Scientific Research and Essay Vol.3 (10), pp. 521-523, October, 2008
Available online at http://www.academicjournals.org/SRE
ISSN 1992-2248 © 2008 Academic Journals

Short Communication

Compositional analyses of the seed of sour sop, *Annona muricata L.,* as a potential animal feed supplement

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Accepted 12 September, 2008

The proximate composition of the seed and seed coat of sour sop (local name chap chap) were investigated with a view of highlighting the nutritional and industrial potentials of the seed. The result of the study revealed 27.34 and 11.4% of protein in the seed and coat, respectively. The percentage constitution of carbohydrate in the seed was 4.36 while that of the coat was 24.69%. There was no trace of oil in the seed coat. However, the percentage of fat in the seed was 22.57%. The percentage ash contents of the seed and coat were respectively 2.29 and 2.58% while the crude fiber contents were 43.44% for seed and 63.32% for coat. The mineral content in mg/100 g of seed : coat was found to be potassium (31.4:35.9), sodium (29.1:30.0); calcium (3.6:10.9); magnesium (53.3:58.6) for the macronutrients. Investigation of micronutrients in ppm for seed : coat gave for iron (63.2:44.3); zinc (49.1:41:4) and copper (1.0:0.4). Manganese, lead and cadmium were not detected. The phytate, tannin and cyanide contents were also determined to be (620.52:188.04) mg/100 g; (2.6:4.9) mg/100 g and (3.71:10.8) mg/kg for seed : coat, respectively. The result compares favorably with the composition of feeds and supplements commonly used in Nigeria.

Key words: Sour sop, toxicants, animal feed, proximate & phytate content.

INTRODUCTION

The sour sop (*Annona muricata L.*) is a fruit native of tropical North and South America belonging to the genus Annona of the family Annonaceae which includes about 100 species of trees or shrubs. It is the most tropical of the group and the one bearing the largest fruit (Nagy and Shaw, 1980). Sour sops are irregular in shape but most frequently the fruits are ovoid or heart-shaped. The largest of the fruits is 15 - 30 cm long and the width varying from 10 - 20 cm. The skin is thick, leathery and very dark green with many short, curved fleshy spines. The mesocarp contains numerous shinny dark brown seeds, ovoid in shape and measuring about 2 cm in length and about 1 cm in breadth (National Academy of Science, 1978).

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Sour sop is commonly found in southern part of Nigeria. It is mostly eaten as fresh fruits. It is cultivated mainly in home gardens. The tree yields up to 10 tons per ha and each fruit weighs 0.5 to 2 kg (Oyenuga, 1978). Sour sop has found its uses in many areas. It is consumed as a desert fruit. It is made into a fruit jelly with the addition of some gelatin or used in the preparation of beverages, ice creams and syrups. The fruit makes an excellent drink or ice cream after straining. Its white edible pulp contents 80% water, 1% protein, 18% carbohydrate and fair amounts of vitamin B_1 and B_2. The seeds are flat, hard and contain all that can be used for paint or insecticide (Rice et al., 1991). A number of medicinal properties are attributed to the leaves and juice of the sour sop. Toxic and insecticidal characteristics are reported for different parts of the tree and fruit (Rice et al., 1991).

The seed is about 4% of the whole fruit and much has not been reported about the chemical and nutritional con-

Table 1. Proximate composition of sour sop seed and seed coat on dry matter basis (%).

Parameter	Seed	Seed Coat
Fat (ether extract)	22.57 ± 0.2	Negligible
Protein (N x 6.25)	27.34 ± 0.1	11.41 ± 0.2
Carbohydrate	4.36 ± 0.1	24.69 ± 0.2
Crude fiber	43.44 ± 0.2	63.32 ± 0.2
Ash	2.29 ± 0.3	2.58 ± 0.2

Table 2. Macronutrient content of sour sop seed in mg/100 g.

