Muthu Mohamed Jamal Moideen and M. Mohamed Raffick / *International Journal of Phytopharmacology*, 3(1), 2012, 21-26.

e- ISSN 0975 – 9328
Print ISSN 2229 – 7472

International Journal of Phytopharmacology

Journal homepage: www.onlineijp.com

IJP

ANTIBACTERIAL, ANTIFUNGAL ACTIVITY AND PHYTOCHEMICAL ANALYSIS OF *SANSEVIVERIA ROXBURGHIANA* ROOT

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ABSTRACT

Medicinal plants play an important role in the discovery of novel drugs used in modern medicine. The medicinal plant of *Sanseviveria roxburghiana* root (Tamil name – Marul kizhangu) possesses the wide range of medicinal properties, which were confirmed through literature reviews. However, there are no reports on *Sanseviveria roxburghiana* roots for anti-microbial and antifungal studies. Present study was to determine the *Sanseviveria roxburghiana* roots have any antimicrobial and antifungal activity's also phytochemical constituents responsible for said activities. The root of *Sanseviveria roxburghiana* juice obtained by shoot is cut and the sap is collected by blending followed on filtration. The collected sap was tested the antimicrobial, antifungal activities and the presence of chemical constituents by preliminary phytochemical analysis according to the literature. The antimicrobial susceptibility studies conducted against gram (-) bacteria such as Escherichia coli, Klebsiella pneumonia, and Pseudomonas auroginosa, gram (+) bacteria such as Staphylococcus aureus, Streptococcus faecalis and fungi such as Aspergillus niger and Candida albicans. This result support the medicinal use of the root, and in addition, unveils the possibility of its act as an antimicrobial agent also as a potential source of food nutrients and nutraceuticals but doses not having antifungal activities. However further studies need to isolate the active constituents from the sap and to study the antimicrobial activity in cellular level.

Keywords: *Sanseviveria roxburghiana, E. coli, S. aures, P. aeruginosa, K. pneumona, Streptococcus faecalis, Aspirgillus niger,Candidaalbicans,* Antimicrobial, antifungal activities.

INTRODUCTION

This plant is widely distributed in ornamental coast, roots and leaves of plants are pharmacologically used by the tribal as medicines (nutrients). The objectives of the present investigation are to record the anti-microbial and antifungal activity of the medicinal plant *Sanseviveria roxburghiana* (family-*Agavaceae*) (Aiyer MN *et al*., 1957). Among the herbal medicine, *Sanseviveria roxburghiana* (Bow string hemp) root is one of the plants, which have some medicinal properties commonly cultivated and also used in Chinese and Indian medicines (Aiyer KN, 1960-1966) .This plant has long rhizomes with long fibrous roots and a rapid rate of growth. A number of species of bowstring hemp, such as *Sansevieria cylindrica*, *Sansevieria ehrenbergii*, *Sansevieria guineensis*, *Sansevieria longiflora*, *Sansevieria trifasciata* and *Sansevieria zeylanica* are grown as other species of plants (USDA, 2008). One of the safe methods is by treating with herbal medicine, which are derived from plants and are normally known free from side effect, toxicity and more economical. *Sanseviveria roxburghiana* root has a chemical compounds such as amino acids, vitamins, carbohydrate, minerals, alkaloids, carotenoids, flavonoids (catechins and flavones), phytates, saponins and tannins (Catherine Chidinma Ikewuchi *et al*., 2009). Therefore, to prove the presence of these compounds in the *Sanseviveria roxburghiana* roots certain scientific tests will be carried out on the plant, to know whether the constituents are

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really present in the root of the plant (Asolkar LV *et al*., 1992).

This research also helps to discover the new form of medication for the upcoming severe diseases of microbial infection such as the leaves and roots of *Sanseviveria roxburghiana* are used in traditional medicine for the treatment of asthma, abdominal pains, colic, diarrhea, hemorrhoids, hypertension, monorrhagia, piles, sexual weakness, wounds of the foot, cough, leprosy, rheumatism, glandular enlargement, nutritional deficiencies and treatment of snake bite (Wadher *et al*., 1995). The active ingredient from the root is more natural, fewer chemicals so it consists less toxicity, side effects and safe compared to synthetic drugs. The new discovery of this product will create awareness and revolute advantage of the *Sanseviveria roxburghiana* root usage. This medication well tolerated by patients, with fewer unintended consequences than pharmaceutical drugs because it less toxic and side effects (Nair *et al*., 1995).

MATERIALS AND METHODS

Collection of plant samples

Fresh plant materials (roots) were collected from Taman Tasik Permaisuri, Kuala Lumpur, Malaysia. The roots of *Sanseviveria roxburghiana* (50gm) were cleaned of dirt and fleshy the shoot is cut out and blender for 30 minutes (Sharma PC *et al*., 1992). The saps were filtered through watman filter paper No.1 and the filtrate of the sap is collected and stored in amber colour bottle for subsequent use in the further antimicrobial, anti-fungal and phytochemical analysis (Dey AC, 1980).

