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NUTRIENT AND ANTI-NUTRIENT COMPOSITIONS OF NEW VARIETY OF THE AFRICAN BREAD FRUIT (ARTOCARPUS ATILIS) SEED

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Extended Abstract

BACKGROUND: Non conventional plant foods are possible good sources of nutrient. The current study was conducted to evaluate the proximate, mineral and anti-nutrient contents of new variety of the African Bread fruit in Edo North, Nigeria. The new variety of the breadfruit (*Artocarpus altilis*) was identified by the International institute for tropical Agriculture, Ibadan, Nigeria.

MATERIAL AND METHODS: Samples of the new variety of the African breadfruit (*Artocarpus altilis*) were collected from Igarra, Akoko-Edo Local Government area of Edo state, Nigeria. Carbohydrate, crude protein, ash, crude lipid contents were determined using standard methods. Determination of phytate, oxalate, tannin and saponin were also conducted. Among the minerals investigated were phosphorus, calcium, magnesium, potassium and sodium. The various analyses were expressed as mean ± standard deviation.

RESULTS: Tannin content had the highest (6.36mg/100g) concentration while Phytate recorded the lowest (1.65mg/100g). However saponin and oxalate had 3.04mg/100g and 3.05mg/100g respectively. Carbohydrate and crude protein recorded high value of 75.92% and 14.98% respectively. Crude fibre contained 1.42%, crude lipid 4.60% and ash 3.02%. The mineral content amounted to phosphorus (0.312mg/100g), calcium (0.164mg/100g), magnesium (0.0485mg/100g), potassium (0.482mg/100g) while sodium (0.0476mg/100g) had the lowest value in the composition.

CONCLUSION: The study showed that the new variety of the African breadfruit (*Artocarpus altilis*) is a foodstuff with appreciable levels of protein, carbohydrate and minerals as well as safe levels of antinutritional factors

Keywords: African bread fruit (*Artocarpus altilis)*, proximate composition, mineral composition, anti-nutritional factors.

INTRODUCTION

The Breadfruit *(Artocarpus altilis)*, a native to Polynesia, is a common forest tree that can be cultivated. The plant belongs to the Moraceae, a family of about 50 genera and over 1000 species (Eusoso and Bamiro, 1995), and was introduced in Venezuela as a food for slaves. In Nigeria, *Treculia africana* species of the Breadfruit is common in the eastern part (Ifeanachho and Uzoukwu, 2008). *Artocarpus altilis* is a species of breadfruit in Edo north of Nigeria whose parts have various nutritional and medicinal uses. Reports have it that the roots, leaf, bark of some varieties of bread fruit are used as component in the treatment of some disease (Aghoha, 1971). The seeds are usually roasted and eaten as such or dulled before consumption. This is usually a delicacy among the people of Igarra especially when eaten with palm kernel nut or coconut.

Some varieties in Nigeria (*Treculia africana*) have been studied and are appreciated for their nutritional properties (Ifeanachho and Uzoukwu, 2008; Olugbenga *et al*. 2008). When cooked, the taste is described as potato-like, or similar to fresh-baked bread (Morton and Julia, 1987). Many people in other parts of the world have heard of *Artocarpus altilis,* few have eaten it among. Most varieties of the seeds are purgative if eaten raw. Adequate information on the chemical composition of a material is a pre- requisite for its effective utilization in animal nutrition. Determination of nutrient composition of foods had in no small measure helped in identifying the quality and usefulness of such foods in nutritional management and clinical care (Olugbenga *et al*. 2008). Given its remarkable nutrition potential, there is need for detailed nutrient evaluation. In Nigeria, no data is available for *Artocarpus altilis* unlike *Treculia africana* that is consumed by the eastern Nigerians. The aim of this study therefore seeks to evaluate the nutritional and anti-nutritional composition of the seed of *Artocarpus altilis* grown in Igarra, Nigeria.

MATERIALS AND METHOD

Source of material

Fresh Bread fruit (*Artocarpus altilis*, identified by the International institute for tropical Agriculture, Ibadan, Nigeria, IITAA) were collected purchased, September, 2018 from Igarra in Akoko-Edo Local Government Area in Edo State, Nigeria

Sample preparation

The seeds were separated from the pulp by handpicking. The seeds were washed clean with distilled water and oven dried at 55^0C. The clean seeds were then kept in a covered plastic container at ambient temp until required.

Chemical analysis

Moisture, crude protein, crude fat, crude fibre, and ash contents were determined in triplicate by the methods of AOAC (2005). Carbohydrate was determined by the difference. Nitrogen was determined by wet digestion analysis of the micro Kjelhdal method, and nitrogen multiplied by 6.25 to estimate crude protein content (pearson, 1976).crude fat was estimated by exhaustive extraction of sample (5 g) with petroleum ether (40-60^0C) using Tecator soxhlet apparatus. The anti-nutrient, Oxalate content was determined by Day and Underwood (1986). Saponin was determined according to Obadoni and Ochuko (2001). Phytate content was acoording to the methods of Nkama and Gbenyi (2001), while tannin content was determined by Van-Burden and Robinson (1981). The minerals, calcium and magnesium were determined using atomic absorption spectrophotometer (AAS). Potassium and Sodium were analyzed using flame photometry method while phosphorus was determined calorimetrically with spectrophotometer using phospho-vanadomolybdate method (AOAC, 2005)

Statistical analysis

Means and standard deviations were calculated for all samples using the procedure of Obi (1986).

