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Research Paper

GRAVIMETRIC AND SPECTROSCOPIC PHYTOCHEMICAL INVESTIGATION OF NEEM TREE (*Azadirachta indica*) IN NORTH CENTRAL NIGERIA

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Abstract

This work aimed at investigating the active principles present in the leaf and stem bark of neem tree (*Azadirachta indica*) in the North Central part of Nigeria. The phytochemicals were extracted using cold extraction method and screened qualitatively. Quantitative analysis was done using gravimetric and spectroscopic methods. Results showed that saponnin, reducing sugar, steroid and phenol were highly present in the stem whereas terpenoid, quinone and alkaloids were moderately present in the stem. The leaf was noted for the high presence of saponnin, reducing sugar and quinone. Phenol and glycosides were moderately present in the leaf. Tannin, phlobatannnin, anthraquinone and oxalate were not found in both parts of the plant. The stem bark contained 1.07% steroid, 0.28% saponin and 0.11% phenol. The leaf was composed of 0.78% saponin, 0.68% steroid and 0.12% phenol. Phenolic level was very low in the leaf and stem bark with minimal deviation. However, steroid and saponin levels were high in the stem and leaf. Radal plot showed that steroid was highly concentrated in the two plant parts followed by saponin. Proportionately, steroid is 73% in the stem but 43% in the leaf whereas saponin records the highest in the leaf (49%). Phenol has 8% in both leaf and stem. The various active principles reported thus suggest copious therapeutic benefits of the plant as a repository of drug synthesis.

Key words: Neem Tree, Phytochemicals, Qualitative screening, Quantitative determination.

INTRODUCTION

The neem tree (*Azadirachta indica*) is an evergreen tree found in most tropical countries. It belongs to the same family (meliaceae) with Mahogany. It is very popular in Nigeria and commonly used by many people to cure many ailments locally. According to Brototi (2011), the neem tree is intimately connected with the everyday life of Indians (Brototi, 2011) where it is applied to save life because each part of the neem tree has some medicinal properties (Biswas, 2002)

The extract from bark, leaves, fruits and root have been used to control leprosy, intestinal helminthiasis and respiratory disorder in children (Shravan *et al*., 2011). The bark extract also used as tonic, astringent and useful in relieving fever thirst nausea, vomiting and skin diseases.

The immunomodulatory activity of the neem bark extract has also been reported (Shravan *et al*., 2011).

Chemical investigation on the product of neem tree was extensively undertaken in the middle of the 20th century. The isolation of nimbin was reported as first bitter compounds isolated from neem oil and more than 135 compounds have been isolated from different part of neem. (Kausik *et al.,* 2002). Over the years, scientific research has expanded our knowledge of medicinal plant and new drugs.

Plants are rich in wide variety of secondary metabolites and active principles which have been found to have medicinal properties. Pharmacological studies have accepted the value of medicinal plants as potential source of bioactive compound (Biswas *et al*., 2002). Phytochemicals for medicinal plants serve as lead compound in drug discovery (Chakravarthy *et al.,* 1985; Cohen *et al.,* 2002). The aim of phytochemical screening is to isolate various constituents of the plants for assessing their biological activity or medicinal uses. The medicinal uses of a plant are due to the presence of a particular chemical substance that has a definite physiological action on living system. The most important of these are alkaloids, glycosides, saponins, flavonoids, steroids, anthraquinones and tannins. (Aguoru *et al.,* 2014).

It is a common practice in Nigeria to use neem plant in curing diverse types of ailments though without scientific justification. Moreover, the active principles present in different parts of the plant are qualitatively and quantitatively unknown. This study therefore aimed at determining the type and quantity of phytoconstituents of medicinal importance present in the stem bark and leaf of neem plant in the North Central part of Nigeria.

MATERIALS AND METHOD

Leaf and stem bark of neem plant were collected within the University of Agriculture Makurdi, Nigeria. Plant parts were separately dried and pulverized. Cold extraction method was employed using 50g of the plants samples (Aguoru *et al*., 2014). Standard qualitative screening methods were adopted to determine the functional types of phytoconstituents. A total of thirteen (13) active principles were screened and tested in each plant part. Three most common chemicals in the leaf and stem were quantified using gravimetric method Harborne (1973) and spectroscopic method (Aguoru *et al*., 2014). Data were statistically analysed to generate charts and plots.

RESULTS AND DISCUSSION

Saponnin, reducing sugar, steroid and phenol were highly present in the stem whereas terpenoid, quinone and alkaloids were moderately present in the stem. The leaf was noted for the high presence of saponnin, reducing sugar and quinone. Phenol and glycosides were moderately present in the leaf. Tannin, phlobatannnin, anthraquinone and oxalate were not found in both parts of the plant (table 1). The stem bark contained 1.07% steroid, 0.28% saponin and 0.11% phenol. The leaf was composed of 0.78% saponin, 0.68% steroid and 0.12% phenol (table 2). This shows that phenolic level was very low in the leaf and stem bark with minimal deviation (figure 1). However, steroid and saponin levels were high in the stem and leaf (figure 2). Radal plot (figure 3) has clearly shown that steroid was highly concentrated in the two plant parts followed by saponin. Proportionately, steroid is 73% in the stem but 43% in the leaf whereas saponin records the highest in the leaf (49%). Phenol has 8% in both leaf and stem (figure 4). The morphological view of neem plant is shown in figure 5.

