



Chemical profile of *Landolphia owariensis* seed from Ikeduru, Imo State, Nigeria

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ABSTRACT

The nutrient, antinutrient and mineral element compositions of the seed extract of *Landolphia owariensis* were investigated. Proximate analysis of the extract showed that it contained crude protein ($11.85 \pm 0.35\%$ DW), fat ($17.40 \pm 0.20\%$ DW), carbohydrate ($52.40 \pm 0.40\%$ DW) and fibre ($3.5 \pm 0.30\%$ DW). The toxicant composition of the seed extract revealed that phytate, oxalate and cyanogenic glycoside contents were 48.15 ± 0.05 , 56.01 ± 0.02 and 33.20 ± 0.01 mg/100 g DW respectively while the phytochemical composition revealed that tannins, saponins, alkaloids and flavonoids were 100.50 ± 0.30 , 28.40 ± 0.20 , 1.90 ± 0.08 and 1.50 ± 0.25 mg/100 g DW respectively. Mineral element concentrations also revealed that the seed is a rich source of macro and micro elements containing calcium 110.20 ± 0.10 , potassium 205.04 ± 0.150 , sodium 48.02 ± 0.20 , iron 9.50 ± 0.40 , phosphorus 20.08 ± 0.05 and magnesium 2.91 ± 0.05 mg/100g dry weight respectively.

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Keywords: *Landolphia owariensis* seed, proximate analysis, mineral elements, toxicant composition.

INTRODUCTION

Nigeria has a wide variety of plants which are both of nutritional and economic important (Ebana et al., 1995). In literature, there is considerable information on the nutrient compositions of most well known and easily cultivated foods in Nigeria. There are little or no information regarding the nutrient compositions of the lesser known fruits and seeds. However, analysis carried out on some of these lesser known fruits and seeds show that they are nutritionally useful and should be exploited further as source of food for man and animals (Temple, 1998).

Landolphia owariensis is a common African plant that has been found very useful due to its therapeutic potentials (Gill, 1992;

Owoyele et al., 2002; Nwaogu et al., 2007). It is a high climbing plant in the rain forest (Akubugwo and Ugbogu, 2007). The plant has brownish purples with simple terminal cymes of small white flowers which turn yellowish with age.

It belongs to the family Apocynaceae commonly called white rubber vine and known locally by various names in Nigeria: Igbo – *Eso*, Yoruba – *mba* and Hausa – *Ciwa*. *L. owariensis* is one of the plants whose leaves, bark and roots are used for the treatment of many ailments.

The seed which is often discarded after sucking the pulp has nutritional values. The glabrous fruit which is 2–5 cm in diameter is reddish yellow and spherical when ripe. The

fruit is very popular among the peasant population in the South eastern part of Nigeria where the ripe fruit can easily be obtained in the month of April (Udoessian and Ifan, 1998). The pleasantly flavoured ripe fruit is sometimes usually eaten by swallowing the juicy fleshy pulp containing the seed which are defecated intact (Temple, 1998). The aim of this study was to evaluate the nutritional values and biological active compounds of *Landolphia owariensis* seed since they are discarded after sucking the pulp.

MATERIALS AND METHODS

Plant sample collection and preparation

Fresh ripe samples of *L. owariensis* fruits were collected from their natural habitat in Ikeduru, Imo State, Nigeria, in the month of April, 2007. The plant was identified by Prof. S. E. Okeke, a Plant taxonomist, of the Department of Plant Science and Biotechnology, Imo State University, Owerri, Nigeria. Apparently healthy seeds were collected, sorted and the pulp removed. The seeds were dehulled manually, washed and oven-dried to constant weight at 105 °C and ground using a mechanical blender.

Extract preparation

Ten grams (10 g) of the powder was soaked in 100ml of pre-boiled distilled water. This was covered, shaken vigorously every 30 minutes for 2 hours and then allowed to stand for 12 hours. The solution was subsequently shaken and filtered using Whatman No.1 filter paper. Extract was concentrated by freeze – drying and used for the various analyses.

