App. Trop. Agric. Vol 15, Nos 1 & 2, PP 36-38, 2010

Applied Tropical Agriculture

CHEMICAL COMPOSITION AND NUTRITIVE SIGNIFICANCE OF *Ceiba pentandra* LEAVES

A. A. IBITOYE
Department of Crop, Soil and Pest Management, Federal University of Technology,
P. M. B. 704, Akure, Ondo State, Nigeria.

Abstract
Ceiba pentandra leaves were harvested one week after new leaves emerged and four weeks after, from three locations in Akure, southwestern Nigeria. The leaf samples were either sun-dried or parboiled before and grinding into powder for analysis of proximate, mineral and some anti-nutritional contents on dry matter basis. Protein content ranged from 14.35 to 31.90%; ash, 4.00 to 6.60%; fat 9.10 to 11.70%; fibre, 8.60 to 15.50% and carbohydrate, 43.34 to 54.75%. Mineral analysis (mg/100g) showed that sodium ranged from 54.0 to 100.2; potassium, 94.0 to 156.2; calcium, 40.0 to 80.1; magnesium, 23.9 to 48.0; phosphorus 50.0 to 132.8; and nitrogen, 243.8 to 493.4. Anti-nutritional analysis in (mg/100g) showed that tannin ranged from 0.25 to 0.49 to phytin from 0.55 to 0.89. The results showed that the mineral contents were generally higher in the mature leaves than in the young leaves, while protein content is higher in the young leaves than in the mature leaves. Tannin and phytin contents were generally low ranging from 0.39 to 0.45 and 0.53 to 0.59 (mg/100g). C. pentandra can be a very good source of protein and minerals and has potential as raw material for the production of animal feeds.

Introduction

Kapok (C*eiba pentandra*) is a distinctive tree widely found in the lowland rainforest zone, especially in secondary forests. Also, it can be found planted near villages in the savanna zone. The tree grows up to 60 high and 8 girths. The leaf is a compound digitate with 8-10 leaflets and measures 5 –18.3 cm long by 1.8 – 4.6 cm wide.

C. pentandra is used in various ways. Generally, as a vegetable, the shoots and young leaves are consumed in both fresh and dry forms. The leaves and shoots are also used as fodder, medicinal potion, ornamental and plant fibre. *C. pentandra* leaves are produced during the dry season when other vegetables are scarce and expensive. The local women preserve the young leaves by parboiling and sun-drying, grinding and packing in nylon bags, while the mature leaves are only sun-dried, ground before packing in nylon bags. The mature leaves can be preserved up to a period of six months.

With daily increase in the level of awareness of the dietary roles of vegetables, and increasing population consequent demand for both leaf and fruit vegetables, there is apparently a need to supplement cultivated vegetables with those locally sourced from the wild. Many researchers have worked on common and some under-utilized vegetables in Nigeria (Gomes, 1982; Gbile, 1983; Amoo, 1998; Olaleye and Ola, 2001). However, no research has been carried out to determine the nutritional qualities of *C. pentandra* that is locally consumed but not commercially exploited. Therefore, this work is aimed at assessing the chemical composition and nutritive significance of the leaf of this vegetable.

Materials and Methods

Sample Collection and Preparation

Young *C. pentandra* leaves were harvested one week after new leaves emerged while mature leaves were harvested four weeks after. Samples were collected from three locations in Akure, southwestern Nigeria. Selection was done by quartering method. The mature leaves were processed in two forms: (i) sun-dried and ground into powder form (ii) parboiled, dried and ground into powder form. These materials were analyzed for proximate composition, minerals levels of some and anti-nutritional factors, using standard methods.

Chemical Analysis

Ash content was determined gravimetrically, 2 g samples were ashed at 500^{o}C in muffle furnace according to the method described by Sadasivan and Manickam (1996). Crude fibre and fat were determined using the

method of Pearson (1976). Protein was determined using method described by Foss Tecator (1997)in which 3 g samples were digested using K_2SO_4 + $CuSO_4$ as catalyst mixture. The digests were steam-distilled into boric acid and titrated with standard Molarity/Normality HCl. Protein content was obtained by multiplying the percentage nitrogen with 6.25. Carbohydrate was obtained by difference i.e. 100 (percentage ash, fat, fibre and protein) Tel (1984) and AOAC (2005).

Mineral content was determined from the analysis of the ash obtained. The ash dissolved in 10 ml of 10% HCl, filtered and made up to 100ml with 0.01% HCl (IITA, 1979). Sodium and potassium were determined using flame emission spectrophotometer, (Model Jenwey PFP7) calcium and magnesium by atomic absorption spectrophotometer (Model 210 VC) and phosphorus by using spectrophotometer (Model Navaspect II). The yellow colour was developed using the procedure described by IITA (1979). Tannin and phytic acid were determined using the methods described by Charyam (1980).

