Journal of Medicinal Plants Research Vol. 4(9), pp. 844-846, 4 May, 2010
Available online at http://www.academicjournals.org/JMPR
DOI: 10.5897/JMPR10.089
ISSN 1996-0875 © 2010 Academic Journals

Short Communication

Phytochemical studies and antimicrobial screening of *Schwenkia americana* Linn.

Bello Isaac Asusheyi*, Ndukwe George Iloegbulam and Audu Oladimeji Tokunbo

Department of Chemistry, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

Accepted 7 April, 2010

The petroleum spirit (60 - 80°C), chloroform and methanol extracts of *Schwenkia americana* Linn. (Solanaceae) were screened for antimicrobial activity and for their chemical constituents. Phytochemical studies showed that it contained cardiac glycosides, saponins, steroids, triterpenes, flavonoids, cyanogenic glycosides, tannins and alkaloids. Antimicrobial screening showed that at 100 mg/ml, the methanol and chloroform extracts were active against *Escherichia coli, Bacillus subtilis, Staphylococcus aureus, Salmonella typhii, Pseudomonas aeruginosa* and *Candida albicans* while the petroleum spirit extract was only active against *E. coli, Bacillus subtilis, S. typhii and C. albicans.* Work is going on to isolate and characterize the component(s) responsible for the observed activity.

Key words: *Schwenkia americana*, Solanaceae, phytochemical screening, antimicrobial activity.

INTRODUCTION

Schwenkia americana Linn. (Solanaceae) is known in Ghana by the *Fanta* as *agyigyinsu*. In Nigeria it is known by the *Hausa* as *dandana* and *igbale odan* by the Yoruba (Hutchinson and Dalziel, 1974). In Northern Nigeria it is a common remedy for rheumatic pains and swelling, a decoction is taken internally and also applied locally. The plant is powdered up with natron and butter, shea butter or oil and rubbed on the forehead, limbs etc. If a nursing mother thinks her milk is purging the infant, she takes a decoction with natron and also gives it to the child. In Yoruba communities the plant is a common ingredient in *agbo* for children in the first and second year, or it is boiled and added to their food (Dalziel, 1956). In Ghana it is used as a cough medicine for children. A similar use for chest complaints is recorded from Angola. In Southern Nigeria it is used as a fish poison (Dalziel, 1956). There is no documented literature on its phytochemistry or antimicrobial properties. This works aim to establish these parameters.

*Corresponding author. E-mail: lobell_ng@yahoo.com.

MATERIALS AND METHODS

Plant extraction

The plant was collected in Zaria in the month of June and identified at the Herbarium of the Department of Biological Sciences, Ahmadu Bello University, Zaria as specimen with voucher number 881. It was air-dried, pulverized using a wooden mortar and pestle and stored in air-tight plastic bags until required. The air-dried Pulverized plant material (170 g) was packed into a soxhlet extractor and extracted exhaustively using Petroleum Spirit (60 - 80°), followed by chloroform and finally, methanol. The extracts were evaporated using a rotavapor, respectively weighed and kept in a desiccator. The petroleum spirit (60 - 80°), chloroform and methanol extract yielded 5.60, 2.40 and 41.38 g solid mass, respectively. These extracts were subjected to phytochemical and antimicrobial analyses.

Phytochemical analysis

Phytochemical analysis was carried out using the method set out by Brain and Turner (1975).

Antimicrobial screening

The antimicrobial activities of the extracts from the plants were

determined using some pathogenic microorganisms. The microbes were obtained from the Department of Medical Microbiology, Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. All isolates were checked for purity and maintained in slants of blood agar. A solution of 0.5 g of the extracts was prepared using 10mL of DMSO. This solution was used to check the antimicrobial activities of the plant extracts. A control experiment was also set up using DMSO. Blood agar base (Oxoid, England) was prepared according to the manufacturer's instructions. This was then sterilized at 121°C for 15 min using an autoclave and was allowed to cool. The sterilized medium (20 ml) was pipetted into sterilized Petri dishes, covered and allowed to cool and solidify. The Petri dishes containing the medium were seeded with the test organisms by the spread plate technique and were left to dry for half an hour.Filter paper discs were cut and sterilized at 160°C for 30 min. The sterilized paper discs were then dropped into the solutions of the extracts and were dried at 45°C. The dried discs were then planted on the medium previously seeded with the test organisms. The plates were incubated at 37°C for 24 h after which they were inspected for the zones of inhibition of growth. The zones were measured and recorded in millimetres by the use of a pair of dividers and a ruler.

Minimum inhibition concentration (MIC)

Minimum inhibition concentration of the extract was carried out on the microorganisms that were susceptible to the extract and was carried out using the broth dilution method as described by Bauer et al. (1966). Nutrient broth (Oxoid, England) was prepared according to the manufacturer's instructions. 10 ml of each solution were dispensed into 5 sets of screw cap test tubes and sterilized at 121°C for 15 min. The test tubes were allowed to cool. McFarland's turbidity standard scale number 0.5 was prepared. 10 ml of normal saline solution were used to make a turbid suspension of the microbes. Dilution of the microbes was done continuously in the normal saline until the turbidity matched that of the McFarland's scale by visual comparison. At this point the microbes had a density of 3×10^8 cfu/ml. Serial dilutions of the extracts were made using the nutrient broth and the following concentrations were obtained; 50, 25, 12.5, 6.25 and 3.125 mg/ml. Having obtained the different concentrations, 1ml of the microorganism in the normal saline was inoculated into the different concentrations of the extracts in the broth and was incubated at 37°C for 24 h. The lowest concentration that showed no turbidity (clear solution) was recorded as the MIC.

