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Chemical composition of root and stem bark extracts of *Nauclea latifolia*

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ABSTRACT

The medicinal value of any plant derives largely from its endowed chemical substances responsible for the observed pharmacological action(s). The present study therefore, evaluated the distribution of these constituents viz: phytochemicals, proximate composition and vitamin content of the stem and root bark of Nauclea latifolia. The result revealed the presence of relatively high amounts of antioxidant vitamins (mg/100g) in the samples: Vitamin E (106.25±3.90 and 69.75 ±2.78), Vitamin C (74.80 ± 4 .40 and 45.14 ±2.87) and Vitamin A (103.18 ±1.98 an d 89.83) in the stem and root bark extracts respectively. The proximate composition (%) analysis indicated moisture content (7.00± 0.03 and 15.01 ±0.02), ash (15.00±0.03 and 1 2.00± 0.04), fat (24.03 ±0.05 and 32.04 ±0.02) and crude protein (94.84 ±0.06 and 0.64 ±0.06) in the stem an d roots respectively. Amongst other phytochemicals, the saponins (12.01± 0.01 and 5.59±0.01), total flavono ids (1.01± 0.01 and 0.51 ±0.01), total alkaloids (8 .02 ±0.01 and 13.53 ±1.00) and tannins (0.25± 0.00 and 0.25 ± 0.0 0) were also determined in the stem and root bark respectively. Overall, the results suggest that Nauclea latifolia could be a potential source of pharmacologically active natural products and/or for development of neutraceuticals.

Key words: *Nauclea latifolia*, Phytochemicals, Vitamins, Proximate composition

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INTRODUCTION

The consumption of plant is not just for its nutritive value but also for its medicinal effects. A number of plants possess medicinal properties and have been exploited in the management and treatment of diseases. In modern times, plant part is incorporated into preparation used by non-orthodox practitioners and a number of orthodox medicinal components. It has also been established that a number of drugs used as orthodox medicines are derived from plant materials. However, most of these medicines are expensive and have a number of side effects; hence the use of medicinal plants is becoming more popular [1].

Nauclea latifolia (family: Rubiaceae) commonly known as pin cushion tree is a straggling shrub or small tree native to tropical Africa and Asia. Parts of the plant are commonly prescribed traditionally as a remedy for diabetes mellitus. The plant is also used in the treatment of ailments like malaria [2, 3, 1], gastrointestinal tract disorders [4], sleeping sickness [5], prolong menstrual flow [6], hypertension [3] and as a chewing stick [7]. However, there are no scientific reports on the chemical composition of the root and stem bark extracts of this plant. It is on this basis that this work is designed to evaluate its chemical composition viz: phytochemical, proximate and vitamin composition.

MATERIALS AND METHODS

Sample collection and preparation

N.latifolia was identified and authenticated by a botanist Dr Mike Eko, Department of Botany, University of Calabar, Nigeria. Fresh roots were excavated and stem of the plant harvested from the teaching hospital premises of University of Calabar, Calabar Cross River state-Nigeria. The roots and stems were thoroughly washed to remove debris and the earth remains. From these the barks were divested and thereafter chopped into bits and allowed to dry under shade. They were blended into fine powder using a Q-link electrical blender (Model QBL-18L40, china).About 205.8g of the blended root bark and 1063.4g of the blended stem barks were separately soaked in 1223.2ml and 5600ml of ethyl alcohol (80% BDH) respectively, and agitated then allowed to stay in refrigerator for 48 hours at 4^{o}C. The mixtures were doubly filtered, first with cheese cloth, and then with Whatman No 1 filter paper (24cm). The filtrates were concentrated *in vacuo* using Rotary Evaporator (ModelRE-52A, Shangai Ya Rong Biochemistry Instrument Company, China) to 10% of its original volume at 37^{o} C - 40^{o} C. These were concentrated to complete dryness in water bath, yielding 41g (19.96%) of root bark and 98.6g (9.2%) of stem bark extracts. The extracts were stored in a refrigerator from where aliquots were used for the proximate, phytochemical and vitamin analyses.

Phytochemical analysis: The phytochemical analysis was carried out using the method of Trease and Evans [8]. The proximate analysis was carried out using standard AOAC methods [9]. The vitamins were determined by method described by Kirk and Sawyer [10].

