African Journal of Biotechnology Vol. 11(50), pp. 11096-11098, 21 June, 2012
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB11.4054
ISSN 1684–5315 © 2012 Academic Journals

Short Communication

Proximate, phytochemical and mineral compositions of seeds of *Allanblackia floribunda*, *Garcinia kola* and *Poga oleosa* from Nigerian rainforest

Dike, M. C.* and Asuquo, M. E.

Department of Forestry and Environmental Management, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

Accepted 27 February, 2012

Evaluation of the proximate, phytochemical and mineral compositions of seeds of three tree species was carried out at the University of Agriculture, Umudike. Mature fruits of *Allanblackia floribunda*, *Garcinia kola* and *Poga oleosa* were collected from the rainforest at Umudike and Oban National Park. The seeds were extracted from the fruits and washed with distilled water. Plant seeds were put in a labeled and numbered envelope. The envelopes were put into an oven set at 60°C for 6 h. Seeds of each plant species were milled and separately put in air-tight numbered sterile bottles. The bottles were stored in a refrigerator set at 4.0°C. Samples for proximate, phytochemical and mineral compositions were collected for the bottles. The moisture content ranged between 9.98 and 12.10% while the dry matter ranged between 87.80 and 90.44%. Of interest was the high percent oil content (>60.0%) of both *A. floribunda* and *P. oleosa*. Each seed had between 25.36 and 75.38% carbohydrate. The high concentration of carbohydrate in *G. kola* seeds justified the acceptability of the seeds as edible seeds by many people. However, the seeds contained some quantity of lead, cadmium and chromium. This research work recommends that little quantities of these seeds should be taken periodically to minimize the adverse effects arising from consuming large quantities of the seeds.

Key words: Proximate, oil, *Poga oleosa*, *Allanblackia floribunda*, phytochemical.

INTRODUCTION

The tropical rainforest of Nigeria consists of a complex mixture of woody plant species of which over 100 woody plant species were enumerated per hectare (Dike, 1992). Some leaves, fruits and seeds of these plant species are edible both by man and animals (Dike, 2010). Several parts of some plants such as stem, bark, leaves and roots are used in folk medicine (Burkill, 1985; Odoemelam and Onwubuazu, 2009). Seeds of *Garcinia kola* are offered to visitors as a sign of hospitality. Seeds of *G. kola* are used in reducing pains caused by toothache and stomachache. Fruits of *Allanblackia floribunda* are edible by some large vertebrate wild animals such as *Loxodonta africana cyclotis*. The seeds are used as bait for small gains. The seeds of both *A. floribunda* and *Poga oleosa* are locally used in producing valuable oil (Hutchinson et al., 1954). *A. floribunda* seeds are used for treating hypertension (Bilanda et al., 2010). Occasionally, the oil from *P. oleosa* is mixed with the oil from *Elaeis guineensis* and consumed. There is paucity of literature on the exact chemical compositions of these seeds. There is the need to understand the chemical compositions of these seeds. Presumably, there could be toxic element in the seeds that have cumulative adverse effects on the consumers. The aim of this study was to estimate the proximate, phytochemical and mineral compositions of seeds of *A. floribunda*, *G. kola* and *P. oleosa* and to determine some of the active ingredients in the seeds.

MATERIALS AND METHODS

The study areas were the rainforest at the University of Agriculture, Umudike, and the nearby forests at Oban National Park. Umudike lies between latitudes 5°27' and 5°32' N. The climate is the tropical

*Corresponding author. E-mail: michael.dike@ymail.com. Tel: +234(0) 806 4349 125.

type. The minimum and maximum top soil temperatures were 16 and 45°C, respectively. There are two seasons; a wet and a dry season. Umudike is at an elevation of 122 m above sea level. The vegetation is the tropical rainforest (White, 1983). The rainforest has been destroyed in several areas by farmers. The abundant plant species are *Anthonotha macrophylla, Elaeis guineensis, Dactyladenia barteri, Dialium guineense*, *Pentaclethra macrophylla* and *Chromolaena odorata.* The gradient is gentle. There are no mountains or plateaux. The soil is deep and without stones in many places. The soil parent material is the Pre – Cambrain Basement.

