INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN CHEMISTRY AND PHARMACEUTICAL SCIENCES

(p-ISSN: 2348-5213: e-ISSN: 2348-5221)

www.ijcrcps.com

DOI: 10.22192/ijcrcps Coden: IJCROO(USA) Volume 7, Issue 2 - 2020

Research Article

DOI: http://dx.doi.org/10.22192/ijcrcps.2020.07.02.003

Preliminary phytochemical and antimicrobial screening of *Sweitenia mycrophylla* Exudate gum

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Abstract

Ethanolic, aqueous and petroleum – ether extracts of the exudates gum from *S. mycrophylla* were screened for their phytochemistry and antimicrobial activities against *Staphylococcus aureus, Streptococcus pyogens*, *Escherichia coli*, *Salmonella typhi* and *Shigella dysenteriae*. The results indicated that the extracts inhibited the growth of one or more test pathogens. The ethanolic extract showed a broad spectrum of antibacterial activity than the other extracts. Phytochemistry study revealed the presence of tannins, alkaloids, glycosides, flavonoids, carbohydrates and terpenes. The zone of inhibition (mm) ranges from 4.0±0.00mm to 30.0± 0.15mm. Highest antimicrobial activity was observed with the ethanolic extract at a concentration of 500mg/ml and least activity with petroleum – ether extract at 200mg/ml.

Keywords: *S. mycrophylla*, phytochemistry and antimicrobial activities.

Introduction

Exudate gums are heteropolysaccharide complex carbohydrate with high molecular weight. They are sticky substances which exude from certain plants either as a result of microbial infection or as a result of mechanical injury (Adeyanju *et al.*, 2014). According to Samai *et al.*, (2009), exudate gums are formed as a result of microbial infection on the plants and in turn the plants synthesize the liquid substance as a defense mechanism to seal off the wound and prevent further invasion of the tissue. The use of exudate gum in pharmaceutical formulation and drugs release system have been reported by many researchers. (Adeyanju *et al.*, 2012; Huang *et al.*,Calinescu*et al.*, 2007; Brouillet*et al.*, 2008 and

Adeyanju *et al.*, 2016). Antimicrobial substances are agent that inhibit the growth and existence of microorganisms. Quite a number of antimicrobial substances exists, mainly from plants, animal and chemical sources. (Gasnellin and Robert, 1999). Plants have a greater potential for producing new drugs of great benefit to mankind. Medical uses of these plants range from the administration of the plant's roots, bark, stem leaves, fruits and seeds. There are many approaches to the search for new biologically active principles in higher plants. This search for new antimicrobial properties of natural products cannot be ignored because this can be found in the most remote parts of the world where medical doctors are not present (Olukemi and Kandakai, 2004). Principles that could be used for chemotherapeutic purposes.*Sweitenia mycrophylla* gum is non-starch polysaccharides obtained from the bark of *Sweitenia mycrophylla* tree (*meliaceae*), a large tree reaching a height of 30-40m and a girth of 3-4m, in favourable condition, it can reach 60m high and 9m girth. (Adeyanju *et al.*,2014).Secondary metabolites of certain American and Asian *sweitenia* species have been extensively investigated as a source of useful non-timber product, especially the antifeedant tetranortriterpenoids and seed oils. *Sweitenia* seeds are traditionally used as anti-hypertensive, anti-diabetic and antimalaria; the stem bark decoction is in addition taken as anti-diahorrheal and applied as wound astringent. The physicochemical, toxicological, structural characterization and application of purified *S. mycrophylla* gum as excipient had been investigated in our previous studies (Adeyanju *et al.*, 2014)

Materials and Methods

Plants used for this study were collected from Maiduguri metropolis, Borno State, Nigeria. The plant material was identified by Professor S. S. Sanusi of the Biological Science Department, University of Maiduguri and a Voucher specimen No. 47BA was deposited in the research laboratory of chemistry Department, University of Maiduguri.

