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Chemical Composition of *Cassia Obtusifolia* L. Leaves

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Abstract: *Cassia obtusifolia* L. leaves, a top ranking leafy vegetable of the arid Africa zone were analysed for proximate (moisture, ash, lipid, crude protein, crude fibres, total carbohydrates, total phenolic compounds) and mineral (calcium, magnesium, iron, phosphorus, zinc and manganese) composition. The leaves collected in the North of Cameroon, were dried (sun drying and oven drying), finely ground and analysed. The results of this study showed that *C. obtusifolia* leaves had significant amount of crude protein and total carbohydrate. The mineral analyses revealed high amount of Calcium, Phosphorus and Magnesium. Exempt the moisture and total phenol contents, the drying method (sun and oven drying) did not affect significantly ($p>0.05$) the proximate and mineral composition of *C. obtusifolia* leaves.

Key words: *Cassia obtusifolia* L., leaves, proximate composition, mineral contents

INTRODUCTION

Cassia obtusifolia L. is a branched annual herb with alternate leaves, pinnately divided, without a conspicuous gland at the base of the leaf stalk[1]. This weed specie also called foetid cassia is presented as one of the most promising leafy vegetables[2]. In fact, the leaves of this plant commonly called "Tasba" in the arid Africa zone are widely consumed by the local populations[3]. The leaves always dried prior to eating. The use of such vegetables contribute to combat malnutrition especially kwashiorkor and anaemia[4-7]. Leafy vegetables are well known sources of proteins, vitamins (A, C) and minerals (iron, calcium, ...)[8-11]. Dietary fibres constitute a non negligible fraction. Unfortunately, they also contain non nutritional factors such as tannins, oxalates[7] and nitrates.

Despite the relative importance of foetid cassia leaves in the food habits of the populations, there's a lack of data on their proximate composition, as many studies were only carried out on the plant seeds[12-16]. The seeds are poisonous but when roasted, they are used as a substitute for coffee[1] and they contain a gum of commercial interest in addition to protein and fat[16].

The purpose of this study is to determine the proximate composition of foetid cassia leaves eaten in Cameroon.

MATERIALS AND METHODS

Sampling: Foetid cassia leaves were collected in Ngaoundere and divided into two lots. The first lot was sun dried for 48 h according to the local practices. The second lot (control) was oven dried overnight (12 h) at 50°C. The dried samples were finely ground and kept for further analysis.

Analytical methods: Lipid, Crude fibre, Ash, Moisture, Total Carbohydrate contents were determined according to the standard methods described by the Association o Official Analytical Chemists[17].

Total nitrogen was determined with the acetyl acetone reagent according to Devani *et al.*[18] and the crude protein content calculated by multiplying the nitrogen content by 6.25.

Total phenol compounds were quantified with the Folin-Ciocalteu method according to Marigo[19].

Ash dilution in hydrochloric acid was used to obtain aqueous solution of minerals. The absorbance readings of solutions were made on an atomic spectrophotometer (SP 1900 Pye Unicam) to determine trace elements.

Statistical analysis: The results were expressed as mean and standard deviation of three determinations. Statistical significant difference was determined by the *t*-test using the Statgraphics Plus 3.0 software[20].

RESULTS AND DISCUSSION

In Northern Cameroon, sun drying is the major processing method for foetid cassia leaves which then

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Table 1: Proximate composition (% dw), Nitrates (mg/100 g dw) and Total phenol contents (% dw) of *C. obtusifolia* leaves

	Oven dried leaves	Sun dried leaves
Moisture*	10.5±0.3	14.7±0.1
Ashes	10.3±0.3	10.4±0.4
Lipid	4.8±0.2	4.6±0.4
Crude protein	21.4±0.9	21.1±1.5
Crude fibres	13.9±1.1	13.6±0.8
Total carbohydrates	53.1±1.9	53.3±2.5
Total phenol compounds	5.3±0.2	4.8±0.2

* %

kept at room temperature until needed. This study simulated the sun drying and the results are compared with oven dried leaves. Results on Table 1 show the chemical composition of foetid cassia leaves. The moisture content of dried leaves ranged from 10.5% (oven drying) to 14.7% (sun drying). As expected, a significant difference ($p<0.05$) was observed within the two samples. However, the low water content of the samples is an advantage for the conservation of dried leaves. The ash content of foetid cassia leaves (Table 1) is within values reported for various leafy vegetable ranging from 6-26%[21].