Proximate analysis

Crude fat was extracted by the soxhlet method with petroleum ether at 40-60 °C for 8hrs, crude protein content was determined by the microkjeldahl method. These as well as carbohydrate, crude fibre, ash and moisture contents were estimated as described by the Association of Official Analytical Chemists (AOAC, 2000).

Determination of phytochemical and toxicant composition

Quantitative determination of tannins, saponins, alkaloids flavonoids and cyanogenic glycosides were carried out using the methods of Harborne (1973) and Trease and Evans (1989). Oxalates were determined according to the methods of Oke (1969). Phytate was determined by the method of Marfor et al. (1990).

Mineral composition

The mineral sodium, potassium, calcium, phosphorus, iron and magnesium were determined by atomic absorption/emission spectrophotometer as described by the Association of Official Analytical Chemists (2000).

Statistical analysis

Data obtained were expressed as mean \pm standard deviation and analyzed using student's 't' test. Values for $P \leq 0.05$ were considered to be significant.

RESULTS

The results of the proximate, toxicant, phytochemical as well as mineral elements analyses of *L. owariensis* seed extract are presented in Tables 1 – 4 respectively. The seed extract showed to be a rich source of carbohydrate, protein and fat (Table 1).

Table 2 revealed that the seed contain few toxicants namely phytate, oxalate and cyanogenic glycosides. However, the levels of these toxicants are below that considered lethal to man. Oxalate is higher followed by phytate and cyanogenic glycosides.

Table 3 shows the phytochemical constituents of the seed. It contained high concentrations of tannins and saponins while alkaloids and flavonoids are very low.

The mineral components of the seed indicated that it had high concentrations of potassium followed by sodium. Phosphorus, iron and magnesium are in very low concentration respectively.

Table 1: Proximate compositions of seed extract of *Landolphia owariensis* (% DW).

Nutrients	Seed extract composition
Crude protein	11.85±0.35
Fat	17.40±0.20
Carbohydrate	52.40±0.56
Moisture	11.97±0.10
Ash	5.12±0.40
Fibre	3.50±0.30

Values are mean of three determinations ±S.D ; DW=Dry weight.

Table 2: Toxicant compositions of the seed extract of *Landolphia owariensis* (mg/100 g DW).

Toxicants	Composition in seed extract
Phytate	48.15±0.05
Oxalate	56.01±0.02
Cyanogenic glycosides	33.20±0.01

Values are mean of three determinations ±S.D ; DW=Dry weight.

Table 3: Phytochemical composition of the seed extract of *Landolphia owariensis* (mg/100 g DW).

Phytochemical constituents	Component values
Tannins	100.50±0.30
Saponins	28.40±0.20
Alkaloids	1.90±0.08
Flavonids	1.50±0.25

Values are mean of three determinations ±S.D DW=Dry Weight.

Table 4: Mineral elements composition of the seed extract of *Landolphia owariensis* (mg/100 g DW).

Mineral elements	Component values
Potassium	205.04±0.50
Calcium	110.20±0.10
Sodium	48.02±0.40
Iron	9.50±0.40
Phosphorus	20.08±0.05
Magnesium	2.91±0.05

Values are mean of three determinations ±S.D

DISCUSSION

The crude protein content of the seed is relatively high (11.85±0.35 DW) (Table 1) when compared to that reported by Osabor et al. (2008) for *Nypa fruticans* seed. The result is in conformity with the report of Umoh (1998) that leguminous seeds are usually higher in nitrogenous components than any

other parts of the fruit, although this seed is not a leguminous one.

The values obtained for fat were high (Table 1). The knowledge of the fat content of any food item helps to ascertain the shelf life of the food. The fat is in form of essential oils with agreeable colour and odour which have

potentials for development for use as domestic oil (Achinewhu, 1998).