Minimum bactericidal/fungicidal concentration (MBC/MFC)

This was carried out in order to determine whether the microbes could be completely killed or their growth could only be inhibited. Blood agar base (Oxoid, England) was prepared according to the manufacturer's instructions. The solution was sterilized at 121°C for 15 min using an autoclave and poured into sterilized Petri dishes. The contents of the MIC test tubes in the serial dilution were sub-cultured on the Petri dishes by dipping a sterile wire loop into each test tube and streaked on the surfaces of the Petri dishes. The Petri dishes were incubated at 37°C for 24 h after which they were observed for growth. The minimum bactericidal/fungicidal concentration (MBC/MFC) was the Petri dish with the lowest concentration of extract that had no growth of the micro organisms.

RESULTS AND DISCUSSION

The phytochemical analysis of the plant revealed that it contained carbohydrates, reducing sugars, cardiac glycosides, saponins, steroids, triterpenes, flavonoids, cyanogenic glycosides, tannins, alkaloids and resins. The presence of these metabolites in the plant means that a lot of research can be done to isolate and characterize them because these matabolites have various pharmacological importances. Alkaloids have been discovered for quite a long time and have found medicinal uses over the centuries. Flavonoids are widely distributed in plants. They are known to be responsible for the yellow or red/blue pigmentations in flowers and also provide protection from attack by microbes and insects. The widespread distribution of flavonoids, their variety and their relatively low toxicity compared to other active plant compounds (for instance alkaloids) had led to many animals, including humans, ingesting significant quantities in their diet without problems. Flavonoids have been referred to as "nature's biological response modifiers" because of the strong experimental evidence of their inherent ability to modify the body's reaction to allergens, viruses, and carcinogens. They show anti-allergic, -inflammatory, -microbial and -cancer activities (Cushnie and Lamb, 2005).

Tannins may be employed medicinally as antidiarrhoeal, hemostatic, and antihemorrhoidal formulations (http://en.wikipedia.org/wiki/Tanins). Terpenes have been reported to play important biological roles. For example the tetraterpene, β-carotene is a major dietary source of vitamin A (McMurry, 1992).

The result of the antimicrobial tests showed that all the extracts had significant activity against the micro-organisms at 100 mg/ml with zones of inhibition between 11 and 15 mm. The chloroform extract exhibited the highest activity against the fungus *C. albicans* with a zone of inhibition of 20 mm.

The MIC studies showed that the methanol extract inhibited the growths of the bacteria at concentration of 50 mg/ml (Table 1) with a corresponding MBC at 100 mg/ml for the bacteria *S. aureus, P. aeruginosa* and *S. typhii.* It inhibited the growth of the fungi *C. albicans* at 25 mg/ml with an MBC of 50 mg/ml No MBC was observed for the organisms *B. subtilis* and *E. coli* (Table 2). This is probably because the concentration of the extract was not high enough since it was able to inhibit the growth of the microorganisms. The chloroform extract inhibited the growths of *S. aureus, B. subtilis, P. aeruginosa* and *C. albicans* at concentration of 50 mg/ml, with corresponding MBC/MFC of 100 mg/ml except for *B. subtilis* for which no MBC was observed. It inhibited the growth of *S. typhii* at a concentration of 25 mg/ml, with an MBC at 50 mg/ml but could only inhibit the growth of *E. coli* at a concentration of 100 mg/ml. It showed no observable MBC against *E. coli* (Tables 1 and 2). The petroleum spirit extract inhibited the growths of *S. aureus, B. subtilis* and *S. typhii* at 50 mg/ml, with corresponding MBC of 100mg/ml. It inhibited the growths of *P. aeruginosa* and *E. coli* at concentration of 100 mg/ml and maintained the same concentration for the MBC. It inhibited the growth of *C. albicans* at 25 mg/ml and had a corresponding MBC at 50

Table 1. Minimum inhibition concentration of extracts (mg/ml).

Test organisms	Extracts		
	Methanol	Chloroform	Petroleum spirit
E. coli	50	100	100
B. subtilis	50	50	50
S. aureus	50	50	50
S. typhii	50	25	50
P. aeruginosa	50	50	100
C. albicans	25	50	25

Table 2. Minimum bactericidal/fungicidal concentration of extracts (mg/ml).

Test organisms	Extracts		
	Methanol	Chloroform	Petroleum spirit
E. coli	>100	>100	100
B. subtilis	>100	>100	100
S. aureus	100	100	100
S. typhii	100	50	100
P. aeruginosa	100	100	100
C. albicans	50	100	50

mg/ml (Tables 1 and 2).

Conclusion

The findings from this research has supported the ethno-medicinal uses of this plant in the treatment of rheumatic pains and swellings, feverish conditions and general weakness of the body, cough medicine for children and chest complaints any of which may be caused by the tested microorganisms. Work is on-going to isolate and characterize some of these bioactive components from the plant.

REFERENCES

Bauer AW, Kirby WMM, Sherris JC, Turk M (1966). Antibiotic susceptibility testing by a standardized single disc method; American J. Clin. Pathol. 45; pp 493-496.

Brain KR, Turner TD (1975). The practical evaluation of phytochemicals, Wright Science Technical. Bristol, Britain, pp. 56–64.

Cushnie TPT, Lamb AJ (2005). "Antimicrobial activity of flavonoids". Int. J. Antimicrob. Agents 26 (5): 343-356.

Dalziel JM (1956). *Useful Plants of West Tropical Africa*, Crown Agents for Overseas Government: London. p. 407, 432

http://en.wikipedia.org/wiki/Tannin

Hutchinson J, Dalziel JM (1974). Flora of west tropical Africa; 2nd ed.; Crown Agents for Overseas Government and Administration; Millbank, London. p.138

McMurry J (1992). Organic chemistry 3rd ed. Brooks/Cole publishing co., Pacific Grove, California. p. 1092.