Obeche Journal 29(2): 366-369, 2011; ISSN 0078-2912

Nutritional Potential of Hard seed of *Raphia hookeri*

*Adeniyi, A.A. and Akpabio, U.D.

Department of Chemistry, University of Uyo, Uyo, Akwa-Ibom State, Nigeria.

Corresponding: [redacted]; +234-813-6909221

Abstract: *Raphia hookeri* is one of the forest trees that naturally grow in the swampy coastal region of Nigeria. Every part of this tree has significant uses but the usefulness of the seed is not well known. The proximate analysis of its seed was carried out to ascertain the nutritive and anti-nutrient constituents and its possible application. The results of the analysis showed that the seed is very rich in carbohydrate. Although the crude protein content is low, yet it is relatively higher than the amount found in some common staple food stuff. The results of the mineral analysis revealed that the seed is rich in potassium but low in sodium which are needed for regulation of body activity and provision of extra building material. However, the high concentration of hydrocyanic acid, above the lethal dose is a major problem that needed to be addressed if the seeds should be included as feeds for animals. The concentration of the fat in the seed is very low and therefore cannot be a good source of oil. For the seed to be edible various methods of reducing the concentration of hydrocyanic acid must be employed.

Keywords: proximate analysis, anti-nutrient, mineral, percentage composition

INTRODUCTION

There are many species of Raphia palms and their origin can be traced to tropical West Africa. Even *Raphia taedigera* which now exist in the swampy area of central America and in South America reached there during the slave trade era (Martin,1999; Ndon, 2003). Soils supporting Raphia palms are developed mainly from aranaceous sedimentary rocks, sandstones and coastal palm sands and they strive predominantly in a swampy area which are mostly hydromorphic (Imogie *et al* , 2007).

Raphia palm is a monocarpic crop with a terminal inflorescence that flowers once and dies after the fruit matured; this is known as "hapaxanthic flowering". At vegetative stage the crop is characterized with continuous stem elongation. When it gets to flowering stage, the spear leaves become shortened and fan-like. Its inflorescences emerge from the base of the fan-like leaves and they bear the male and female flowers that will develop to form the fruits and the seeds. These inflorescences also become the sink for the photosynthate. Raphia palm has been shown to be of tremendous benefit to mankind. The liquid which is made up of the sap and the photosynthates are what is tapped as popular drink called "palm wine"; its trunks are used in production of paper; its leaves are used as thatches, piassava, for building and furniture making; while its fruits are used as oil and other economic value (Imogie *et al* , 2007; Ndon, 2003; Obahiagbon and Osagie, 2007). Yet, most of the existing ones are naturally grown up ones and there has been little or no conscious effort to plant it in large plantations. Also the reasons for the neglect of this palm in many rural areas in Nigeria were traced to lack of adequate knowledge about the usefulness, botany, physiology, products, and methods of cultivation of Raphia.

The specie of the Raphia palm seeds (figure 1) used in this research is that of *R. honkeri*. Just like every other Raphia palm seed, it is characterized by a large ellisoid seed within the oily mesocarp of the fresh fruit (figure 1). The mature seed is variously ridged and furrowed on the outer coat, and has endosperm with deep and narrow rumination (Ndon, 2003). The seed is not yet known as source of food for man nor for animals, this may be due to its hardness or the presence of toxic chemicals though it is reported to be edible (Martin, 1999) and of useful diagnostic value (Ndon, 2003). This research is focused on the inner hard seed that at present has no nutritive application besides the knowledge that it is being used as ornamental decoration. The proximate analysis of the seed was done to evaluate the nutritional potential as well as the non-nutritive component with the aim of determining its suitability for consumption or for livestock feeds. Although some earlier work has been done on the chemical composition of the seed by Ndon, 1985 and Atchley, 1984, there were variations in their reported values and the analysis were not detailed enough. Our aim is therefore to determine the chemical composition of the seed in a more detailed way as well as to examine if there can be influence of geographical location of the seed on its chemical composition.