Table 1: Phytochemical screening of the stem and leaf of *A.indica*

Phytochemicals	**Stem**	**Leaf**
Saponnins	++	++
Tannins	—	—
Reducing sugar	++	++
Phlobatannnins	—	—
Anthraquinone	—	—
Steroid	++	+
Flavonoids	—	+
Terpenoids	+	—
Quinones	+	++
Oxalate	—	—
Phenol	++	+
Glycosides	—	+
Alkaloids	+	—

Legend: (+) = moderately present, (++) = highly present, (—) = absent

Table 2: Quantitative analysis of the stem and leaf of *A.indica*

Plant part	**Saponnin**	**Phenol**	**Steroid**
Stem bark (%)	0.28	0.11	1.07
Leaves (%)	0.78	0.12	0.68

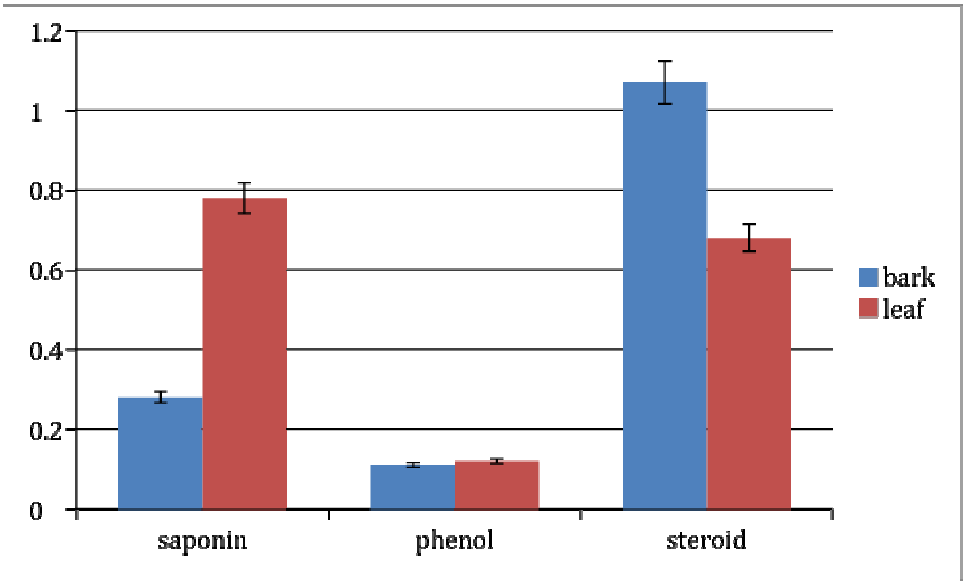

Fig 1: Quantified phytochemicals in the stem bark and leaf (error bars)

