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Phytochemical analysis and antimicrobial activity of *Trichilia emetica* Vahl (Meliaceae)

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Abstract

The crude methanol extract of the stem bark of *Trichilia emetica* Vahl was assayed. The crude methanol extract displayed a considerable antifungal activity against *Trichophyton tonsurans*, *Aspergillus flavus* and *Candida albicans* and anti-bacteria activity against *Proteus mirabilis*, *Pseudomonas aeruginosa*, *staphylococcus aureus* with MIC and MBC between 6.25-25.0mg/ml. Phytochemical screening of the plant extract revealed the presence of saponins, steroids/triterpenes, cardiac glycosides, tannins, flavonoids and anthraquinones. Alkaloids were absent in the plant extract.

Keywords: antimicrobial, *Trichilia emetica*, meliaceae

Introduction

Plants contain organic metabolites, which have been reported to be responsible for remarkable physiological properties. Bioactive compounds from a variety of natural sources have been proposed to be useful for treating a number of human maladies.

The Isolation, characterization, structure-activity relationship studies and synthesis of bioactive compounds begin with the general screening of plants to identify those with bioactivity against pathogenic organisms.

Trichilia emetica (Vahl) is wide-spread in most sub-Saharan Africa. It is an ever-green or semi-ever green small tree (10-20m tall) or shrub. The bark is used as an emetic in small doses while the decoction is used to dress wounds, ulcers, fresh cuts and bruises. The decoction of the bark is also given for cardiac problems. Calcedrin has been reported as the bitter principle in the bark, a sterio-daucosterol and a triterpene, tircual (a-4(28)-14(15)-dienoid acid, have been isolated from the plant. The Fulani people of Bauchi State of Nigeria use the decoction of the stem bark for the treatment of leprosy.

In view of the medicinal application of *Trichilia emetica* in the treatment of leprosy, this study reports the antifungal and antibacterial activity of the methanol extract of the stem bark.

Materials and Methods

Plant Material

Fresh stem-bark of the plant was collected in Toro Local Government of Bauchi State, air-dried and grounded into coarse form. The plant was duly authenticated by Dr. I. Abdulkarim, Federal College of Forestry, Jos.

Extraction

The crush of the plant material (60g) was extracted with methanol using the Soxhlet extractor. The extract was filtered, concentrated and kept in the refrigerator for use.

Phytochemical Studies

The crude methanol extract was screened for the presence of alkaloids, tannins, glycosides, steroid/triterpenes, flavonoids, saponins and anthraquinones using standard methods.

Organisms and Media

The following test organisms were used in this study. *Staphylococcus aureus*; *Proteus mirabilis*; *Klebsiella pneumonia*; *Salmonella paratyphie A*; *Bacillus cereus*; *Pseudomonas aeruginosa*. The fungi were *Trichophyton. Tonsurans*; *Aspergillus flavus* and *Candida albicans*. The bacteria and fungi were clinical isolates obtained from School of Medical Laboratory Technology, NVRI, Vom and Department of Dermatophilosis, NVRI, Vom. The strains were maintained and tested on nutrient agar (bacteria) and sabouraud dextrose agar (fungi). The antimicrobial activity test was carried out using Agar well diffusion and dilution

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techniques similar to Hufford *et al*, 1975. In the Agar well diffusion method, plates of nutrient Agar were used, the agar thickness was about 10mm in a 90mm plate.

Media: Sabroud Dextrose Agar (SDA, product of Oxoid Ltd, Basmagstoke, Hampshire England, (pH=5.6 ± 0.2), Nutrient Agar (Product of i.d.g., topley House, 52 Washlane, B196-UK, pH= 7.3 ± 0.2) were used for testing the antifungal and antibacterial activities respectively. Nutrient broth (BHI), pH 7.4 was used for the overnight culture of the organisms.

Result Discussion

The plant family Meliaceae has been the subject of extensive investigation because of its assumed therapeutic efficacy in folkloric medicine.

