

*Full Length Research Paper*

# Evaluation of chemical constituents of *Phyllanthus Niruri*

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Accepted 12 June, 2011

The study was carried-out to evaluate the chemical constituents of *Phyllanthus niruri*, a commonly multifunctional activities herbal plant used for curing different ailment. The plant (roots, leaves and stem) was collected in Federal Capital Territory Abuja, Nigeria in the months of July to August, 2009 and used throughout the study. Phytochemical, elemental and physicochemical constituents of the plant was evaluated and the results were as follows: Phytochemical screening indicated the presence of alkaloid, balsams, sterols, carbohydrate, glycoside, flavonoids, tannins, phlobatannins, resins and terpene in trace; while the essential elements detected were of variable concentrations (mg/L) as; Ca (157.419±1.42), Na (14.393), K (11.344), P (2.341), Mg (59.627±0.54), Mn (7.926±0.27), Fe (34.552±815), Cu (3.082±0.67) and Zn (3.346±0.24) but Cd, Pb and Ni were not detected by the equipment. Physicochemical parameters evaluated were, percentage moisture content (12.4057±0.45% w/w), total ash (6.9950±0.46 %w/w), bitterness value (1636.88±0.74 Units/g), water extractable matter (1.3353±0.10% w/w) and retention value (RF) value (0.5772, 0.5781, 0.5665). The results indicated that, the plant is rich in various chemicals which may be the reason for its activities against different ailment as claimed by the indigenous people.

**Key words:** *Phyllanthus niruri*, physicochemical, phytochemicals, essential elements.

## INTRODUCTION

Medicinal herbs have been used for healing as an alternative medicine, by all cultures, for thousand of years. About 80% of the world's population does not have access to conventional drugs and, therefore, rely on traditional medicine. According to the World Health Organization, the uses of medicinal herbs become widely useful even in the industrialized countries as a complementary way to cure and prevent diseases. The growing attractiveness of herbal medicines is that many people accept them as true, they are innocuous, in contrast to pharmaceutical drugs, and the idea that what is natural can only be good and it was the belief that herbal medicines are naturally superior to synthetic drugs (Abugassa et al., 2008).

*Phyllanthus niruri* is a small, erect, annual herb that grows 30 to 40 cm in height. It is indigenous to the

rainforests of the Amazon and other tropical areas throughout the world, including the Bahamas, Southern India, China, Ghana, others including Nigeria. It is a perfect example of a highly beneficial medicinal plant which deserves often much more research due to its increasing popularity on many continents as an herbal remedy for different disease ailment. The plant is employed by standard infusion or weak decoction of the whole plant or its aerial parts in water against, diabetes, malaria, dysentery, fever, flu, tumors, jaundice, analgesic and as digestive, laxative, stomachic, tonic, kidney stones elimination and other urinary tract infection as a result of its various chemical constituents (Obodozie, 2000). Some literatures revealed that, 81 elements have been reported in human body all of which play vital biochemical roles (Iyenger, 1985; Vohra, 1981) where deficiency access to them affect various physicochemical functions of the human body. This shows that, there is definite correlation between the level of trace elements in the human body and some diseases (Ceyik et al., 2003;

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Kazi et al., 2009). The need to develop specifications for the starting materials of herbal products is imperatively well documented (Obodozie, 2000). Chemical profiling of *P. niruri* was not fully exploited, therefore as an effort to attain to that, this study was designed in order to evaluate chemical constituent of the plant.

## MATERIALS AND METHODS

### General experimental procedures

All chemicals used in the experiment were of analytical grade (BDH chemicals Ltd. Poole, England). Atomic Absorption Spectrophotometer (Model 969 with an air and acetylene burner head) was used for quantifying the elements. All glass wares used were of standards and properly washed before use. TLC plate (20 x 20 cm, silica gel, Merck Germany), water-bath (Karl Kolb, Germany), UV lamp 366nm (ModelUVL-21, Black Ray Lamp by San Gabriel California, U.S.A); and Vecstars furnace (Chesterfield U.K)

### Plant sample collection and processing

The plant sample was collected fresh from the FCT-Abuja, Nigeria from the months of July to August, 2009, identified by the professional in the herbarium unit of the institute, where voucher was assigned to it as NIPRD No.3649. The sample was labeled, air dried and powdered for subsequent analysis.

### Phytochemical analysis

Qualitative analysis of the plant was carried-out by weighing two grams (2.0 g) of the plant material extracted with 20 ml of the solvent by shaking for 3 to 30 min or heating on water bath depending on the test in question. The solution was filtered through a whatman filter paper using funnel and the filtrate was used for the phytochemical under test using established standard methods (Trease and Evans, 2002; Edeoga et al., 2005; Sofowara, 1993).

### Physicochemical determinations

#### Moisture

One gram (1.0 g) of the powdered sample was weighed on aluminium foil on the automated moisture analyser pan and set at 105°C for 3 h where % moisture content of the sample was obtained after the specified time (WHO, 1998).

#### Total ash

Two gram (2.0g) of the powdered sample was ignited in a previously ignited and tarred crucible at 500°C for about 4 h until the sample was white, indicating the absence of carbon. Cooled in desiccators and weighed and calculated as %w/w (WHO, 1998).