Mature fruits of *A. floribunda*, *G. kola* and *P. oleosa* were collected from 33 tagged and numbered trees within the rainforests at Umudike and Oban National Park. The fruits were processed manually, thereby exposing 680,691602 seeds of *A. floribunda, G. kola* and *P. oleosa* respectively. The seeds of each plant species were washes with distilled water. A total of 300 seeds of each plant species were selected. For *A. floribunda*, the seed testa was removed from the remaining parts of each seed to enable the sliced parts dry properly. The sliced parts were put in a labeled envelope. The same method was used for seeds of *G. kola*.

The seeds of *P. oleosa* were broken, thereby exposing the fleshy cotyledons which were used in this study. The fleshy cotyledons were put in a labeled envelope. The envelopes were put in an oven set at a temperature of 60°C for 6 h. Sliced *A. floribunda* seeds were milled with Thomas Wiley milling machine into uniform powder and sieved with 1.00 mm rubber sieve. The same method was also used for sliced seeds of *G. kola* and the dried cotyledons of *P. oleosa.* Each sample was put in an air – tight, sterile and numbered bottles. The bottles were stored in a refrigerator set at 4.0°C. The moisture content was obtained by collecting 5.0 g sample from each of the bottles and drying for 1.0 h in a Fisher Isotemp oven (Model 175) set at 110°C. The Muffle Furnace Ignition Method at 550°C as described by Pearson (1976), James (1995) and AOAC (2000) were used to obtain the ash content. The Weende method was used to determine the crude fibre (James, 1995; AOAC, 2000). Using a Soxhlet apparatus, the fat content was determined by the continuous solvent extraction method as described by James (1995). Extractions of minerals were done by multiple nutrient extractions by wet acid digestion method. Calcium and magnesium were determined by the versenate complexometric titration method using ethylene diaminetetracetic (EDTA) as indicator. Sodium and potassium were separately determined by flame photometry (James, 1995) while phosphorus was determined by Vanado – Molybdate Yellow Method (Pearson, 1976; AOAC, 2000).

The confirmatory tests for alkaloid, tanins, flavonoid and saponin were carried out, for the alkaloid; 2.0 g of the dried and powdered sample was boiled in 50 ml of 5.0% H_2SO_4 in 50.0% ethanol for 5.0 min. The solution was cooled, filtered and 20 ml of the filtrate was alkalined with 5.0 ml of dilute ammonia solution. The alkaline solution was extracted with H_2SO_4 and tested for alkaloids using Mayer's reagent which showed creamy white colour. For the tanins, 1.0 g of the powdered sample was boiled in 50.0 ml of distilled water. It was filtered and the filtrate was used for the test using ferric chloride. A green black precipitate confirmed the presence of tanins. For the flavonoid, 2.0 g of the sample was heated with ethyl acetate in a water bath. It was cooled and filtered. 4.0 ml of the filtrate was shaken with 6.0 ml of dilute ammonia solution. The layers were separated and the colour of the ammonia layer was noted to be yellowish, thereby confirming the presence of flavonoid. For the saponin, 2.0 g of the dried and powdered sample was heated in 20.0 ml of water; 10.0 ml of the filtrate was diluted with 10.0 ml of distilled water and shaken vigorously. The resulting froth was stable, thereby confirming the presence of saponin.

RESULTS AND DISCUSSION

Table 1 shows the result of the proximate, phytochemical and mineral compositions of seeds of *A. floribunda*, *G. kola* and *P. oleosa*. There were variations within and between plant families and plant species in the proximate, phytochemical and mineral compositions of seeds of the plant species studied. Within the family *Guttiferae,* data obtained for *A. floribunda* varied from those obtained for *G. kola* (Table 1). The dry matter was over 85.0% and ranged between 87.80 and 90.44%. The moisture content ranged between 9.98 and 12.10%. The least moisture content value of 9.98% was observed in *P. oleosa* belonging to the family *Rhizophoraceae*.