RESULTS AND DISCUSSION

The results of proximate, antinutrients, mineral compositions are presented in Tables 1-2.

Table 1 shows the nutrient composition of *Artocarpus altilis* seedling. The crude protein 14.98%, crude fat 4.60%, crude fibre 1.42%, ash content of 3.02% and carbohydrate content of 75.92% with an energy value of 405.00kcal/100g. The meal of *Artocarpus altilis* seeds can be described as a high carbohydrate diet compared to the values investigated for *Treculia africana* seed (13.66%) as reported by Olugbenga et al. 2008 and pulp(12.69%) (Ifeanacho and Uzoukwu, 2008). This This study also reveals high protein (14.98%) which exceeds the minimum protein requirement () .This value is higher than previously reported data for African Breadfruits seed (Ejiofor, 1988; Olugbenga et al. 2008) and pulp (Ifeanacho and Uzoukwu, 2008) and comparable with values reported (Aletor and Omodara, 1994). The fibre and fats content were found to have lower values than previously reported data for *Treculia africana* seed (2.82% and 2.50% respectively) (Olugbenga et al. 2008). It had been suggested that the fibre naturally occurring in foods might reduce the rate of small intestinal digestion by impeding the penetration of food by digestive enzymes. This phenomenon is thought to manifest in low GI of foods (Osilesi et al. 1991). The mineral contents (Table 1) were found to contain Phosphorus 0.312mg100g, calcium 0.164mg/100g, Potassium 0.482mg/100g, magnesium 0.485 mg/100g and Sodium 0.0476 mg/100g. This values are comparable with data for phosphorus and lower than that of calcium and sodium (Ifeanakwo, 2008). Phosphorus is stored in plant seeds as phytate during seed development (Lott *et al*., 1995; Mubarak, 2005). African breadfruit constitutes very impotant sources of minerals which may be utilized in the diet of the low income groups in Nigerian. The relatively low levels of potassium (0.482%) for Artocarpus altilis seed suggest that it could be suitable for patients with cardiovascular and renal disorders whose dietary management in many cases hinges on sodium and potassium restriction. The potassium value is significantly lower than the values for African breadfruit (Ifeanacho and Uzoukwu, 2008).

Table 2 shows the result of antinutritional factors present in a seeds. The values were found to contain Oxalate (3.05mg/g), phytate (1.65mg/g), Saponin (3.04mg/g) and Tannin (6.36mg/g). Tannin had the highest concentration while Phytate had the lowest. The phytate content in this study is the comparable with the range of previously reported literature data (0.660 − 3.302 mg/g) for cereal and legume seeds (Marshall *et al*. 2011). Phytate accounts for approximately 50-80% of the phosphorus in seed-feed stuffs (Ravindran *et al*., 2000; Fredrikson *et al*., 2001). The seed contains significant values in antinutritional factors and toxicant; and this suggest the reasons why the seeds are subjected processes such as boiling and roasting before consumption which has been the usual practice with the people who comsumed them. The digestility of foods may be reduced by the presence of antinutritional factors which are present in plant seeds (Kumar *et al*., 2010). This antinutritive factors lead to the formation of indigestible complexes with some nutritionally important minerals (Konietzny and Greiner, 2003; Khattak *et al*., 2007) thereby impairing the bioavailability, absorption and utilization of minerals. Result of proximate and antinutrient supply clues in research which is paramount to human an animal nutrition.

Table 1: Proximate and Mineral composition of the African bread fruit (*Artocarpus altilis)* seed

Parameter	Composition
Crude protein (%)	14.98± 0.010
Crude fibre (%)	1.42±0.013
Lipids (%)	4.60±0.067
Ash (%)	3.02±0.013
Carbohydrate (%)	75.92±0.010
Energy (kcal/100g)	405.00±0.67
P (mg/100g)	0.312 ± 0.000067
K (mg/100g)	0.482± 0.000067
Ca (mg/100g)	0.164± 0.0010
Mg (mg/100g)	0.0485± 0.00010
Na (mg/100g)	0.0476± 0.000067

Values are Means ± Standard deviations of triplicate determinations

Table 2: Some anti-nutritional factors of the African bread fruit (*Artocarpus altilis)* seed

Parameter	Composition(mg/100g)
Phytate	1.65±0.0067
Tannin	6.36± 0.010
Saponin	3.04±0.0067
Oxalate	3.05±0.013

Values are Means ± Standard deviations of triplicate determinations

CONCLUSION

The seed of the African bread fruit (*Artocarpus altilis*) contain substantial amount of nutrient, enhancing human nutrition. The high non-protein nitrogen which is shown to be present in the analyzed seeds could contribute to the building of non essential amino acids, therefore a large proportion of the individual protein requirement could be met by the bread fruit subject to adequately high rate of intake. *Artocarpus altilis* seeds like the common bread fruit (*Treculia africana)* variety are known to contain vitamins and phytochemical, it is therefore recommended that investigation into levels of the phytochemical and vitamins be carried out so as to further ascertain its health potential and safety. Investigation should also include processing such as germination or sprouting of the seeds for possible nutrient improvement

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