Parameter	Seed	Seed coat
Potassium	31.40±0.1	35.90±0.1
Sodium	29.10±0.2	30.00±0.1
Calcium	3.60±0.2	10.90±0.2
Magnesium	53.30±0.1	58.60±0.1

tents of the seed in recent times. The importance of the study is the evaluation of the proximate composition, mineral content and toxicants of the seed. This report therefore discusses some of the mineral, toxicants and proximate composition of the seed in order to throw more light on the utilization potentials of this seed in the areas of food industry and possibly, animal feed formulation.

MATERIALS AND METHODS

The sour sop fruits used for this work were obtained from sour sop trees from Ondo town and nearby villages in Nigeria. The sour sops were washed, peeled and the pulps squeezed to remove the seeds that were dried in the oven at 45°C for 3 h to enable effective dehulling of the seeds to obtain the mesocarp. The dehulled seeds and the husks were then dry-milled and the powder kept in polythene bag at room temperature for various analyses.

Proximate composition of the seed and seed coat were determined by the standard AOAC (1990) methods (Association of Official Analytical Chemists, 1990). Atomic absorption spectrophotometer (Pye Unicam Sp 9 AAS) was used for the determination of calcium, magnesium, iron, copper, manganese, lead, cadmium and zinc while flame photometer was used for the determination of sodium and potassium from a solution obtained by first dry-ashing the sample at 525°C and dissolving the ash in de-ionized water with few drops of concentrated hydrochloric acid.

The phytate content was determined by the method of Young and Greaves (1940). This is based on the ability of standard ferric chloride to precipitate phytate present in the sample (Young and Greaves, 1940). Tannin was determined using the method of Makkar et al. (1993) while cyanide content of the seed was determined by silver nitrate titration procedure described by De Bruijn (1971).

RESULTS AND DISCUSSION

The data on the proximate composition of the seed and its coat are shown in Table 1, which indicates that the seed is rich in oil and protein. The ether extract of the seed coat is negligible. The coat also contains 11.41% protein against 27.34% of the seed. It is clear from Table 1 that the fiber content is higher in the coat than in the seed. These figures when compared with those of common feeds indicate that the sour sop seed could be used as a concentrate. For instance soybeans, guinea corn and cocoa shell are common feeds. These contain respectively 19.63, 3.25 and 3.10% fat; 42.78, 15.03 and 14.5% protein; 7.97, 79.12 and 46.50% carbohydrate; 4.99, 2.36 and 6.70% ash (Oyenuga, 1978).

Table 3. Micronutrients of sour sop seed in ppm.

Parameter	Seed	Seed coat
Iron	63.20	44.30
Zinc	49.10	41.40
Copper	1.00	0.40

With higher fat content (22.57%) than common feeds, sour sop seed could be a valuable concentrate. Its potential in this regard is made more attractive by the relatively high protein content of 27.34% (Table 2). The higher fiber content of the seed and seed coat compared with those of soybeans and cocoa shell (5.52 and 18.30%, respectively) (Oyenuga, 1978) may not make sour sop seed an attractive feed for non-ruminants. However, the maintenance rations of cattle, sheep, goats and horses would be met adequately by the coat which like cocoa shell is rich in protein, carbohydrate, fiber and ash. In herbivores such as ruminants, fiber is the source of energy after it is digested by microorganisms to acetate, propionate and butyrate, which are adsorbed into the blood stream (Daryl et al., 1990).

When compared with other feeds, sour sop seed is poorer in some macronutrients. For example millet and maize contain respectively 310.00 mg/100 g and 400.00 mg/100 g of potassium, 10.00 mg/100 g and 50.00 mg/100 g sodium, 50.00 mg/100 g and 6.00 mg/100 g calcium, 180.00 mg/100 g and 160.00 mg/100 g magnesium (Oyenuga, 1978). Sour sop seed or seed coat would need to be enriched by other mineral sources if it is to be used as animal feed. Sour sop seed is richer in iron content (Table 3) than other feeds such as millet, guinea corn, groundnut cake and maize with 9.00, 0.37. 2.10 and 2.50 ppm iron, respectively (Oyenuga, 1978). Therefore, sour sop seed can be used as a source of iron to enrich rations particularly in treating iron deficiency problems.