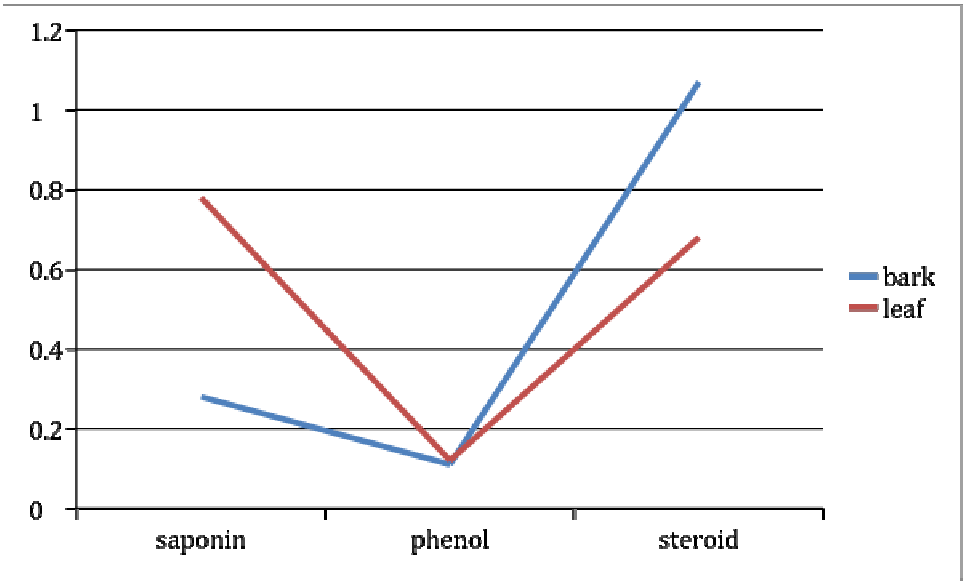

Fig 2: 3D Plot of the phytochemicals

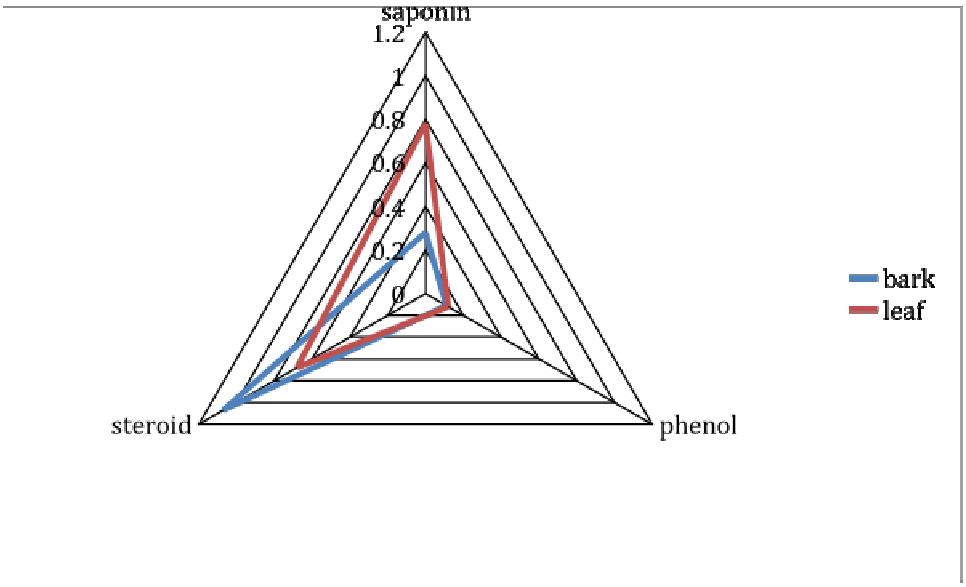

Fig 3: Phytochemical concentration in plant parts.

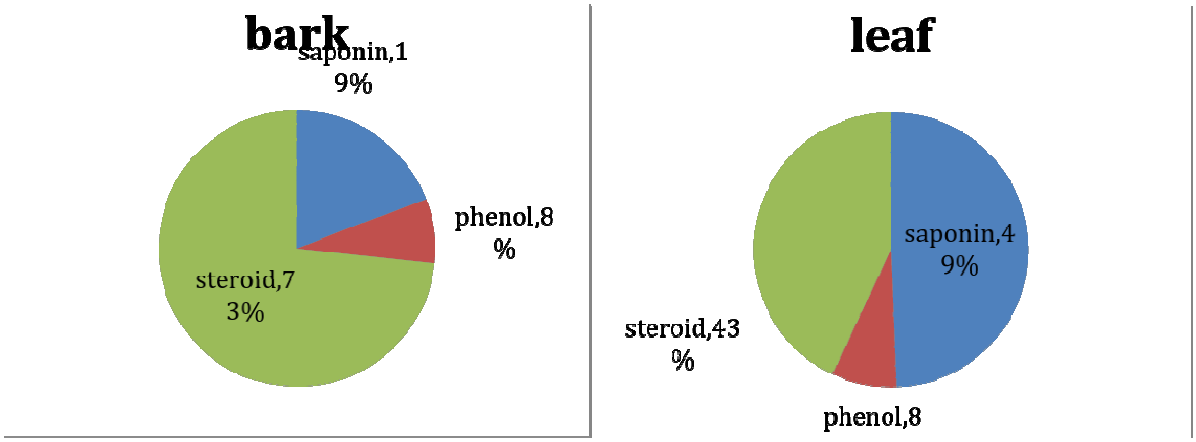

Fig 4: Proportions of the saponin, phenol and sreoids in the stem bark and leaf

Fig 5: Neem plant (*Azadirachta indica*)

The presence of these phytochemicals in the stem bark and leaf has thus suggested their thererapeutic benefits to mankind. This is because therapeutic benefits of plants are contingent on the presence of their active principles (Edeoga *et al*., 2009; Aguoru *et al*., 2014). The high amount of saponnin thus suggests that the leaf may help in treating lethal pathogenic infections among other curative uses (Morisaki *et al*., 1995). The qualitative presence of flavonoid also implies that the leaf may be potent in inhibiting human cancer cells apart from its cardiovascular therapeutic functions (Hymete, 2004). The high amount of steroid in the stem also suggests that the plant could be used to alleviate blood cholesterol and prevent high blood pressure (Hafiza, 2000).

In conclusion, the outcome of this research has clearly revealed that neem plant is a repository of various active principles that may be of help in pharmaceutical industries to synthesize useful drugs. Hence, both the leaf and stem bark are useful in this regard. However, the effect of the extract may need to be tested on microbes and lab animals to determine and discover more therapeutic benefits to be derived from this plant.

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