MATERIALS AND METHODS

The sample seeds of *R. hookeri* were randomly picked out of the exposed seeds (i.e those that the scale and the mesocarp have rotten) under the palm. The samples were collected within locality of Akowonjo and Supare Local Government Area of Ondo State. They were washed in water at room temperature, sun dried for some days, cut into small pieces of about 1.00cm diameter. The cut pieces were then oven dried, milled and stored in water proof containers for other subsequent analysis. The recommended methods of the Association of Official Analytical Chemist (1995) were used for the proximate analysis of the seeds (except otherwise stated).

To determine the moisture content a known weight of the fresh sample was placed into porcelain dish. The sample was placed in an oven heated at 105±5°C to dryness. It was cooled in a desiccator and reweighed. The percentage of Ash was determine by weighing 1.0g of the milled sample into a crucible which had been previously ignited in a muffle furnace at 600°c for 3hrs cooled and weighed. This was then transferred into a muffle furnace and ashed for 3hrs at 600°C. The percentage of fat was determined by exhaustively extracting a known weight of sample in petroleum ether (b.p. 40-60 °C) extraction using a Soxhlet Condenser. The percentage of the crude protein (N x 6.25) was obtained by first digesting the milled sample. The ammonia content was collected and titrated with 0.1 N HCl.

The crude fibre content was obtained by making use of fat-free sample and after proper treatment; the organic matter was burnt off, cooled and weighed. Crude fibre was determined after digesting a known weight of fat-free sample in refluxing 1.25% sulphuric acid and 1.25% sodium hydroxide. The carbohydrate content is the Nitrogen Free Extract (NFE) and was estimated as the difference obtained after subtracting the protein, ash, fat, fibre and moisture contents from 100%. The minerals content was determined from the ash content of the sample. The ash was dissolved in 10ml HCL, and then transferred quantitatively to 50ml volumetric flask for the further determination of the minerals. Concentration of sodium and potassium were determined using flame photometer. Their absorbers were used to determine their concentration from the standard curve of absorber against concentration. Part per Million (PPM) of phosphorus was obtained with the help of colorimeter [spectra-20] and the reading taking at wave-length of 440nm. Calcium, Potassium and Magnesium were determined with the help of Atomic Absorption Spectrometer (AAS). The anti-nutrients Oxalate and Hydrocyanic acid were determined by titration method.