Preparation of plant extracts

The plant material was dried at room temperature and then powdered using a grinder. The powdered sample (100 g) wassubjected to soxhletextraction using 300 ml of each of the solvents(water, petroleum ether and ethanol).The resulting extracts were concentrated on ahot water bath and kept for further investigation.

Phytochemical screening

Phytochemical screening of major constituents was undertaken using standard qualitative methods. The extracts were screened for the presence of glycosides, alkaloids, tannins, flavonoids, saponins, anthraquinones and terpenes.

Test organisms

Standard strains of *S. aureus, S. pyogens, E. coli, S. typhi and S. dysenteriae* were obtained from the department of medical microbiology, university of Maiduguri teaching hospital, Maiduguri, Nigeria.

Antimicrobial screening test

The paper disc diffusion method was used to determine the antimicrobial activity of the extract from *S. mycrophylla* using standard procedures (Erickson *et al.*, 1960; Bauer *et al.*, 1996) Solutions of the extract of varying concentrations, ranging from 200 to 500 mg/ml were prepared. Nutrient agar was prepared, sterilized and used as the growth medium for the microorganisms. 20ml of sterilized medium was poured into each sterilized petri-dish covered and allowed to solidify. The Mueller-Hinton sensitivity agar plate was then seeded with the test microorganisms by the spread plate technique, and was left for about 30m. The sterilized paper discs were soaked in the prepared solution of the extracts with varying concentration and were dried at 50°C. The dried paper discs were then planted on the nutrient agar seeded with the test microorganisms. The plates were incubated at 37°C for 24h and then inspected for zones of inhibition of growth. The zones of inhibition were measured and recorded in millimeters. A control experiment was also set up using pure DMSO for each tested organism.

Results

Table 1: Phytochemical screening of *S.mycrophylla* exudate gum, water, petroleum – ether and ethanolic extracts

Phytochemicals	Water extract	Pet-ether extract	Ethanolic extract
Tannins	-	-	+
Carbohydrate	+++	++	+++
Alkaloid	-	-	+
Glycosides	-	-	-
Flavonoids	+	+	++
Terpenes	++	-	++
Saponins	-	-	++
Anthraquinones	-	-	-

+++ = High concentration; ++ moderate concentration, + = low concentration, - = absent

Table2: Inhibition Zones of *S.mycrophylla* exudates gum water, Pet – ether and Ethanolic extracts against the tested microorganisms.

Extract	Conc Mg/ml	S. a	S. p	*E.coli*	s.d	S.t
Ethanol	500	20.0±0.00	22.0±00	25.4±0.58	30.0±0.15	31.0±1.15
	400	14.3±0.20	13.0±0.40	18.5±0.20	28.0±0.16	26.0±1.24
	300	12.0±0.15	10.0±0.15	15.4±0.13	26.0±0.12	23.7±0.58
	200	10.0±0.20	7.0±0.00	15.2±0.18	26.4±1.15	22.0±0.26
Pet ether	500	16.0±0.10	20.0±1.00	18.0±1.00	18.0±1.00	16.5±0.05
	400	14.800.07	15.4±0.20	13.2±0.30	13.2±0.30	12.4±0.04
	300	12.340.05	13.450.06	10.20.21	11.450.30	10.120.03
	200	10.230.00	11.760.04	9.00.05	8.560.02	7.640.01
Distilled water	500	21.0±0.53	20.0±0.10	23.5±1.05	21.3±1.80	20.0±0.00
	400	19.4±0.16	15.0±0.58	22.4±0.15	18.0±0.20	17.7±0.28
	300	17.3±0.05	14.1±0.20	22.0±0.15	15.0±0.58	15.2±0.12
	200	14.0±0.04	12.4±0.15	20.0±0.00	14.7±0.10	13.4±1.53
Gentamicin	250	25	28	27	10	13

S.a =*Staphylocccus aureus*
S.p = *Streptococcus pyogens*
E.coli: *Escherichia coli*
S.d = *Shigella dysenteriae*
S.t = *Salmonella typhi*
R = Resistance (-ve)
All data were average of 3 values (x ±ESM)

Discussion

The results of the phytochemcial screening and antimicrobial activities of *S. mycrophylla* gum exudate extracts are presented in table 1 and 2.