Results

The summary of the comparative proximate composition of both the unparboiled and parboiled young leaves and mature leaves is presented in Table 1. The ash contents of both unparboiled, parboiled and mature leaves were 4.30 ± 0.30, 5.90 ± 0.20 and 6.30 ± 0.50 g/100 g dry sample. These values fall within the range of ash contents reported for sorrel leaves by Olusola and Zebulon (1993). Fat contents were 10.40 ± 0.70, 9.90 ± 0.80 and 10.00 ± 0.90, g/100 g for young and mature leaves respectively. The ash, fat and fibre contents were generally higher in mature leaves than in young leaves, while fat and fibre contents were lower in parboiled leaves than in unparboiled leaves. The crude protein contents were 28.88 ± 1.20, 30.81 ± 1.10 and 15.25 ± 0.90 g/100 g for unparboiled young leaves parboiled young leaves and mature leaves, respectively. There values are high compared with other leaf vegetables (Martin and Rubert 1975; Gbile, 1983). There is no appreciable difference, between young leaves parboiled and unparboiled .

Table 2 shows the mineral composition of *C. pentandra*. The values are higher than what was reported in edible leaves of the tropics by Martin and Rubert (1975), Ogbalu *et al*. (2004) and Abulude, *et al*. (2004). These will be beneficial to the body especially calcium in the bone formation. The levels of tannin and phytin are very low, and compare favourably with those in other green vegetables (Cheryan, 1980).

Table 1. Proximate composition g/100 g of *Ceiba Pentandra* leaves

Proximate Component	Young Leaves (unparboiled)	Young Leaves Parboiled	Mature Leaves
Ash	4.30 ± 0.30	5.90 ± 0.20	6.30 ± 0.50
Fat	10.40 ± 0.70	9.90 ± 0.80	10.9 ± 0.80
Fibre	10.00 ± 0.90	9.05 ± 0.90	14.25 ± 0.90
Protein	28.88 ± 1.20	30.81 ± 1.10	15.25 ± 0.90
Carbohydrate	46.42 ± 1.30	44.34 ± 1.00	53.25 ± 1.50

Table 2. Mineral composition of tannin and Phytin acid content (mg/100 g, SE) *C. pentandra* leaves.

Mineral/ Antinutrients	Young Leaves (unparboiled)	Young Leaves (Parboiled)	Mature Leaves
Sodium	55 ± 0.1	64 ± 0.1	100 ± 0.2
Potassium	94 ± 0.0	74 ± 0.1	156 ± 0.2
Calcium	40 0.0	56 ± 0.0	80 ± 0.1
Magnesium	24 ± 0.1	34 ± 0.0	48 ± 0.0
Phosphorus	133 ± 0.2	117 ± 0.2	50 ± 0.0
Nitrogen	462 ± 0.3	493 ± 0.4	244 ± 0.2
Tannin	0.42 ± 0.03	0.25 ± 0.03	0.49 ± 0.03
Phytin	0.57 ± 0.04	0.55 ± 0.04	0.89 ± 0.05

The results of this study show that *C. pentandra* can be a very good source of protein and minerals which are essential nutrients for normal growth. It also has the potential to be used as raw material for the production of animal feeds.

References

Abulude, E. O., Couple, A., Dafiewhare, B.H and Ogunkola, M. O. 2005. Metal contents and Distribution in vegetables found in Nigeria. Journal Applied Tropical Agriculture 9, pp.38 – 41.

Amoo, I. A. 1998. Estimation of Crude protein in some Nigeria foods, Journal of Applied Sciences 1,pp. 65 – 72.

AOAC. 2005. Official methods of Analysis,18th Edition.

Cheryan, M. 1980. Phytic concentration on food system Critical reviews in food science and nutrition 14 (4), pp.297 – 302.

Foss Tecator A.B. 1997. Operator's Instruction on Kjeltec 2200 auto distillation unit. Hoganas Sweden. Gbile, Z. O. 1983. Indigenous and adapted African Vegetables. Tropical Hort. VI, pp. 71 – 80

Gomes M. I. 1982. The evaluation of fruits and vegetables. Resources in Machakos District in relation to seasonal deficits and micro nutrient deficiencies. Technical Report IDRC 39.

Keay, R.W.J. 1989. Trees of Nigeria. Oxford University press, New York, USA, pp.191 – 196. IITA. 1979. Series No. 1 Laboratory Manual on Soil and Plant Analysis

Martin, W. F. and Rubert, R. M. 1975. Edible leaves of the tropic Antillian College Press, 235 pp.

Ogbalu, O. K.; Amachere, E. I., Amifor, P. N. and Ben Kalio, G. 2005. The distribution of insect pest of fauna of cultivated vegetables of the Niger Delta – Nigeria. Journal Applied Tropical Agriculture 9, pp. 1 – 6.

Olaleye, M. T. and Ola, F. L. 2001. Chemical composition and nutritive significance of the leaves of Almond tree Terminalia Cattapa. The Journal of Technoscience, Vol. 5.

Olusola L. and Zebulon S. C. 1993. Chemical analysis of sorrel leaf Fd. Chem. 48, pp.205 - 206. Pearson, D. 1976. Chemical analysis of foods, 7th ed. J and A Churchill, London pp. 523.