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Phytochemical analysis and Antibacterial Efficacy of leaf extracts of *Nauclea latifolia* L.

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ABSTRACT

Nauclea latifolia is a valuable medicinal plant that is widespread in the humid tropical rainforest or in savannah woodland zone of West and Central Africa. Different parts of the plant possess remarkable therapeutic actions that can support the traditional usage of this plant in the treatment of several ailments. Phytochemical analysis and antibacterial efficacy of the leaf extracts were evaluated. Phytochemical analysis was carried out using standard procedure, the chemical ingredients detected were Flavonoids, Tannins, Saponins, Alkaloids, Steroids, Glycosides, Saponins glycosides, Volatile oils and absent of Cardiac glycosides, Balsam and Anthraquinones. Antibacterial efficacy of the leaf extract was also tested against certain strains of clinical isolates of *Salmonella typhi, Klebsiella pneumoniae, Staphylococcus aureus, Streptococcus spp* using disc diffusion and broth dilution techniques. The antibacterial test results had indicated that, the test isolates were sensitive to the leaf extract of the plant with the highest efficacy against *Salmonella typhi* (33mm) at 200mg/ml, *Klebsiella pneumoniae* (40mm) at 200mg/ml, *Staphylococcus aureus* (11mm) at 200mg/ml, *Streptococcus spp* (14mm) at 200mg/ml and lowest activity at 25mg/ml. The extract found to showed strong inhibitory effect against the test isolates at higher concentration which was in dose dependent manner. The study

had indicated that the leaf extracts of the plant has potential against microbial infections.

INTRODUCTION

African plants constitute a rich and still under explored source of natural products of potential medicinal interest. According to World Health Organization (WHO), an approximately 80% of world population relies on herbal preparations as their primary source of healthcare (Kumara, 2001). It was estimated that some 20,000 species of higher plants are used medicinally throughout the world (Tagboto and Townson, 2001). Millions of Africans rely on these herbal preparations for their primary health care (McCaleb, 2000). Plants have provided the basis for traditional treatment for different types of diseases such as cancer, liver diseases, diabetes, ulcer, bacterial infections, fungal infections, etc. and still offer an enormous potential source of new chemotherapeutic agents. Plant becomes a medicinal plant only when its biological activity has been ethno-botanically reported or scientifically established (Elujoba, 1995). Plants and their derived products from the outset have also served as veritable sources of food for humans and animals (Ogbonnia *et al.,* 2011).

Nauclea latifolia linn is belong to the family of *fabaceae* is a spreading, evergreen, multi-stemmed shrub or small tree native to tropical Africa and Asia (Gidado *et al.,* 2005). *Nauclea latifolia* is a valuable medicinal plant that is widespread in the humid tropical rainforest zone or in savannah woodlands of West and Central Africa. It is known as African peach and may be used for traditional medicinal practices of the East and West African sub-regions of

continental Africa (Dalziel, 1957) where various extracts of the plant are used for the therapeutic management of malaria (Gamaniel *et al.,* 1997); hypertension (Akubue and Mittal, 1982); prolonged menstrual flow (Elujoba, 1995); cough, gonorrhoea, stomach disorders, dysentery, ulcers and liver ailments (Traore *et al.,* 2000).

The research was designed to investigate the antibacterial efficacy of leaf extract of the plant against the tested clinical isolates.

MATERIALS AND METHODS

Sample collection of plant material

Fresh leaves of the plant were collected from Zuru Emirate, Zuru Local Government of Kebbi State, Nigeria. It was botanically authenticated at the Herbarium Botany Unit, Department of Biological Sciences, Usman Danfodiyo University, Sokoto, Nigeria. A voucher specimen of the plant was deposited at the herbarum for referencing. The leaves was then air dried under shade, cut into a small pieces, grounded into a powder using mortar and pestle and kept in a container until required for analysis.

Preparation of plant extracts

Twenty five grams (25g) of the leaf powder of the plant was dissolved in 200ml of distilled water in 250ml conical flask and kept to settle for 24 hours. The extracts was filtered using Whatman's Filter Paper (No. 1) and dried in an oven. The residue was reconstituted for phytochemical screening tests (Harbon, 1998).

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PHYTOCHEMICAL SCREENING

The extract of the plant was used for phytochemical analysis after reconstitution with distilled water and concentrated to determine the secondary plant metabolites present in the plant material in accordance with methods of (Harbone, 1998; Sofowora 1991; El-Olemyl, 1994).

Preparation of extract for antibacterial activity

The powdered leaf sample of *Nauclea latifolia* plant; 1.25, 2.5, 3.75 and 5g were used. The various grams were placed in a test tubes, 10ml of distilled water was added to each test tube to give different concentration of (25, 50, 100 and 200mg/ml) of the plant extract. The same concentration were also prepared for standard control (ciprofloxaxin 500mg).

Bacterial culture

Isolates of bacteria *Salmonella typhi, Klebsiella pneumoniae, Staphylococcus aureus, Streptococcus spp* were obtained from Microbiology Laboratory of Department of Microbiology, College of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto State.

