell cytotoxicity

assay (Talib and Mahas, 2010). As compared to commercial antibiotics, plant-based medicines have very small side effects if they are consumed in excess quantity (Talib and Mahasneh, 2010). In the world, 80 % of different pharmaceuticals are prepared from plant-based medicines and which are effective to cure any chronic disease.

CONCLUSION

According to the studies, ethanol extract has the most potential, which may be because it includes the majority of the phytochemical compounds and bioactive compounds that have antibacterial activity. The complete plant extract of *Biophytum sensitivum* has to be further studied in order to identify and purify chemicals that might be used as natural medicinal alternatives to synthetic commercial ones.

Table 1. Preliminary phytochemical analysis of whole plant extract of *Biophytum sensitivum*

Sr. No.	Phytochemical Test	Whole plant extract of *Biophytum sensitivum*				
		Water Extract	Ethanol Extract	Chloroform extract	Ethyl acetate extract	Hexane extract
1	Saponins	+	+	-	-	+
2	Phenols	+	+	+	+	+
3	Tannins	+	+	+	+	+
4	Glycosides	+	+	-	+	+
5	Terpenoids	+	+	+	+	+
6	Flavonoids	+	+	+	+	+
7	Alkaloids	+	+	+	+	+
8	Coumarins	+	+	-	+	+

Table 2. Antimicrobial activity of the whole plant extract *Biophytum sensitivum*

Sr. No.	Microorganism	Minimum inhibitory concentration (MIC)						
		Whole plant extract of *Biophytum sensitivum* (µg/ml)						
		Water extract	Ethanol extract	Chloroform extract	Ethyl acetate extract	Hexane extract	Gentamicin (µg/ml)	Cephalosporins (µg/ml)
1	*Escherichia coli*	233	152	321	346	412	ND	51
2	*Pseudomonas aeruginosa*	266	165	289	308	358	ND	45
3	*Klebsiella pneumonia*	229	198	275	376	389	ND	41
4	*Staphylococcus aureus*	265	207	344	284	267	33	ND

The results summarized are the mean values of two parallel experiments.

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