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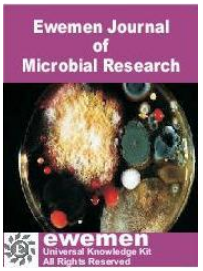

Full Length Research

PHYTOCHEMICAL SCREENING AND ANTIMICROBIAL ACTIVITIES OF THE LEAF EXTRACTS OF *MOMORDICA BALSAMINA*

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ABSTRACT

The leaves of *Momordica balsamina* L. was extracted successively under cold maceration with n-hexane, chloroform and methanol. The extracts were subjected to phytochemical and antimicrobial screening to determine the presence of some secondary metabolites and establish the antimicrobial activities against *Salmonella typhi* and *Staphylococcus aureus* using standard methods. The results of phytochemical screening revealed the presence of flavonoids, tannins, saponins, glycosides and alkaloids, while terpenes were not detected. The results of antimicrobial screening showed that the extracts had highest activity against *Salmonella typhi* in a concentration dependent manner. The findings of this study supports the ethnomedicinal use of *Momordica balsamina* as an antibacterial and the plant may be useful in the treatment of related ailments such as diarrhea and dysentery caused by similar bacteria.

Keywords: *Momordica balsamina*, Antimicrobial, Phytochemical.

INTRODUCTION

Traditional and folklore medicine play an important role in health services around the globe and about three quarters of the world's population depend on plants and its extracts for health care (Mishra and Mishra, 2007). A good number of our population particularly those living in the villages depend largely on herbal remedies. Most of these herbal remedies have stood the test of time particularly for the treatment of allergic, metabolic and cardiovascular diseases (Igoli *et al.,* 2005). The medicinal value of these plants is because they contain some chemical substances called bioactive constituents of the plants, which are also known as secondary metabolites and these include alkaloids, flavonoids, glycosides, tannins, steroids, saponins, etc. Many of these indigenous medicinal plants are used as food plants or crops. They are also sometimes added to food meant for pregnant and nursing mothers for medicinal purpose (Personal communication with herbalist).

In Nigeria many indigenous medicinal plants are used in herbal medicine to cure diseases. The health benefits of medicinal plants are attributed in part to their unique physiochemical composition, as antioxidants, stimulant of protective enzymes in the liver or blockage of damage to genetic material. These plants have been used as remedies in the treatment of many diseases such as in bitter stomachic, as a wash

for fever and yaws and purgative in the treatment of urethral discharges (WHO, 1998).

Momordica balsamina is widely used in ethnomedicine although much study on the plant growing in Northern Nigeria has not been reported in literature. It is believed that *Momordica balsamina* like *Momordica charantia* may possess some bioactive compound that exhibit physiological activities against bacteria and other organism which may be responsible for its traditional medicine use. *Momordica charantia* which is a closely related species had been reported to contain a bitter principle, momordicin an alkaloid (Supraja *et al*., 2015; Yasuda, *et al.,* 1984). *Momordica charantia* is a native of tropical regions of Africa. The leaves and fruits are used as vegetable. Fruit pulp of the plant is infused in olive or almond oil and used as an application on chopped hands, burns and haemorrhoids, and mashed fruit are used as poultice (Gills, 1992). Leaf infusion is used as anti-emetic (Gills, 1992). Leaf extract is used for the management of high fever, excessive uterine bleeding and for the treatment of syphilis. It is also used in the treatment of rheumatism, hepatitis, skin diseases, diabetics and gastroenteritis (Gills, 1992).

Typhoid sickness has become rampant in our society as a result of environmental conditions. It therefore becomes necessary to investigate an alternative means of treating this sickness which will be relatively cheap most especially to the local community who depend on part of trees around them for treating various types of sickness. The phytochemical and the bioactivity of *Momordica balsamina* will justify the traditional uses of this plant in healthcare delivery. This work covers the phytochemical analysis of the extracts of *Momordica balsamina* leaves growing in Northern part of Nigeria and determination of their antimicrobial activities.

MATERIALS AND METHODS

Materials

All reagents used in the study were of analytical grade. The test organisms, *Salmonella typhi* and *Staphylococcus aureus*, were identified, isolated and preserved in incubator in Microbiology laboratory of the Department of Microbiology, Faculty of Natural Sciences, Abubakar Tafawa Balewa University Bauchi (ATBU), Bauchi State, Nigeria.

Plant Sample Collection, Preparation and Extraction

Momordica balsamina were collected from Yalwan Kagadama, Bauchi metropolis and air-dried at room temperature. After which it was grounded into fine power using mortar and pestle. The pulverized plant sample was extracted successively with n-hexane, chloroform and methanol by cold maceration at room temperature. 100 g of dried powdered sample was macerated in the initial extraction solvent (n-hexane) for 72 hrs. The extract was filtered and the filtrate was concentrated to dryness at reduced pressure. The dried extract was weighed and kept in a sterile air-tight container until required.

Phytochemical screening

Qualitative phytochemical screening of plant sample to detect the present of saponins, flavonoids, tannins, alkaloids glycosides steroids and anthraquinones were carried out using the standard method of Sofowora (1993) and Evans (2002).

Preparation of nutrient agar and inoculation of test organisms

Five grams (5.0 g) of commercially prepared nutrient agar was weighed and transferred into a flask containing 250 mL of distilled water. The mixture was heated (and shaken vigorously to avoid charring) on a hot plate until it was dissolved completely. It was thereafter sterilized in the autoclave at 121°C for 15 mins with the flask plugged with non-absorbed cotton wool, covered with aluminum foil. The flask was allowed to cool to 45°C before it was poured into plates The plates of nutrient agar were prepared according to standard method (Ghani, 1990). The test microorganisms were inoculated on to the nutrient agar using a wire loop following all the necessary precautions. The inoculums were then incubated in an incubator for 24 hrs.