Antimicrobial susceptibility testing

Antibacterial activity was determined using agar diffusion method of Bauer and Kirby procedure. In this technique, Muller-Hinton agar was used and the medium was prepared according to the formulation, sterilized and poured into a sterile plate (Petridis) to a depth of 4mm (2.5ml). Discs containing 500µg/ml and 1000µg/ml of sap were placed on cultured pathogenic bacteria on agar plates and incubated at 37°C. The plates were checked for Antifungal activity *Sanseviveria roxburghiana* root sap of two different concentrations such as 500µg & 1000µg were performed antibacterial activity against five bacterial strains by the streaking method and the results are summarized in Table 2.

The antibacterial activity of *Sanseviveria roxburghiana root* was found to be increased in the antibacterial activity with the dose dependent manner. The maximum zone of inhibition was exhibited by *Sanseviveria roxburghiana* against *Escherichia coli* (12mm), *Staphylococcus aureus* (12mm). The moderate zone of inhibition was found *Klebsiella pneumonia* (9mm) and *Pseudomonas aeruginosa* (10 mm) but there is no zone of inhibition was found in *Streptococcus faecalis* bacterial growth after a minimum of 18 hours and occasionally until 24 hours (Bose A *et al*., 2007; Brindha *et al*., 2010). The diameter of the zone of inhibition was measured, commercial disc of Azithromycin (15µg/ml) used as positive control (standard) and experiment was done thrice.

Antifungal Assay

For Antifungal activity, sap was serially diluted with Dimethyl Sulfoxide (DMSO) to get the final concentration of 500µg/ml and 1000µg/ml (Brindha *et al*., 2010). A volume of 0. 5ml of microorganism suspensions containing approximately 4 × 106 cells were used to inoculate the surface of the solidified media prepared to use a Sabouraud Dextrose Agar (SDA) medium and allowed to set and then incubated at 37°C for 1- 4 weeks (Deepa N *et al*., 2004). The diameter of the zone of inhibition was measured, commercial disc of Fluconazole (10µg/ml) used as positive control (standard) and experiment was done thrice (Ravindra T *et al*., 2007).

Determination of Minimum Inhibitory Concentration (MIC)

MICs are considered as the "gold standard" for determining the susceptibility of the organisms to antimicrobials. MIC of antibiotics was evaluated (thrice) using standard micro broth dilution method against *Escherichia coli* (gram negative) and *Staphylococcus aureus* (gram positive) organisms (Liu CP *et al*., 2004).

Phytochemical analysis

Phytochemical analysis to screen the plants for the presence of Alkaloids, Carotenoids, Flavonoids, Phytates, Saponins, Tannins, Amino acids, Carbohydrates, Vitamins and Minerals was performed according to the literature (Astry MS *et al*., 1959; Elegbede JA, 1998).

RESULTS

The antibacterial activity of the Antifungal activity *Sanseviveria roxburghiana* root saps has shown (Table 1).

species. Gram-negative bacterium is more susceptible to the *Sanseviveria roxburghiana* root than gram-positive bacteria, which contradict the previous reports that plant extracts are more active in gram-positive bacteria than gram-negative bacteria.

However, the results revealed that the *Sanseviveria roxburghiana* root sap showed that good antibacterial activity of both gram-negative and gram-positive organisms except *Streptococcus faecalis*. This may be due to its variation in phytochemical constituents like alkaloids, carotinoids, flavonoids, phytates, saponins, tannins, amino acids, carbohydrates, vitamins and minerals, which were also reported by Ikewuchi *et al*.,

and these results were compared with the standard antibiotic Azithromycin (15µg/ml).

Antibacterial activity against *Staphylococcus aureus, Pseudomonas aeruginosa and Escherichia coli* showed that the plant can be used in the treatment of gastrointestinal infection and diarrhoea in human. The minimum inhibitory concentration for *Sanseviveria roxburghiana* root sap against *Escherichia coli and Staphylococcus aureus* was found to be 480µg and 485µg respectively (Figure 5 & 6). The lowest MIC was exhibited by against both the microorganisms.

The antifungal activity of the *Sanseviveria roxburghiana* root sap were determined against two fungal strains and recorded in Table 3.

The result was observed in the dose dependent manner shows that no antifungal activities with *Sanseviveria roxburghiana* root sap. These results were compared with the standard Fluconazole (10µg/ml). These results clearly indicated that root sap possess no substantial antifungal properties was observed against the tested fungal strains such as *Aspirgillus niger* and *Candida albicans*. The findings of this study confirmed the therapeutic potency of *Sanseviveria roxburghiana* root used in traditional medicine. These results offer promising lead for the discovery of potent antimicrobial compounds in therapeutic and dietary use globally.