Landolphia owariensis seed can be ranked as carbohydrate rich seed due to its high carbohydrate content ($52.40 \pm 0.50\%$ DW). The high carbohydrate content of the seed show that it can serve as a good source of energy. The seeds could also serve as a raw material for the production of industrial products such as juices (Uzoचना, 2007).

The moisture content of the seed is high ($11.97 \pm 0.10\%$ DW) when compared to that reported by Achinewhu (1998) for fluted pumpkin and unfermented melon seeds respectively, moisture content of food is usually used as a measure of stability and the susceptibility to microbial contamination (Onyike et al., 1995). The values for the ash contents were high ($5.12 \pm 0.50\%$ DW) compared to that reported by Uzoचना (2007) for *Cajanus cajan* seed. The high content of ash indicates that the seed contains useful minerals.

The crude fibre content of the seed is higher than that reported by Achinewhu (1998) and Ijeh et al. (2004) for *Mucuna sloanei*. Crude fibre cannot be digested by man; rather, it plays an important role in providing roughage that aid digestion and reduces the accumulation of carcinogen in the body.

The toxicant composition of the seed extract is presented in Table 2. The phytate levels in the seeds ($48.15 \pm 0.05\%$ DW) were higher than that reported for melon seed by Osagie (1998) and *Nypa fruticans* seed by Osabor et al. (2008). Phytate is a toxicant whose toxicological effects could be balanced with the benefits. The knowledge of phytate levels in food is necessary because high concentration can cause adverse effects on digestibility (Nwokolo and Bragg, 1977). It also forms stable complexes with Cu^{2+} , Zn^{2+} , Co^{2+} , Mn^{2+} , Fe^{2+} , Cd^{2+} , and Ca^{2+} rendering them unavailable for absorption in the body. MacCance and Widdowson, (1955) have shown that phytate has many health benefits which include being antioxidants, anticancer, hypocholesterolemic and hypolipidemic effect

but the mechanisms of action have not been fully established.

The levels of oxalate in the seeds were relatively high ($56.01 \pm 0.02\%$ DW) when compared to that reported for *Cajanus cajan* by Osagie (1998). Oxalate interferes with mineral. It binds with calcium and forms insoluble calcium oxalate which cannot be absorbed in the body (Giami et al., 1999). The level found in the seeds is unlikely to pose toxicity problems to man since it is much below the toxic level 2– 5g of oxalate (Munro and Bassir, 1960; Oke, 1966). Consumption of high concentration of oxalic acid can cause corrosive gastroenteritis, shock, convulsive symptoms, low plasma and renal damage (Osagie, 1998).

Cyanogenic glycosides content in the seed (Table 2) is much higher compared to that reported by Osabor et al. (2008) for *Nypa fruticans* seed (0.08 ± 0.01 mg DW). Cyanogenic glycosides are precursor of hydrogen cyanide a well know toxicant in foods. The level in the seed was slightly lower than the (36 mg/100g DW) considered lethal to man (Munro and Bassir, 1969). Quantitative phytochemical analysis of the seed (Table 3) revealed that *L. owariensis* is a rich source of important phytochemicals such as tannins, saponins and alkaloids. These phytochemicals are known to have antimicrobial activity. The presence of these secondary plant products accounts for its potentials as a medicinal plant (Sofowara, 1980; Njoku and Akumefule, 2007).

The mineral composition (Table 4), clearly indicate that *L. owariensis* is a rich source of mineral elements. The elemental composition revealed increased potassium, calcium, sodium but iron, phosphorus and magnesium were low. Their values are comparable to values reported by Temple (1998) for lesser known plant foods.

Conclusion and recommendations

Landolphia owariensis seeds contain high amount of carbohydrate. However, other proximate components such as crude protein, ash, fibre and moisture were relatively low.

The toxicant levels were found at concentrations that were not lethal. The seeds proved a rich source of important mineral elements. The seed, though underutilized, should be encouraged to be incorporated in our food since it contains important phytochemicals and nutrients the body needs.

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