The levels of toxicants (tannin, phytate and cyanide) are relatively low in both the seed and its coat (Table 4). The total cyanide which is a measure of toxicity in the seed is very low as compared to 8.64 mg/100 g and 10.80 mg/100 g reported for almond fruit and African wall nut fruit, respectively. Tannins level in almond and African wall nut fruits are 3820.00 mg/100 g and 28.98.00 mg/100 g, respectively, while phytate levels are 2564.72 mg/100 g and 1932.00 mg/100 g, respectively (Ekop and Eddy, 2005). Tannins affect the nutritive value of food products by

Table 4. Some toxicants in the seed and seed coat of sour sop.

Parameter	Seed	Seed coat
Tannin (mg/100 g)	2.6	4.9
Phytate (mg/100 g)	620.52	188.04
Cyanide (mg/kg)	3.7	10.8

forming a complex with protein thereby inhibiting digestion and absorption. They also bind Fe, making it unavailable (Akindahunsi et al., 1999). Recent studies suggest that condensed tannins may cleave to DNA in the presence of copper ions (Akindahunsi et al., 1999). The phytate, is capable of chelating divalent cationic minerals, like Ca^{2+}, Fe^{2+}, Mg^{2+}, and Zn^{2+} thereby inducing dietary deficiency. Several workers have attributed the incidence of several mineral deficiency symptoms in animals to the occurrence of phytate in seeds (Balogun and Fetuga, 1988).

Conclusion and Recommendation

The present preliminary study reveals that the seed of sour sop, *Annona muricata,* is rich in oil and protein and low in toxicants (tannins, phytate and cyanide) and therefore could be harnessed in human and animal nutrition. Work is in progress to determine the fatty acid components of the oil and the amino acid components of the protein. Other nutrients level would be determined to give the chemical assay of the seed. Climatic and seasonal influence over sour sop components would also be studied. It would then be possible to determine specific potential of the seed and to recommend large-scale cultivation of the plant. Unlike oranges, mangoes and bananas which are widespread and largely cultivated in Nigeria, sour sop trees are rarely found. They are sparsely distributed in gardens in the southern part of the country. Based on our findings, we therefore recommend a large scale cultivation of sour sop.

REFERENCES

Akindahunsi AA, Oboh G, Oshodi AA (1999). Effect of fermenting Cassava with Rhizopus oryzae on the chemical composition of its flour and gari products. La Rivista Italiana Delle Sostanze Grasse – Ottobre 76: 437-439.

Association of Official Analytical Chemists (1990). *Official Methods of Analysis,* 15th edn. Washington DC: 125-126, 132, 877-878.

Balogun AM, Fetuga BL (1988). Tannin, Phytin and Oxalate Contents of Some Wild Under utilized Crop-seeds in Nigeria. J. Food Chem. 30: 37-43.

Daryl KG, Peter AM, Robert KM, Victor WR (1990). Harper's Biochemistry, 22nd Edition, Prentice Hall International United Kingdom.

Ekop AS, Eddy NO (2005). comparative studies of the level of toxicant in the seeds of Terminalis catappa (Indian Almond) and conela edulis (African walnut). Chem. class J. 2: 74-76.

Makkar HPS, Blummet M, Borowy NK, Bekker K (1993). J. Sci. Food Agric. 61: 161-165.

Nagy S, Shaw PE (1980). Tropical and Subtropical Fruits (composition, Properties and Uses) Avi Publishing, Inc. Westport, Connecticut USA. pp. 375-406.

National Academy of Science (1978). Under exploited tropical plant with promising economic value, wash. DC.

Oyenuga VA (1978). Nigeria's Foods and Feeding-Stuffs: Their Chemistry and Nutritive value. Ibadan University press, Ibadan, Nigeria.

Rice RP, Rice LW, Tindal HD (1991). Fruit and vegetable production in warm climate. Macmillan Education Ltd, p. 383.

Young SM, Greaves JE (1940). Food Res. 5: 103-108.