The result of the phytochemical analysis revealed that the plant extract is very rich in saponins, flavonoids, triterpenes, tannins, anthraquinones and cardiac glycosides. Alkaloids were not present in the stem bark (Table 1). The crude methanol extract exhibited a concentration dependent antifungal activity against *Trichophyton tonsurans* and *Aspergillus flavus* (Table 2). The antimycotic activity of the plant extract against *Candida albicans* was moderate at the tested concentration of the crude extract (Table 3). Table 4

shows the antibacterial activity of the plant extract. The results show a very significant concentration dependent activity on the used pathogenic bacteria.

The antibacterial effect of the plant extract was more pronounced on the gram +ve bacteria and moderately active against gram-ve bacteria. It is interesting to report that the extract was active against *Pseudomonas aeruginosa*, which is usually resistant to most antimicrobial agents including streptomycin used in this study.

The methanol extract of the dried leaves has been reported in Sudan to be active against *Plasmodium falciparum* while the water and chloroform extracts of the entire plant were reported to be inactive against *Candida albicans*, *Staphylococcus aureus*, *Bacillus cereus*, *Pseudomonas aeruginosa* and *Escherichia coli*.

In this study, the methanol extract of the stem bark of *Trichilia emetica* exhibited moderate antifungal activity and also showed inhibitory effect on both gram positive and gram negative bacteria. This has lend more credence to the claimed therapeutic efficacy of *Trichilia emetic* in folkloric medicine. The results from this study provide scientific basis for the use of the plant in the treatment of leprosy.

Table 1: Result of phytochemical analysis of crude methanol extract of *Trichilia emetica*.

	Alkaloids	Steroids/ Triterpene	Tannins	Saponins	Cardiac glycosides	Anthra-quinones	Flavonoids
CME	-	+++	+++	+++	+++	+++	+++

Key: CME – crude methanol extract, +++ - appropriable amount; ++ - Moderate amount; + - trace; - - not detected.

Table 2: Result of the Antifungal activity of Crude methanol extract of *Trichilia emetic*

Fungi	Growth diameter (mm)				Extract dilution (mg/ml)	
	200	150	100	50	Chemo	Control
A. Flavus	7.0	15.0	29.0	34.0	6.0	85.0
T.tonsuran	17.0	35.0	42.0	50.0	6.5	80.0

Chemo-Nizoral (2.5ug/ml); Control-solvent

Table 3: Result of the Antimycotic Activity of the Crude Methanol Extract of *Trichilia emetica* on *Candida albicans*

Extraction concentration	Stock of the Organism				Control
	ICFU _{1/2}	CFU	1/8 CFU	1/4 CFU	
200mg/ml	MG	MG	MG	MG	DG
100mg/ml	MG	MG	MG	MG	DG
50mg/ml	MG	MG	MG	MG	DG
25mg/ml	DG	DG	TG	TG	DG

CFU-Colony Forming Unit = 1X10⁶, DG-Dense growth, MG-moderate growth, TG-tiny growth and NG-no growth, control-solvent

Table 4: Result of the Antibacterial Activity of the Crude Methanol Extract of *Trichilia emetic*

Bacteria	Zone of inhibition (mm)				Chemo	MBC	MBC
	200	100	50	250			
<i>S. aureus</i>	15.0	12.0	11.0	10.0	21.0	12.5	25.0
<i>B. Cereus</i>	17.0	16.0	15.0	13.0	25.0	25.0	ND
<i>S. parathypie A</i>	11.0	10.0	NI	NI	26.0	ND	ND
<i>K. pneumoniae</i>	10.0	8.0	7.0	NI	22.0	ND	ND
<i>P. aeruginosa</i>	12.0	11.0	11.0	10.0	Ni	25.0	ND
<i>P. mirabilis</i>	10.9	9.0	7.0	7.0	13.0	12.0	25

Chemotherapeutic agent – (Streptomycin 2.5mg/ml; NI – no inhibition; ND – not determined; MIC – minimum inhibitory concentration; MBC – Minimum bactericidal concentration; NT – not tested.

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