Several workers have reported on the medicinal properties of plants – derived compounds. These classes of compound are known to show curative activity against several bacteria and it is not surprising that these plants extracts are used traditionally by herbalist the cure bacteria related ill-health (Tor-anyiin and Shimbe, 2012).

For instance, saponins are reported to be effective in the treatment of syphilis, rheumatism and certain slain diseases, ulcer and septic wounds (Chindo*et al.*, 2002).Saponins are responsible for tonic and stimulating activities observed in chinsese and Japanese medical herbs (Alinnor, 2008).

Flavonidsare known to have hypoglycemic activity used in the treatment of diabetes (Ghamba *et al.*, 2012), exhibit anti-inflammatory, anti-angionic, anti-allergic effect, analgesic and antioxidant properties (Hodek *et al.*, 2002; Harborme and Williams, 2000; Penecilla and Magno, 2011).

Terpenoids are said to have some biological activities in animal and also play a meaningful role in human medicine. They are reported to have a wide spectrum of biological activities including bactericidal, fungicidal, antiviral, anticancer and antiallergic (Patocka, 2003).

The phytochemical screening (table 1) revealed the presence of tannins, alkaloids, glycoside, flavonoid anthraquione, carbohydrate and terpenes. These chemical constituents present in the extracts have many therapeutic values (Adeyanju *et al.*, 2011). Tannins are plants metabolites well known for their antimicrobial properties. Flavonoids have both antifungal and antibacterial properties. They possess anti-inflammatory activity (Adeyanju et al., 2011).

Flavonoids, terpenes and steroids are known to have antimicrobial and bactericidal proprieties against several pathogens (Usman *et al.*, 2007 and Hassan, *et al.*, 2004). Antimicrobial activity test (table 2) revealed that the ethanolic extract of the gum exudate possess the highest antimicrobial activity against *E. coli* (33mm), followed by *S. aureus* (30mm) and *S. pyogens* (30mm), when compared to pet – ether extract against *E. coli* (18mm), and resistant against *S. aureus* and S. *pyogens*. Ethanol is known to extract some phytochemicals like tannins and polyphenols. The high antimicrobial activity of the ethnolic extract may be due to the extraction of higher amounts of phytochemicals compared to that of petroleum – ether and water. These findings are consistent with the findings of Adeyanju *et al.*, (2014) and Olusale *et al.*, (2011) who reported that the leaves and the bark of *D. oliver i*had antibacterial activities *in vivo*. Previous reports have demonstrated the antidiarrhea activity of tannins, flavonoids and saponins are present in plants. The result obtained in the study thus suggest that the identified phytochemicals may be the bioactive constituents responsible for the efficacy of the exudates gum of *D. oliveri*. It suggests that the traditional medicinal use of all the parts of *D. oliveri* be continued and scientific evaluation of its active constituents be given serious consideration.

Conclusion

The results of the experiment showed that the exudates gum from *S. mycrophylla* may have some valuable antimicrobial activities against gram positive and gram negative microorganisms.

This property tends to support the traditional medical stage in the treatment of bacterial infection. The result of the study justified the use of the plant exudate gum in the treatment of diseases of microbial origin in herbal medicine.

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	Subject: PhytoChemistry
Quick Response Code	
DOI: 10.22192/ijcrcps.2020.07.02.003	

How to cite this article:

R Adeyanju O., Ogaji.O.D., Ogaji A.O., Dano, J.T and Lawan Y. (2020). Preliminary phytochemical and antimicrobial screening of *Sweitenia mycrophylla* Exudate gum. Int. J. Curr. Res. Chem. Pharm. Sci. 7(2): 14-19.

DOI: http://dx.doi.org/10.22192/ijcrcps.2020.07.02.003