#### Determination of the extractable matter (EM)

Four gram (4.0 g) of the powdered sample was macerated (cold method) with 100 ml of the solvent specified by frequent shaking for

6 h and allowed to stand for 18 h and filtered through cotton wool in a funnel; followed by evaporating 25 ml of the filtrate in a flat bottom platinum dish on a water-bath. The extract was dried at 105°C for about 6 h and cooled in desiccators for 30 min, weighed and calculated as milligram per gram of the powdered sample (WHO, 1998).

#### Determination of bitterness value

The bitterness value was determined by finding the threshold bitter concentration through tongue-tasting the dilutions of quinine solutions and the plants material subsequently by different individual beginning with the lowest concentration of the dilutions. The threshold bitter concentration at which a material continues to provoke a bitter sensation after 30 s was the concentration at which the bitterness was determined and calculated in units per g according to WHO (1998) method.

#### Elemental analysis

Two grams (2.0 g) of the sample was ashed and digested using concentrated nitric acid and perchloric acid and made-up to appropriate volume (WHO, 1998) and analyzed using Atomic Absorption Spectrophotometer model 969 and flame photometer after calibrating the instrument with appropriate working standards of the elements of interest.

#### Results computation and statistical analysis

The data obtained were processed by Microsoft Excel, expressed as Mean  $\pm$  SD and computed in tabular form.

## RESULTS AND DISCUSSION

The results of the studies were presented as percentage mean ( $\pm$  SD) contents of the minerals (Table 2), documentation of the phytochemical screening after confirmatory test (Table 1) and the other physicochemical parameters (Table 3) for triplicate analysis.

Results of the analysis shows that the plant is rich in phytochemical, physicochemical and mineral contents as highlighted in Tables 1 to 3. Multi-functional activities of the plant against various diseases may be attributed to the presence of the various chemical constituent of the plant.

In relating the result presented in Table 1 with the literature, literature reported that, the presence of terpenoids potentates the plant for ability to treat diabetes (Treadway, 1994); tannins enables the plant to treat dysentery and urinary tract infections (Goh et al., 1995); flavonoids in the plant are also associated to the fever-reducing (antipyretic) and pain-relieving (analgesic) ability (Krishnaiah et al., 2009). Alkaloids and Saponins in the plant enable it to prevent excessive absorption of cholesterol and reduce the risk of cardiovascular diseases (Akinpelu and Onakoya, 2006; Olaleye, 2007; Malinow et al., 1977). Among the claims of the indigenous people and traditional medicine healers, the plant have potentials to treat urinary tract infections,

**Table 1,** Phytochemical screening results.

Phytochemical	Alkaloids	Carbohydrates	Balsam	Tannins	Terpenes	Saponin	Phlobatannins	Sterols	Glycosides	Resins
Extract	+	+	+	+	Trace	+	+	+	+	+

+, Present.

**Table 2.** Mineral content of the plant.

Content (Mg/L)											
Macro mineral					Micro mineral						
Na	Ca	K	Mg	P	Mn	Fe	Cd	Pb	Cu	Zn	
14.39±0.63	157.42±1.42	11.34±0.38	59.627±0.54	2.34±0.33	7.93±0.27	34.55±815	ND	ND	3.08±0.67	3.35±0.24	

**Table 3.** physicochemical parameters.

Parameter	% Moisture content	% Ash w/w	Bitterness value (Units/g)	% Extractable matter	RF value
Results	12.4057±0.45	6.9950±0.46	1636.88±0.74	1.3353±0.10	0.5772, 0.5781, 0.5665

malarial, flush-out excess sugar, treat kidney disease and other toxins from body system. This indicated that, the plant chemical constituent made it to be useful against various diseases.

Table 2 shows the various mineral content of the plant indicating that, it has sizeable quantity of dietary minerals which all falls within the range of the recommended daily allowance (RDA) per day with the exception of zinc in which its RDA varies (Sallamanda, 2010). Cadmium (Cd) and Lead (Pb) were not detected by the instrument; this means they were either not present or below the detection limit of the instrument. Elemental content has a role in enhancing activities of the plant against different diseases due to definite correlation between mineral content in human body with some diseases conditions (Ceyik et al.,

2003; Nada et al., 1999).

Physicochemical parameters were reported in Table 3 which comprises of; loss on drying (LOD), total ashes, extractable matter, and bitterness value. Percentage ash content of the plant is useful for the purpose of gauging inorganic impurities such as sand or measure of mineral content (Ameh et al., 2009) although differences in composition between the ash content and the mineral matter may occur, as a result of the loss of some volatile inorganic constituents (James, 1995). Water extractable matter (WEM) is use as the only quantitative variable around which physiological projection can be tested. Example, the WEM of the plant shows that, 1 g of crude drug from the plant is equivalent to 13 mg of the WEM; while the bitterness values serve as a

marker for bioactive ingredient of the plant (Ameh et al., 2009). The TLC results gave three light-blue visible spots of closely related retention value (RF) values indicating three active compounds of the plant that were able to separate in by the mobile phase.

## Conclusion

The chemical analyses results indicated that, the plant is very rich with various chemical constituents; this may be the reason for its various activities against several ailments. Further research is necessary in order to subject the plant to in-depth separation/isolation of the constituents to investigate the role of each isolate against

particular disease.

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