Antibacterial test

The antibacterial tests of the leaf extracts of the plant was tested on the microbial isolates using disc diffusion method of (NCCLS, 2008). The grams of the leaf powder used for the preparation of various concentrations were 1.25, 2.5, 3.75, and 5g which were dissolved in 10ml of distilled water to give different concentrations of 25, 50, 100 and 200mg/ml respectively. Similar concentration of standard control (Ciprofloxaxin drug) was prepared. Disc of variable concentrations of the prepared extract was incorporated into

Mueller Hinton Agar medium and allowed to solidify. Sensitivity test was determined by the absence of growth on or around the plate. The plates were incubated at 37°C for 24h before observation and measurement of zone of inhibition.

RESULTS

The phytochemical analysis presented in table I had indicated that *Nauclea latifolia* leaf extract contains, the active secondary plant metabolites tested such as Flavonoids, Tannins, Saponins, Steroids, Alkaloids, Saponin glycosides, Volatile oils, Glycosides and the absence of Cardiac glycosides, Balsam and Anthraquinones.

Table I: Phytochemical constitutens of leaf extract of *Nauclea latifolia* L.

ALK	VO	TAN	GLY	SAP	CGS	STER	SGS	BAL	ATQ	FLA
+	+	+	+	+	ND	+	+	ND	ND	+

Key: + = Presence
ND = Not detected
FLA = Flavonoids, TAN = Tannins, ALK = Alkaloids, SAP = Saponins, CGS = Cardiac glycosides, STER = Steroids, SGS = Saponins glycosides, BAL = Balsams, ATQ = Anthraquinones, VO = Volatile oils, GLY = Glycosides.

Antibacterial activity test of *N. latifolia.* Extract of *N. latifolia* had shown strong effect on the growth of all the clinical isolates tested at all concentrations, in a dose dependent manner with highest inhibitory activity at

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200mg/ml for the isolates with lowest effect at 25mg/ml of *Salmonella typhi, Klebsiella pneumoniae, Staphylococcus aurues, Streptococcus spp* as indicated in the table II below:

Table II: Antibacterial activity of leaf extract of *Nauclea latifolia*

		Zone of inhibition (mm)			
Plant part/control	**Conc. (mg/ml)**	***S. typhi***	***S. aureus***	***S. spp***	***K. pneumoniae***
Leaf	25	17	9	8	17
	50	23	10	10	19
	100	26	10	12	27
	200	33	12	14	40
Ciprofloxacin	25	35	20	25	42
(Standard	50	38	24	30	48
control)	100	42	28	40	50
	200	48	32	43	52

Key: - = No inhibition
Value 1mm = inhibition
S. typhi = Salmonella typhi, S. aureus = Staphylococcus aureus, S. spp = Streptococcus spp, K. pneumoniae = Klebsiella pneumoniae.

DISCUSSION

The phytochemical analysis of *N. Latifolia* leaf extract had indicated the presence of some secondary plant metabolites tested such as alkaloids, tannins, glycosides, saponins, steroids, saponins glycosides flavonoids, volatile oils and absent of cardiac glycosides, balsam and anthraquinones, this is similar to the work reported by (Borrelli and Izzo, 2001; El-Mahmood *et al.,* 2008; Ahuocha, 2010, Ogueke *et al.,* 2011; Orale *et al.,* 2013; Edet *et al.,* 2013; Balogon *et al,* 2015; Onu

et al., 2015). The absent of anthraquinones and glycosides in this research disagreed with the find of (Borrelli and Izzo, 2001; El-Mahmood *et al.,* 2008, Ahuocha, 2010; Ogueke *et al.,* 2011; Orale *et al.,* 2013; Edet *et al.,* 2013; Balogun *et al.,* 2015, Onu *et al.,* 2015). The secondary plant metabolites are the active principle that possesses pharmacological activity against the growth of certain microbial organisms (Balogun *et al.,* 2015).

Antibacterial activity of the leaf extract of *N. Latifolia* leaf had shown strong inhibitory effect against the growth of the clinically test isolates in a dose dependent manner and this is similar to the find of (Lino and Deogracious, 2006; El-Mahmood *et al.,* 2008; Ahuocha, 2010; Ogueke *et al., 2011;Maitera et al.,* 2011). The activity of the leaf extract of the plant might be attributed to the presence of some secondary plant metabolites which were reported to have antimicrobial activity (Singh and Bhat, 2003). The antibacterial activity reported in this research might be due to the presence phytoconstituents such as tannins glycosides whose antimicrobial properties was documented (Tschehe, 1971). The results of this study had demonstrated some antibacterial properties of *N. latifolia* leaf extract that may serve in further study to investigate the actual structure and characterized the active principle tested for further pharmacological research.

CONCLUSION

Phytochemical analysis and antibacterial efficacy of the leaf extract of *N. Latifolia* had shown that, the plant possess pharmacological activity against the clinically test isolates of microbes which may be due to the presence of bioactive constituents of the plant.

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