The range obtained in this research work is in agreement with those reported by Dike (2010), who, working at Umudike, Nigeria, obtained a range of between 8.82 and 12.66% for 15 fruits/seeds. He however recorded that samples that were not initially dried at a temperature of 60°C had a moisture content range of between 20.26 and 68.49%. Odoemelam and Onwubuazu (2009) recorded moisture contents values of 5.14±0.52, 8.39±0.60 and 9.58±0.22 for the roots, leaves and barks of *Alstonia boonei* collected at Osusu in Isiala Ngwa North Local Government Area of Abia State, Nigeria. The range of the moisture content for the roots was lower than the range obtained in this study. The ash content was low, ranging between 1.57 and 4.55%. The highest ash content value was obtained in *G. kola*. The crude protein had the least value of 1.20% in *A. floribunda* while *P. oleosa* with 68.00% had the highest percent fat. Oil is extracted locally from seeds of *P. oleosa.* Hutchinson et al. (1954) recorded that seeds of *P. oleosa* yielded valuable oil. The crude fibre was low and ranged between 3.18 and 14.82%. The recorded percent carbohydrate (75.38%) was highest in *G. kola*. Within the seeds, carbohydrate ranged between 25.36 and 75.38%. Data revealed that most seeds having high percent carbohydrate have low percent crude protein (Table 1). The high percent carbohydrate content of *G. kola* (75.38%) justifies the wide acceptability of the seeds by visitors.

The percentage alkaloid was less than 5.0%. The highest value of 3.58% was recorded in *G. kola*. The percentage flavonoid had the highest value in *A. floribunda*. The percentage saponin, tannin and phenol were in each case less than 0.500 (Table 1). Small quantities of zinc, iron, copper, cadmium and chromium were represented in all of the three studied seeds. However, the quantities are good as adequate intake of chromium for men between the age range of 19 and 50 years in the United States of America is 35 µg/day (Stoecker, 2001).

Conclusion and recommendations

All elements tested were present in all the seeds. Fat content in both *A. floribunda* and *P. oleosa* was found to be 60.00%. In *G. kola*, the fat content ranged between 1.20 and 1.24. Of interest is the variation in the fat

Table 1. Proximate, phytochemical and mineral compositions of three tree species of the Nigerian rainforest.

Parameter	*Allanblackia floribunda*	*Garcinia kola*	*Poga oleosa*	Range
Dry matter (%)	87.96 (87.80 – 87.99)$^{+}$	89.80 (89.70 – 89.90)	90.02 (90.00 – 90.04)	87.80 – 90.04
Moisture content (%)	12.04 (12.01 – 12.10)	10.20 (10.10 – 10.30)	9.98 (9.98 – 10.02)	9.98 – 12.10
Ash (%)	1.70 (1.67 – 1.71)	4.52 (4.50 – 4.55)	1.58 (1.57 – 1.59)	1.57 – 4.55
Crude protein (%)	1.22 (1.20 – 1.24)	3.21 (3.20 – 3.23)	1.82 (1.80 – 1.85)	1.20 – 3.23
Fat (%)	60.40 (60.38 – 60.41)	2.10 (2.06 – 2.12)	68.02 (68.00 – 68.03)	2.06 – 68.03
Crude fibre (%)	4.10 (4.10 – 4.10)	14.81 (14.80 – 14.82)	3.20 (3.18 – 3.20)	3.18 – 14.82
Carbohydrate (%)	32.58 (32.58 – 32.58)	75.36 (75.32 – 75.38)	25.38 (25.36 – 25.39)	25.36 – 75.38
Alkaloid (%)	1.12 (1.10 – 1.14)	3.61 (3.58 – 3.63)	0.55 (0.54 – 0.56)	0.54 – 3.63
HCN (mg/kg)	0.32 (0.30 – 0.34)	1.81 (1.80 – 1.82)	0.28 (0.26 – 0.30)	0.26 – 1.82
Flavonoid (%)	0.875 (0.873 – 0.878)	0.416 (0.416 – 0.420)	0.84 (0.82 – 0.86)	0.416 – 0.878
Saponin (%)	0.121 (0.120 – 0.120)	0.313 (0.310 – 0.313)	0.45 (0.43 – 0.47)	0.120 – 0.47
Tanins (%)	0.106 (0.104 – 0.107)	0.092 (0.90 – 0.94)	0.037 (0.036 – 0.039)	0.036 – 0.107
Phenol (%)	0.105 (0.102 – 0.107)	0.084 (0.082 – 0.086)	0.015 (0.013 – 0.017)	0.013 – 0.105
Anthocyanins (%)	-	-	0.039 (0.036 – 0.042)	-
Ca (mg/100 g)	9.85 (9.84 – 9.86)	8.147 (8.12 – 8.17)	8.96 (8.92 – 9.00)	8.12 – 9.86
Mg (mg/100 g)	11.70 (11.70 – 11.71)	8.75 (8.72 – 8.78)	10.06 (10. 00 – 10.12)	8.72 – 11.71
P (mg/100 g)	-	-	253.33 (240 – 260)	240 – 260
K (mg/100 g)	216 (215 – 218)	375 (374 – 375)	251.00 (248 – 255)	215 – 375
Na (mg/100 g)	21.00 (20.95 – 21.05)	18.52 (18.50 – 18.56)	20.21 (20.15 – 20.25)	18.50 – 21.05
Fe (mg/100 g)	47.50 (47.50 – 47.51)	51.21 (51.15 – 51.26	22.14 (22.10 – 22.17)	22.10 – 51.26
Zn (mg/100 g)	9.40 (9.30 – 9.50)	7.93 (7.90 – 8.00)	6.70 (6.68 – 6.72)	6.68 – 9.50
Cu (mg/100 g)	0.71 (0.71 – 0.71)	0.43 (0.40 – 0.50)	5.06 (5.02 – 5.10)	0.40 – 5.10
Pb (mg/100 g)	0.71 (0.70 – 0.72)	0.45 (0.43 – 0.47)	0.63 (0.62 – 0.65)	0.43 – 0.72
Cd (mg/100 g)	0.03 (0.03-0.03)	0.03 (0.01 – 0.01)	0.04 (0.02 – 0.02)	0.02 – 0.03
Cr (mg/100 g)	0.017 (0.014 – 0.018)	0.014 (0.012 – 0.014)	0.016 (0.015 – 0.018)	0.012 – 0.018