Determination of the phytochemical profile

The phytochemical screening of the sample was carried out as described by Harbone (1973), and Sofowora (1980). The sample was screened for alkaloids, flavonoids (catechin and flavone), phytates, saponins and tannins. Quantitative determination of carotenoids, phytates, saponins and tannins were carried out in triplicates result has shown in table 4.

Table 1. Antibacterial/ Antifungal activity *Sanseviveria roxburghiana* root sap

Microorganism	Anti-Microbial / Antifungal Activity
Escherichia coli	+ve
Klebsiella pneumonia	+ve
Pseudomonas aeruginosa	+ ve
Staphylococcus aureus	+ ve
Streptococcus faecalis	- ve
Aspirgillus niger	- ve
Candida albicans	- ve

Table 2. Antibacterial activity *Sanseviveria roxburghiana* root sap by streaking method

Microorganism	Zone of Inhibition (mm)**		
	Sanseviveria roxburghiana root		Azithromycin (Control)
	500µg/ml	1000µg/ml	15µg/ml
Escherichia coli	8	12	16
Klebsiella pneumonia	7	9	11
Pseudomonas aeruginosa	5	10	12
Staphylococcus aureus	8	12	15
Streptococcus faecalis	-	-	9

Table 3. Antifungal activity *Sanseviveria roxburghiana* root sap by disc method

Microorganism	Zone of Inhibition (mm)**		
	Sanseviveria roxburghiana root		Fluconazole (Control)
	500 µg/ml	1000 µg/ml	10µg/ml
Aspirgillus niger	-	-	10
Candida albicans	-	-	14

Table 4. Phytochemical properties of *Sanseviveria roxburghiana* root sap

Phytochemicals	Status
Alkaloids	+
Carotinoids	++
Flavonoids	++
Phytates	+ ++
Saponins	+ +
Tannins	+

Key: *+= slightly present; ++= moderately present; +++= highly present*

Figure 1. *S. aureus and E.coli*

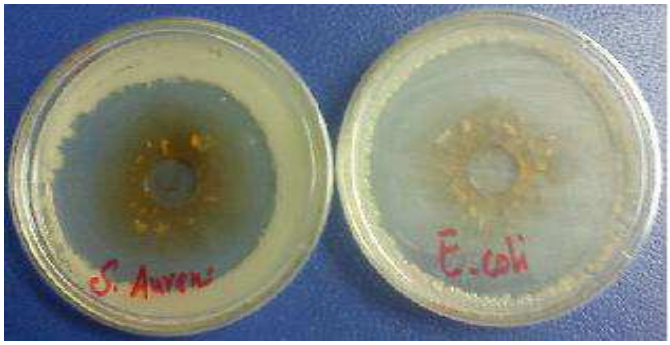


Figure 2. *k.pneumonia*

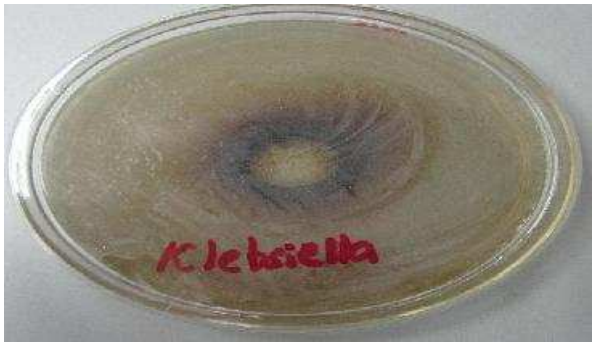


Figure 3. *P. aeruginosa*

Figure 4. *Aspirgillus niger* , *Candida albicans* and *Streptococcus faecalis*

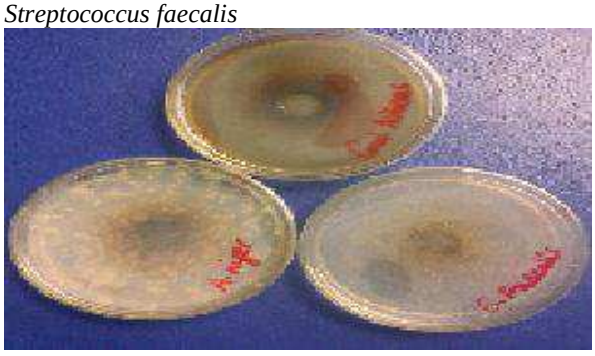


Figure 5. Minimum inhibitory concentration of *Sanseviveria roxburghiana* root sap against *E.coli.*