Disc Preparation

About 50 discs of about 6.25 mm in diameter were prepared from Whatmann No 1 filter paper, and sterilized at 120°C for 15 min in a screw cap bottle. The extracts were prepared for the sensitivity tests by diluting 1 mL of 1 mg/mL solution of each of the extracts in 9 mL of distilled water to obtain concentrations of 10^{-1} mg/mL. Serial dilution was then carried out to obtain two sets of concentrations

of 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4} and 10^{-5} mg/mL for each extract. Five discs were placed in each test-tube containing a particular concentration for infusion. Disc infused with the extraction solvents were used as negative controls.

Sensitivity Test Method

The principle of the disc method is the diffusion of drug (extracts) into the medium that has been already inoculated with the test organism to determine the degree of sensitivity of the organism against the drug (extract) by the size of the zone of inhibition. A media that has been previously inoculated with *Momordica balsamina* was divided into five (5) portions each. To each of these 5 portions, a disc infused with a particular concentration of extract was placed. The plate was then incubated for 24 hrs after which the zones of inhibition (mm) were measured and recorded.

RESULTS AND DISCUSSION

The results of extraction yield, phytochemical analysis and antimicrobial screening were as depicted in Tables 1, 2 & 3, respectively. One hundred grams of the dried powdered sample yielded 0.9%, 1.2%, and 2.9% on extraction with n-hexane, chloroform and methanol, respectively (Table 1). The hexane and chloroform extracts were greenish while the methanol extract was brownish in colour.

The results of phytochemical test of the crude extracts of the leaves revealed the presence of alkaloid, saponins, tannins, flavonoid and glycoside. Terpenoid was however not detected in the sample (Table 2). The finding was similar to those found in by many researchers in *M. Charantia* except for the absence of terpenes (Singh *et al.*, 2012; Wadood *et al*., 2013).

Wadood *et al.* (2013) reported the absence of terpenes, flavonoids, alkaloids in the *M. charantia* investigated. These differences could be as a result of ecological and geographical differences (Kunle and Egharevba, 2012). These classes (such as alkaloids, saponins, tannins, glycoside and flavonoids) of compound are known to have curative activity against several pathogens and therefore could suggest their use traditionally for the treatment of various illnesses (Usman and Osuji, 2007).

Table 1: Percentage Yield of Extracts

Extracts	Colour	% Yield
n-hexane	Green	0.90
Chloroform	Green	2.90
Methanol	Brown	2.90

Table 2: Result of phytochemical screening of extracts of *Momordica balsamina*

Metabolites	Extracts		
	HE	CE	ME
Tannins	-	-	+
Saponins	+	+	+
Flavonoid	+	-	-
Glycoside	+	+	+
Terpenes	-	-	-
Alkaloids	+	+	+

Key: + = Present, - = Absent; HE = n-Hexane extract, CE = Chloroform extract, ME = Methanol extract

Table 3: Result of the Microbial Sensitivity Test

Test organisms	Conc. of Extract (mg/mL)	Zones of Inhibition (mm)		
		HE	CE	ME
S. typhi	10^{-1}	18.0	19.0	17.0
	10^{-2}	15.0	16.0	16.0
	10^{-3}	11.0	15.0	14.0
	10^{-4}	11.0	13.0	12.0
	10^{-5}	10.0	13.0	11.0
S. aureus	10^{-1}	15.0	12.0	10.0
	10^{-2}	13.0	8.0	8.5
	10^{-3}	13.0	7.5	7.0
	10^{-4}	11.0	0.0	0.0
	10^{-5}	9.0	0.0	0.0

The *in vitro* antimicrobial test presented in Table 3 showed that *Momordica balsamina* extracts exhibited higher antimicrobial activity for *Salmonella typhi* than *Staphylococcus aureus.* However, all extracts exhibited considerable level of inhibition against all the test organisms except for chloroform and methanol extracts concentration of 10^{-4} and 10^{-5} mg/mL, which exhibited no activity against *S. aureus*. The highest activity against *Salmonella* with a zone of inhibition (ZI) of 19 mm was exhibited by the chloroform extract *of Momordica balsamina* at a concentration of 10^{-1} mg/mL. On the other hand, the highest activity against *Staphylocuccus aureus* (ZI = 15.00 mm) of at

10^{-1} mg/mL was by the n-hexane extract. It had been suggested that plant extracts exhibiting zone of inhibition of about l0 mm and ≥18 mm could be considered active and very active, respectively (Zwadyr, 1972; Usman and Osuji, 2007). Hence M. balsamina could be considered active at concentrations above 10^{-5} and 10^{-1} mg/mL for *S. typhi* and *S. aureus*, respectively. Osuntokun and Ajayi (2014) also found a similar activity of the extracts *of M. balsamina* against *S. typhi* and *S. aureus* in a concentration dependent manner. The broad antibacterial activities of the extracts could be as a result of the secondary metabolites (alkaloids, flavonoids, tannins, saponins and glycosides) present in the extracts. From the pattern of the antimicrobial activity, the activities of the extracts seemed to increase with increase in the polarity of the extraction solvents and the concentration of the extracts.

CONCLUSION

The result revealed the presence of phytochemicals which may be the medicinally active chemical constituents in the *Momordica balsamina* leaf from Northern Nigeria. The class of phytochemical compounds identified had been documented by early researchers to be bioactive and had been confirmed by previous works to have medicinal and physiological activity, and therefore could be responsible for the efficacy of the leaves of the *M. balsamina* in ethnomedicine application for the treatment of different ailments.

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