content in both *A. floribunda* (60.40%) and *G. kola* (2.10%). The two tree species are in the same family of Guttiferae. The minerals, potassium, sodium, iron and zinc were found to be present. The heavy metals, lead, cadmium and chromium were present in significant quantities. The oil is highly recommended for cosmetic industries. Little quantity of *G. kola* should be taken so that the heavy metals, lead, cadmium and chromium would not have cumulative adverse effects on the consumers.

REFERENCES

AOAC (2000). Official Methods of Analysis. International 17th edition. Association of Official Analytical Chemists, Washington D.C. USA.

Bilanda DC, Dimo T, Dzeufiet PD, Djomeni PD, Bella Nm, Aboubaka OB, Nguelefack TB, Tan PV, Kamtchouing P (2010). Antihypantensive and antioxidants effects of A.*floribunda* olive (clusiaceae) aqueous extract in alchol and sacrose induced hypertensive rats. Ethnopharmacology, 128(3): 634-640.

Burkill IH (1985). The useful plants of West Tropical Africa. Vol. 1 Families A-D. The Royal Botanic Gardens, Kew, p. 691.

Dike MC (1992). Tree regeneration, recruitment and mortality in Nigerian Tropical Moist Forest. Unpublished Ph.D. Thesis. University of Ibadan, Nigeria, p. 235.

Dike MC (2010). Proximate, phytochemical and Nutrient compositions of some fruits, seeds and Leaves of some plant species at Umudike Nigeria. ARPN J. Agric. Biol. Sci. 5(1): 7-16.

Hutchinson J, Dalziel JM, Keay RWJ (1954). Flora of West Tropical Africa: Crown Agent for Oversea Governments and Administrations, Milbank, London, S.W.I. p. 826.

James CS (1995). Analytical Chemistry of Foods. Chapman and Hall, New York.

Odoemelam SA, Onwubuazu GC (2009). Evaluation of the chemical composition of parts of *Alstonia boonei* used in folk medicine. J. Medicinal and Aromatic Plant Sci. 31: 17-20

Pearson D (1976). The chemical Analysis of Foods. 7Ed; Churchill Livingstone, London.

Stoecker BJ (2001). Chromium. In Bowman BA and Russell RM (eds). Present Knowledge in Nutrition 8th edition. International Life Science Institute Press, Washington D.C. p. 805.

White F (1983). Vegetation of Africa. UNESCO Paris.