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PHYTOCHEMICAL ANALYSIS OF SECONDARY METABOLITES AND ANTIMICROBIAL ACTIVITY OF *SANSEVIERIA ROXBURGHIANA*

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ABSTRACT

In the present investigation, different solvent soluble fractions of leaves of Acetone (F1), Ethanol (F2), methanol (F3), chloroform (F4) and Ether (F5) of *Sansevieria roxburghiana* Schult. and Schult.f. (Agavaceae) was evaluated for the preliminary analysis of phyto chemicals and antimicrobial investigation against clinically significant bacterial strains. Qualitative analysis of the selected parts confirmed by the presence of various primary and secondary plant metabolites such as alkaloids, terpenoids, flavonoids, saponins, steroids, phenols, tannins, and quinone. Antimicrobial assays revealed significant antimicrobial activity against bacteria such as *Proteus vulgaris*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Escherichia coli*. The current study suggests that *Sansevieria roxburghiana* contain potential secondary metabolites with effective antimicrobial activities, but still research findings needs to authenticate which compound is effective from the combination.

KEYWORDS: *Sansevieria roxburghiana*, phytochemicals, secondary metabolites, Antimicrobial activity.

INTRODUCTION

Sansevieria roxburghiana belongs to Agavaceae family (L), is one of hemp species with concave, short petioled leaves that are in part transversely banded with light and dark green, also linearly striated with whitish to light green and dark green striations (Jeeva *et al.*, 2012). This plant has long rhizomes with rapid rate of growth containing long fibrous roots and are grown ornamentally (USDA, 2008). Nearly 70 numbers of species exists in *Sansvieria* such

as *Sansevieria trifasciata, Sansevieria ehrenbergii, Sansevieria guineensis, Sansevieria longiflora, Sansevieria zeylanica etc.*

Medicinal plants continue to be an important therapeutic aid for alleviating the ailments of humankind (Harini *et al.,* 2011). In India, this plant has been traditionally used for several medicinal purposes. The whole plant is traditionally used as a cardiotonic, expectorant, febrifuge, purgative, tonic, in glandular enlargement and rheumatism (Aneesh, 2009). Recent studies on *S. roxburghiana* rhizome demonstrated remarkable anti diabetic activity in STZ (streptozotocin) induced diabetic rats (Pallab *et al.,* 2010). The leaf sap is applied directly to infected sores, cuts and grazes (Sardessai *et al.,* 2010).

In current study, our effort is to identify potential bioactive secondary metabolites and unveiling the possible antimicrobial activities of leaf extracts of *Sansevieria roxburghiana*.

MATERIAL AND METHODS

Plant material

Sansevieria roxburghiana was collected from Sri Venkateswara University, India. Botanical identification of the plant was done by K.Madhavachetty, Assistant professor, Department of Botany, Sri Venkateswara University, India.

Solvent extracts

10g of pulverized leaf material was mixed with 100ml of each solvent of acetone, ethanol, methanol, chloroform and ether are kept in rotary shaker at 100 rpm overnight and filtered with Whatman No.1 filter paper and concerted to dryness at 40°C, lyophilized and stored at 4°C until further use.

Antibacterial Activity

Dried fractions Acetone (F1), Ethanol (F2), Methanol (F3), Chloroform (F4) and ether (F5) were dissolved in 5% DMSO (Dimethylsulphoxide) so as to get a concentration of 1 mg/ml. 500µl of this were applied on the disc and allowed to diffuse for half an hour at 4ºC and incubated at 37ºC for 24hrs. Azithromycin (F6) served as control (C).The plates were observed for the presence of inhibition of bacterial growth that was indicated by the clear zone around the disc.

Test for alkaloids

About 0.2 g of each of the fractions was warm with 2% H_2SO_4 for two minutes. The reactants were filtered and added a few drops of Dragendroff's reagent to each filtrate. Orange red precipitate indicates the presence of alkaloids moiety.

Test for flavonoids

About 0.2 g of each extract was dissolved in diluted NaoH and few drops of HCl were added. A yellow solution that turn colorless indicates the presence of flavonoids.

Test for tannins

A small quantity of each extract was mixed with water and heated on water bath and filtered. A few drops of ferric chloride were added to each filtrate. A dark green solution indicates the presence of tannins.

Test for saponins

0.2g of each extract was shaken with 5 ml of distilled water and heated to boiling. Frothing (appearance of creamy miss of small bubbles) shows the presence of saponins.

Test for anthraquinone

About 0.5g of each extract was boiled with 10 % HCl for few minutes on water bath. The reaction mixture was filter and allows to cool. Equal volume of $CHCl_3$ was added to each filtrate. Few drops of 10 % ammonia was added to each mixture and heated. Rose pink color formation indicates the presence of anthraquinone.

Test for steroids

2ml of acetic anhydride was added to the mixture of 0.5g of each extract and H_2SO_4 (2ml). The color change from violet to blue or green in some samples indicates the presence of steroids.

Test for terpenoids

About 0.2g of each extract was mixed with 2ml of chloroform and concentrated H_2SO_4 (3ml) was carefully added to form a layer. The formation of a reddish brown coloration at the interface indicates positive results for the presence of terpenoids.

Phenols

To 1ml of the extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of blue or green color indicates presence of phenols.

RESULTS AND DISCUSSION

The phytochemical screening of the leaf parts of *Sansevieria roxburghiana* revealed the presence of bioactive secondary metabolites such as alkaloids, saponins, steroids, terpenoids, tannins, and phenols (Table 1).