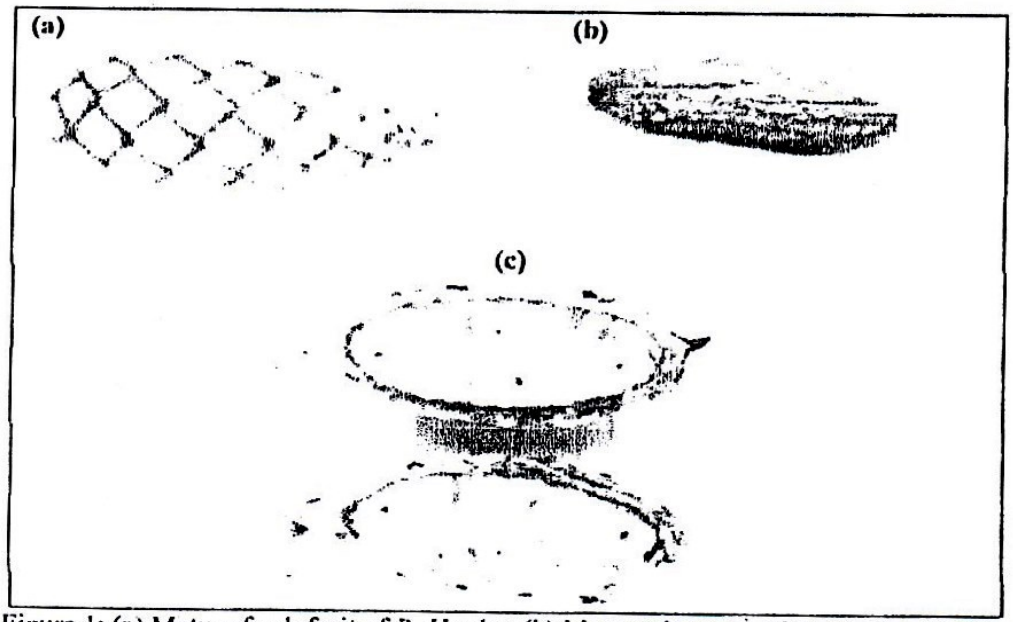

Figure 1: (a) Mature fresh fruit of *R. Honker* (b) Mature dry seed of *R. Honker* (c) Dissect mature fresh fruit of *R. honkeri*

RESULTS AND DISCUSSION

The result of the analysis that shows the values of the considered components of *R. hookeri* seed is shown in three different Tables for easy discussion. Table 1 shows the proximate composition of *R. hookeri* seed measured in percentage composition (%) which includes moisture content, ash, crude fibre, crude protein, carbohydrate, crude fat components. The mineral Sodium, Potassium, Phosphorus, Calcium, Magnesium and Iron of *Raphia hookeri* seed in part per million (ppm) is shown in Table 2 while Table 3 gives the value of the two Anti-nutrient composition, Oxalate and Hydrocyanic Acid [HCN] of *Raphia hookeri* seed in mg per 100g.

The low value of moisture content in Table 1 shows that the mature seed is high in dry matter compared to premature seed (Ndon, 2003). This is an indication that the seed can be stored for long period of time before it can go bad. The seeds contain low value of fat and protein. The fat value is just a bit above the range of values of seed fat of 2% (Ndon, 1985) and 1.1% (Atchley, 1984) reported previously. This is an indication that the fat is generally low compared to the fruit's mesocarp lipid content of 30-40% (Ndon, 1985) and therefore the seed may not be a good source of oil. The major nutritive constituent of the seed is carbohydrate. This carbohydrate value stands within the range values of 79.9% (Atchley, 1984) and 5-10% (Ndon, 2003) for the sugar content of mature seed of *R. hookeri*. The differences in the values reported by the researchers suggest that the percentage composition of the seed is not fix but varies from one geographical location to another. This means that soil composition plays vital role in the

nutritive contents of the palm. However, the fibre value is relatively high and is in agreement with the fibre value of 9.1% previously reported (Atchley, 1984) and it can be a good source of fibre. The percentages of the nutritive composition is an indication that in the absent of poisonous chemicals in the seed, it will be a good substitute as animal feeds to the common food stuffs that are highly demanded by human.

The ash content of the seeds is lower in value compared with the reported value of 10.7% ash content for mature *R. hookeri* seed (Atchley, 1984). The is understandable since the percentage of the ash determines the concentration of minerals and inorganic matters, the variation in results should be the effect of difference in environmental factor like soil minerals where the plant is grown and the location. The highest mineral constituent of this seed is Potassium and can therefore serves as good source of this indispensable mineral. The next to the highest mineral constituents of this seed is phosphorus which is an essential mineral of huge demand by living matters. The concentration of magnesium and calcium are moderate while the concentration of sodium and iron of the seed are very low. The concentration of Ca and Mg is still higher that the concentration that is present in some common food stuff. The low concentration of sodium is common to all the natural plant foods and fruits, except for some species of vegetable like Celery and Spinach (Alias and Linden, 1999). Even though the concentration of Iron is low, yet the seed can still be a good source of iron since the maximum amount of iron absorption expected for example from an average diet in the United States is about 1 to 2mg in normal adult and 3 to 6mg in iron-deficient patients (Shils *et al.*, 1994).