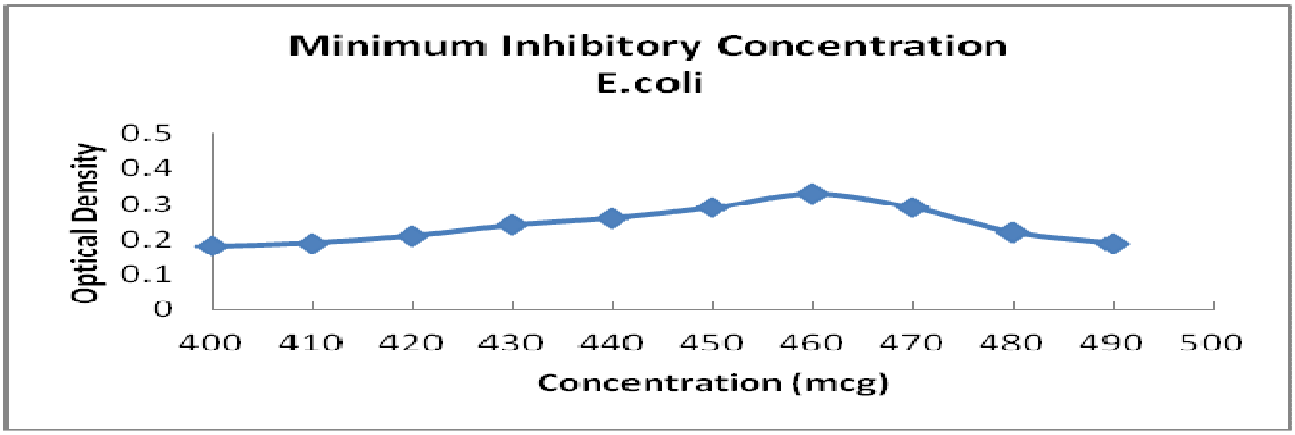
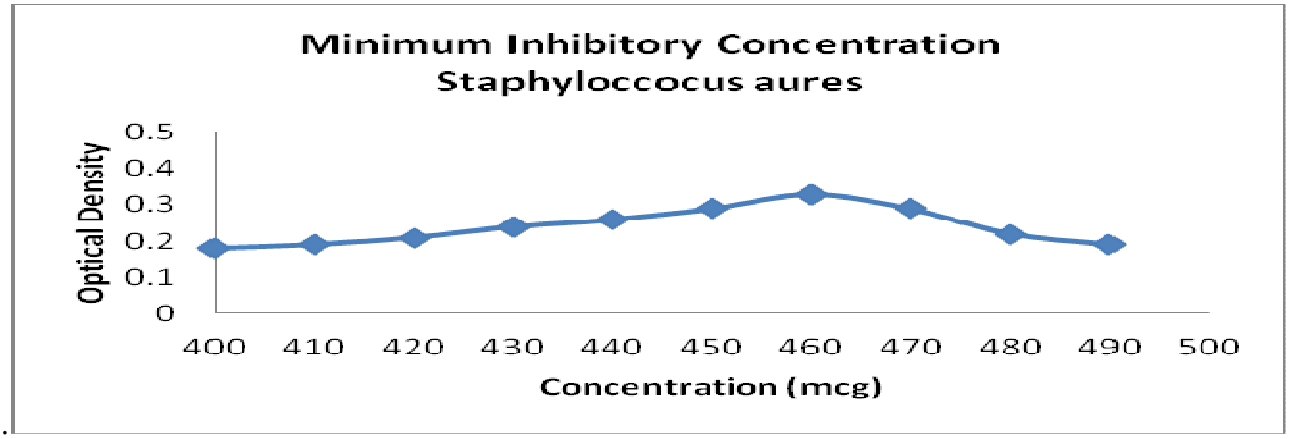


Figure 6. Minimum inhibitory *Sanseviveria roxburghiana* root sap against *S.aureus*



CONCLUSION

Through the research has carried that has proven *Sanseviveria roxburghiana* root have good antimicrobial activity, since the sap of *Sanseviveria roxburghiana* root inhibits the growth of a microorganism from the species of *E.coli, S.aureus, P.aeruginosa* and *K.pneumoniae*. Various researches such as diabetic, anti-tussive and expectorant effects are made on bow string hemp but our emerging idea induces us to do antimicrobial activity against *E.coli, S.aureus, P.aeruginosa, K.pneumoniae* and *Streptococcus faecalis.* There is no antifungal activity such as *Aspergillus niger and Candida albicans.* Actually herbal medicines have less toxicity compared to synthetic drugs and also reduce the side effects. We found that bow string hemp contains amino acids, vitamins, carbohydrate, carotenoids, flavonoids (catechins and flavones), phytates, saponins and tannins contribute activity against a microorganism. This plant can be used in the treatment of various nutrient deficiencies, gastrointestinal infection and diarrhea in human.

ACKNOWLEDGEMENT

The authors are thankful to the management of Masterskill University College of Health Sciences, Malaysia, for providing infrastructure facilities to conduct this work.

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