Table 1. Phytochemical profile of *Sansevieria roxburghiana*

Phytochemical components	Acetone	Ethanol	Methanol	Chloroform	Ether
Alkaloids	++	-	+++	++	+
Flavinoids	-	+	-	-	+
Saponins	-	+	+	-	-
Steroids	+	-	++	++	++
Terpenoids		-	-	+	-
Tannins	++	+	++	+	-
Phenols	-	-	+++	-	-
Quinones	-	-	+	+	+

+, ++, +++ Moderate, High, Very high

The phytochemical screening revealed that shown high presence of alkaloids in methanol extract compared to acetone, chloroform and ether. Flavonoids are present in ethanol and ether in moderate proportions; saponins are present in ethanol and methanol in moderate proportions. Steroids shown higher proportions in methanol, chloroform and ether and moderate in acetone; Terpenoids presence is shown in chloroform and absent in all rest of the extracts. Tannins are high in Acetone and methanol and moderate in ethanol and chloroform. Phenols are very high only present in methanol fractions, quinones are present in methanol, chloroform and ether in moderate levels. Overall extracts of *S. roxburghiana* leaves showed the strong presence of, alkaloids, steroids, terpenoids, tannins and phenols. All these have potential health promoting effects, at least under different circumstances (Basu *et al.*, 2007).

The antimicrobial activity by using disc diffusion method evaluated that methanolic extract was found to have significant activity against all strains. All the bacteria showed better zone of inhibition against 5 fractions (Table 2).

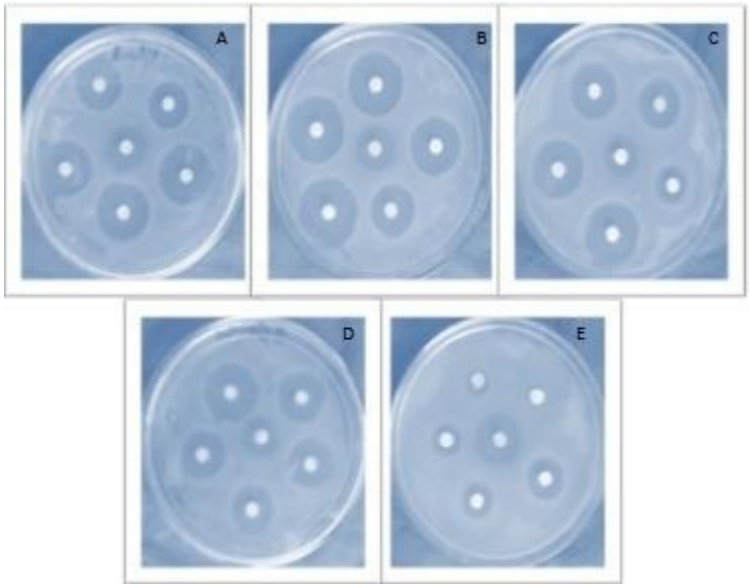
Table 2. Antimicrobial activity of *Sansevieria roxburghiana.*

Microorganism	Zone of inhibition(mm)					
	Acetone (500 µl) mm	Ethanol (500 µl) mm	Methanol (500 µl) mm	Chloroform (500 µl) mm	Ether (500µl) mm	Azithromycin (500µl) mm
Escherichia coli	5±0.2	7±0.34	10±0.13	8±0.65	6±0.5	5±0.4
Klebsiella pneumoneae	8±0.3	11±0.12	13±0.17	7±0.22	8±0.1	6±0.1
Pseudomonas aeuroginosa	7±0.7	8±0.56	12±0.24	3±0.19	3±0.6	3±0.4
Salmonella typhi	5±0.2	9±0.16	14±0.15	9±0.11	7±0.3	5±0.5
Proteus vulgaris	4±0.1	8±0.24	4±0.16	6±0.06	5±0.4	3±0.2

Mean ± SD, n=3

Escherichia coli showed 5±0.2, 7±0.34, 10±0.13, 8±0.65, 6±0.5; *Klebsiella pneumoneae* showed 8±0.3, 11±0.12, 13±0.17, 7±0.22, 8±0.1; *Pseudomonas aeuroginosa* showed 7±0.7, 8±0.56, 12±0.24, 3±0.19, 3±0.6; *Salmonella typhi* showed 5±0.2, 9±0.16, 14±0.15, 9±0.11, 7±0.3; *Proteus vulgaris* showed 4±0.1, 8±0.24, 4±0.16, 6±0.06 and 5±0.4 in Acetone, ethanol, methanol, chloroform and ether solvent extracts compared to Azithromycin acts as control (5±0.4, 6±0.1, 3±0.4, 5±0.5 and 3±0.2). Among all extracts methanol leaf extract exhibited high antimicrobial activity in all strains of about 14 ± 0.15 activity, comparable to acetone (7±0.7) ethanol (11±0.12), chloroform (9±0.11) and ether (6±0.1).

Fig 1: *Sansevieria roxburghiana* leaf pure fractions (F1, F2, F3, F4 & F5 compared with Azithromycin exhibiting zones of inhibition against five pathogenic microbes.



(A) *Escherichia coli* (B) *Klebsiella pneumoneae* (C) *Pseudomonas aeuroginosa* (D) *Salmonella typhi* (E) *Proteus vulgaris*

This antimicrobial activity of the 5 bacterial species implies that this plant can contribute significantly therapeutic use. The information obtained above can be in the identification of the plant. This study has revealed that the presence of important phytochemical analysis of the plant leaves can be for therapeutic usage. These results support the medicinal use of the plant, and in addition, unveil the possibility of its acting as a potential source of secondary metabolites.

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