The result of the anti-nutrients hydrocyanic acid (HCN) reveals high concentration in the seed. The concentration may be dangerously poisonous since it is reported that 5mg/100g is considered innocuous, 5-10mg HCN/100g is moderately poisonous, and more than 10mg HCN/100g is dangerously poisonous. Therefore, if the seeds are to be edible, as purported by Martins (1999) and Marc (2008), then HCN concentration must be reduced through food processing methods. Soaking or cooking can reduce the concentration of HCN in food (Almazan, 1986). The concentration of oxalate does not pose any treat because is far below the lethal dose. Therefore in terms of Oxalate concentration, the seed may not be poisonous because with its relatively low concentration major part up to 50% to 70% will be present in a water-soluble form which will leach out during cooking in water and can be removed by discarding the water (Libert and Franceschi 1987). Also oxalate chelates with certain bivalent metal ions, especially calcium (Ca^{2+}) thus making its bioavailability impossible to the body.

Conclusion

This study shows that *Raphia hookeri* seeds contain high nutritive value of carbohydrate, fibre and protein. Also, it contains moderate concentration of useful minerals which are needed for regulation of body activity and provision of extra building material. However, the high concentration of hydrocyanic acid, above the lethal dose is a major problem that needed to be addressed if the seeds should be included as feeds for animals. For the seed to be edible various methods of reducing the concentration of HCN must be employed. The concentration of the fat in the seed is very low and therefore cannot be a good source of oil.

REFERENCES

A. O. A. C. (1995). Official Method of Analysis. 12th ed. Washington D.C.

Alais, C; and Linden, G. (1999). Food Biochemistry, St. Edimundsbury Press Ltd, Great Britain, pp 90-93.

Almazan (St), A. M. (1986). Cyanide Concentration in Fried Cassava Chips and Its Effect on Chip Taste. Nigeria Food Journal, 4 (1) 68.

Imogie, A. E., Ugbah, M. M., Udosen, C. V. (2007). Response of Raphia Palm [Raphia hookeri (Mann and Wendland)] Seedling to Various Rates of Organic and Inorganic Fertilizer. Journal of Agronomy 6(4): 597-600.

Atchley, A. A. (1984). Nutritional Value of Palms. Principles, 28 (3): 138-143.

Libert, B; Franceschi, V. R. (1987). Oxalate in Crop Plants. J. Agric. Food Chem., 35:926-938.

Marc Nwosu Ogbuagu (2008). Vitamins, phytochemicals and toxic elements in the pulp and seed of raphia palm fruit (*Raphia hookeri*). *CIRAD, EDP Sciences*

Martin, W. F. (1999). Multipurpose Palms You Can Grow. In Elevitch, C. (1999). Ed. www.agroforester.net/pubs.

Ndon, B. A. (1985). Some Morphological and Chemical Characteristics of Developing Fruits of Raphia hookerv. J. Exp. Bot. 36 (192): 1817-1830.

Ndon, B.A. (2003). The Raphia Palm. Concept Publication Limited, Nigeria, 1-6, 16-22,32-39.

Obahiagbon, F. I. and Osagie, A. U. (2007). Sugar and macrominerals composition of sap produced by Raphia hookeri palms. African Journal of Biotechnology 6 (6): 744-750

Shils, M. E., Olson, J. A. & Shike, M. (1994). Modern Nutrition in Health and Disease. 8th ed. Williams & Wilkins, USA, Pp. 127-210.

Table 1: Proximate composition of *Raphia hookeri* seed

Parameters	Values
Moisture content	39.3 ± 7.50%
Ash	3.63 ± 0.55%
Crude fibre	12.24 ±2.14%
Crude protein	4.38 ± 0.44%
Carbohydrate	36.7±7.84
Crude fat	3.75 ± 0.25%

Table 2: Mineral composition of *Raphia hookeri* seed

Parameters	Values
Sodium	150.15ppm
Potassium	2,252.25ppm
Phosphorus	1357.14ppm
Calcium	708.85ppm
Magnesium	957.00ppm
Iron	195.3ppm

Table 3: Anti-nutrient composition of *Raphia hookeri* seed

Parameters	Values
Oxalate	159.50mg/100g
Hydrocyanic Acid [HCN]	9.44mg/100g