RESULTS AND DISCUSSION

Table1a: Phytochemical composition of stem and root bark extracts of *N. Latifolia*

	HCN (mg/kg)	Saponins (%)	Flavonoids (%)	Alkaloids (%)	Tannin (%)
Stem bark extract	2.29 ±0.04	12.01 ±0.01	1.01 ±0.01	8.02 ±0.01	0.25 ±0.00
Root bark extract	2.25 ±0.09	5.57 ±0.01*	0.51 ±0.01*	13.53 ±1.00*	0.25 ±0.00

**P<0.05 vs stem bark extract*

Table 1b: Vitamin composition of stem and root bark extracts of *N. Latifolia*

	Thiamine (mg/100g)	Riboflavin (mg/100g)	Niacin (mg/100g)	Vit. E (IU/100g)	Vit. C (mg/100g)	Vit. A (IU/100g)
Stem bark extract	0.50 ±0.00	0.26 ±0.00	0.06 ±0.00	106.25 ±3.90	74.80 ±4.40	103.18 ±1.98
Root bark extract	0.65 ±0.00*	0.38 0.00*	0.14 ±0.00*	74.80 ±4.40*	45.14 ±2.87*	89.33 ±0.18*

**P<0.05 vs stem bark extract*

Table 1c: Proximate composition of stem and root bark extracts of *N. Latifolia*

	Moisture (%)	Ash (%)	Fats (%)	Protein (%)
Stem bark extract	7.00 ±0.03	15.00 ±0.03	24.03 ±0.05	4.84 ±0.06
Root bark extract	15.01 ±0.02*	12.00 ±0.04*	32.04 ±0.02*	0.64 ±0.06*

**P<0.05 vs stem bark extract*

Results of the chemical composition of root and stem bark ethanol extracts of *Nauclea latifolia* are presented in tables 1a, b and c above. The quantitative phytochemical analysis revealed (in %/100mg), saponin in the stem and root extract respectively to be (12.01 ± 0.01 and 5.57 ± 0.01), alkaloid (8.02 ± 0.01 and 13.53 ±1.00), flavonoid (1.01±0.01 and 13.53 ± 1.00), hydrocyanic acid (2.29 ± 0.04 and 2.25 ± 0.09). Tannin concentration was present in trace amount. Saponins found particularly abundant in various plant parts. They serve as anti –feedant and to protect the plant against microbes and fungi. Some may enhance nutrient absorption and aid in animal digestion [11]. They are known bioactive substances that can reduced the uptake of cholesterol and glucose at the gut through intra-lumenal physiochemical interaction [12]. The results of this analysis revealed a high concentration of saponins in plant parts. This agrees with the finding of [13], which reported that the plant parts are used as anti-hyperglycemic

agent because of their high saponin content. This finding also supported the report by [3], on the traditional use of these plant parts as antidiabetic agents. Alkaloids are naturally occurring chemical compounds which mostly contain basic nitrogen atoms produced by variety of organisms and serve as part of the group of natural products. Some are toxic to animal but often have pharmacological effect and are used as medication [14]. Synthetic and semi-synthetic drug which are produced by structural modification of the alkaloids are been reported by [14] and are used as analgesic, anti-hypertensive and anesthetics. The result of this analysis revealed a high concentration of Alkaloids. This is in tandem with [14] and [15] has also reported on its use as anti-malaria agent.

Flavonoids and cyanogenic glycosides were present in appreciable concentrations, while tanins were present in trace amount. Flavonoids have been shown to have anti-fungal activity [16]. In vitro studies of flavonoids have displayed anti-allergic, anti-inflammatory, anti-microbial [17] and anti-cancer activities [18]. Flavonoids are most commonly known for their antioxidant activity, similar to those of vitamins C and E [19]. These findings confirmed the synergistic roles of the phytochemicals of the plant, and hence its use in various therapeutic trials.

The result of the vitamin composition is presented in table 1b. The vitamin composition (IU/100g) showed Vitamin A (103.18 ± 1.98 and 89.33 ± 0.18), Vitamin C (74.80 ± 4.40 and 45.14 ± 2.87), Vitamin E (106.25 ± 3.90 and 74.80 ± 4.40) while Riboflavin and Niacin were present in trace amounts. This finding corroborate with earlier reports by [20] and [21], on the use of the plant as a strong anti-oxidant agent and also in agreement with anti-oxidant properties of an extensively researched medicinal plant [22]. The result of the proximate composition is presented in table 1c. It revealed (in %) moisture content (7.00 ± 0.03 and 15.01 ± 0.02), Ash (15.00 ± 0.03 and 12.00 ± 0.04), Fat (24.03 ± 0.05 and 32.04 ± 0.02) and protein (4.84 ± 0.06 and 0.64 ± 0.06) respectively. The vitamin and proximate results revealed a possible potential of the plant parts as component of animal feeds.

Summarily, the plant parts indicated positive anti-oxidant potentials as a result of the various constituent phytochemicals, revealed in appreciable amounts in this work. Therefore, *Nauclea latifolia* could be exploited in the development of neutraceuticals.

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