C. obtusifolia leaves appear to be better source of minerals for human nutrition than *Vernonia amygdalina*, *Telfaria occidentalis*, *Solanum macrocarpum*, *Corchorius olithorius* and *Celosia argentea* (purple variety), top ranking leafy vegetables of the region which all have less than 9% dw ash content[7].The lipid content of both oven dried (4.8±0.2) and sun dried (4.6±0.4) *C. obtusifolia* leaves are higher than value previously reported by Randoin *et al.* (1982) who found a 2.2% dw lipid content. The lipid content of the samples analysed fell within the 0-8% range reported by FAO [21] for various leafy vegetables. Compared to other vegetables, *C. obtusifolia* leaves display similar value with *C. argentea*, *C. olithorius*, *S. macrocarpum* [7]. The average crude protein content of *C. obtusifolia* (Table 1) fell within the 21-30% range previously reported for various leafy vegetables[5, 7]. In addition, values from the present studies are in agreement with the 24% dw crude protein content reported for *C. obtusifolia* leaves[22]. According to the crude protein content, it can be concluded that like many other leafy vegetables, *C. obtusifolia* leaves are a good source of proteins for the human nutrition. Crude fibre content of *C. obtusifolia* leaves (Table 1) is higher than the 4-9% dw range reported for various leafy vegetable[7]. In addition to the varietal effect, this difference could be linked to the leaves stage of maturity. In effect, the crude fibre content of leaves increases with the maturity[23]. Taking in consideration the cholesterol lowering effect of dietary fibres[24], the high value of crude fibres in foetid cassia leaves could be a positive point. Carbohydrates, as observed with all other leafy

Table 2: Mineral elements contents of *C. obtusifolia* leaves (mg/100gdw)

	Oven dried leaves	Sun dried leaves
Calcium	2823.6±0.3	2817.9±0.4
Magnesium	502.91±0.1	502.7±0.3
Iron	29.8±1.1	28.9±1.7
Phosphorus	931.1±0.9	932.2±0.7
Zinc	35.1±0.9	34.3±0.2
Manganese	77.2±0.7	76.8±0.5

vegetables[7, 8, 21] constitute the main chemical fraction of *C. obtusifolia* leaves. The values obtained in the present study fell within the 44-59% dw range reported for various Nigerian leafy vegetables[7] and are in agreement with the 51.5% dw carbohydrate content reported by Randoin *et al.* [22] for *C. obtusifolia* leaves. Phenolic compounds mostly found in fruits and vegetables are implicated in enzymatic browning reactions[25]. *C. obstusifolia* leaves display a non negligible content of total phenolic compounds (Table 1). Sun dried samples (4.8±0.2% dw) showed lower value than oven dried ones (5.3±0.2% dw). The significant difference ($p<0.05$) observed within the sample could be due to the oxidation of phenolic compounds during the sun drying period. Mineral contents of *C. obtusifolia* leaves are reported in Table 2.

Calcium, Magnesium and Phosphorus were established as major minerals in the leaves. Other minerals, Iron, Zinc and Manganese were determined at lower levels. *C. obtusifolia* leaves display unusually high calcium content. This element is the major component of bone and assists in the teeth development[26]. The appreciable level of Manganese in the leaves could be a factor of risk. High concentration of this mineral is known to produce diverse disease symptoms that lead to depression[27]. Foetid cassia leaves also appear as a good source of Iron, this element is needed for blood formation. Zinc was also determined in significant amount in the leaves. Zinc is needed to activate enzymatic activities in human and animals, but high levels could lead to toxic effects[28]. General, the drying way did not significantly influenced ($p>0.05$) the mineral contents of the leaves.

CONCLUSION

The results of this study showed that *C. obtusifolia* leaves had significant amount of crude protein and total carbohydrates. Crude fibres, ashes and total phenolic compounds appear in non negligible quantities. The mineral analyses revealed high amount of Calcium, Phosphorus and Magnesium. The leaves contained appreciable level of Manganese, Zinc and Iron, appearing therefore as a good source of minerals for human

consumption. Exempt the moisture and total phenolic contents, the drying method (sun and oven drying) did not affect significantly ($p>0.05$) the proximate and mineral composition of *C. obtusifolia* leaves.

REFERENCES

1. Crowhurst, A., 1972. The Weed Cookbook. Lancer Books, Inc. New York, pp: 190.
2. Facciola, S., 1990. Cornucopia: A Source Book for Edible Plants. Kampong Publications.
3. Bergeret, A., 1990. L'arbre nourricier en pays sahélien Ed. Maison des Sciences de l'Homme, Ministère de la Coopération et du Développement, Paris, France, pp: 237.
4. Oke, O.L., 1975. A case for vegetable protein in developing countries. World Rev. Nutr. Diet., 23: 259-295.
5. Lucas, E.O., 1988. The potential of leaf vegetable in Nigeria. Outlook on Agric., 17: 163-168.
6. Awoyinka, A.F., V.O. Abegunde and S.R.A. Adewusi, 1995. Nutrient composition of young cassava leaves and assessment of their acceptance as green vegetable in Nigeria. Plant. Food Hum. Nutr., 47: 21-28.
7. Falade, O.S, A.F. Dare, M.O. Bello, B.O. Osuntogun and S.R.A. Adewusi, 2004. Varietal changes in proximate composition and the effect of processing on the ascorbic acid content of some Nigerian vegetables. J. Food Technol., 2: 103-108.
8. Tremolieres, J., Y. Serville and R. Jacquot, 1977. Les aliments. Tome 2: Manuel élémentaire d'alimentation humaine. Edn. ESF, Paris, France.
9. Adewusi, S.R.A. and J.H. Bradbury, 1993. Carotenoids in cassava: comparison of open column and HPLC, methods of analysis. J. Sci. Food Agric., 62: 375-383.
10. Rangaranjan, A. and J.F. Kelly, 1998. Iron bioavailability from amaranthus species. 1. *in vitro* dialysate iron from estimation genetic variation. J. Sci. Food Agric., 78: 267-273.
11. Rangaranjan, A., W.A. Chenoweth, J.F. Kelly and K.M. Agee, 1998. Iron bioavailability from amaranthus species. 2. Evaluation using haemoglobin repletion anaemic rats. J. Sci. Food Agric., 78: 274-280.
12. Mc Cormack, J.E. and W.E. Neisler, 1980. *Cassia obtusifolia* toxicity in dairy herd. Vet. Med. Small Anim. Clin., 75: 1849-1851.
13. Kitanaka, S. and M. Takid, 1986. Studies on the constituents in the roots of *Cassia obtusifolia* L. and the antimicrobial activities of constituents of the roots and the seeds. Yakugaku Zasshi, 106: 302-306.
14. Crawford, L., G.M. McDonald and M. Friedman, 1990. Com position of sicklepod (*Cassia obtusifolia*) toxic weed seeds. J. Agric. Food Chem., 38: 2169-2175.
15. Abbott, T.P., S.F. Vaughn, P.F. Dowd, H. Mojtahedi and R.F. Wilson, 1998. Potential uses of sicklepod (*Cassia obtusifolia*). Industrial Crops and Products, 8: 77-82.
16. Wu, V.Y. and T.P. Abbott, 2004. Gum and protein enrichment from sicklepod (*Cassia obtusifolia*) seed by fine grinding and sieving. Industrial Crops and Products Article in Press.
17. AOAC, 1990. Official Methods of Analysis, 15th Edn. Washington, DC.
18. Devani, M.B., J.C. Shishoo, S.A. Shal and B.N. Suhagia, 1989. Spectrophotometrical method for determination of nitrogen in Kjeldahl digest. JAOAC, 72 : 953-956.
19. Marigo, G., 1973. Méthode de fractionnement et d'estimation des composes phénoliques chez les végétaux. Analusis, pp: 106-110.
20. Statgraphics, 1998. Statgraphics Plus 3.0 for windows, Statistical graphic Corp.
21. FAO, 1968. Food composition tables for use in Africa. Roma ,Italy.
22. Randoin, L., P. Le Gallic, Y. Dupuis and A. Bernadin, 1982. Table de composition des aliments. Institut Scientifique d'Hygiène Alimentaire, Ed. J. Lannores, pp: 116.
23. Oyenuga, V.A. and B.L. Fetuga, 1975. Dietary importance of fruits and vegetables. First National Seminar on Fruits and Vegetables [O. Jenga & P.A. Ojehomunu, Eds] NAHORT, Ibadan, Nigeria, pp: 122-131.
24. Brown, L., B. Rosner, W.W. Willet and F.M. Sacks, 1999. Cholesterol lowering effect of dietary fibre. A mega analysis. J. Clin. Nut., 69: 30-42.
25. Cheftel, J.C. and H. Cheftel, 1984. Introduction à la Biochimie et à la Technologie des Aliments, Vol. 1, Tec. Doc., Lavoisier, Pari, France.
26. Brody, T., 1994. Nutritional biochemistry. San Diego,CA: Academic Press, pp: 555-556.
27. Kumar, V. and A.C. Kapoor, 1984. Trace mineral compositions of different varieties of cereals and legumes. Ind. J. Nut. Diet., 21: 137-143.
28. Liener, I.E., 1989. Naturally occurring toxic factors in animal feed-stuff. Proceedings of 50th University of Nottingham Easter School in Agricultural Science, Butterworth Press, London (UK), pp: 135.