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Full Length Research Paper

Chemical composition of *Annona senegalensis* from Nupe land, Nigeria

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The proximate, mineral composition, amino acids content and phytochemical screening of *Anona senegalensis* seed vegetable collected from different farm site in Bida town, Niger State, Nigeria, were carried out using standard methods of food analysis. The results of the proximate composition show that the sample contained 12.20% moisture, 12.10% ash, 24.00% fat, 17.60% crude fibre, 8.80% crude protein and 25.3% of carbohydrate, respectively. Mineral composition in mg/g from the results revealed that calcium, potassium, magnesium, zinc, iron, copper, manganese, lead and chromium values are 1.35, 0.47, 0.24, 0.48, 1.80, 0.29, 0.13, 1.10 and < 0.1, respectively. The phytochemical screening indicates the presence of saponins, steroid, flavonoid and glycoside in the sample. The results revealed high values of amino acid content in the sample and the values are comparable to Food and Agricultural Organization/ World Health Organization (FAO/WHO) standard.

Key words: Seed, nutrition, composition, screening.

INTRODUCTION

Most tropical African countries are blessed with diversity of food stuffs which play a basic role in nutrition and healthy body development. Unfortunately, millions of people in developing countries still suffer from malnutrition especially infants and children of rural areas (WHF, 2005). Malnutrition can be tremendously reduced with an increase use of foods rich in energy, proteins, iron and vitamins, most especially those from the rural environment (Richard et al., 2007). In order to have a healthy population that can promote development, the relation between food, nutrition and health should be reinforced (Atasie et al., 2009). One way of achieving this is through the exploitation of available local resources such as local indigenous vegetable, since human population in Africa depend largely on a large number of edible indigenous vegetables to meet up with shortages in minerals and vitamins (Achu et al., 2005). Knowledge of nutritional status of local soup ingredients and food stuffs is important in order to encourage their cultivation and consump-tion. Several studies have been carried out on the chemical composition of some local indigenous vege-tables and the results reveal some to have high nutritional and medicinal properties (Ujowundu et al., 2008).

Annona senegalensis (Sour sop) locally known as Nungbere in Nupe land is a species of seed vegetable which grow both on dry and raining seasons. It is a savanna plant which is widely spread from Senegal to Nigeria, also in Central African Republic (Abdullahi et al., 2003). It produces seeds which are ovate in shape, very small in size and open by mechanical explosion. *A. senegalensis* is common in Nupe land; they use it in making soup (soup harder). The stem, bark, leaves and root of *A. senegalensis* have medicinal properties, it may be use in the treatment of cancer, cough and for wound dressing (Abdullahi et al., 2003).

The neglect of some local vegetables coupled with the growing reduction in their consumption prompted this research. Therefore, the aim of this work is to assess the chemical composition of *A. senegalensis* in order to ascertain its nutritional suitability for use as human diet.

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Table 1. Proximate composition of *A. senegalensis.*

Parameters	Concentration in %
Moisture	12.2
Ash	12.1
Crude fibre	17.6
Crude protein	8.80
Fat content	24.0
Carbohydrate	25.3

MATERIALS AND METHODS

Sampling and sample preparation

The sample of *A. senegalensis* used in this study was collected in July, 2009 from different farm site in Kusotachi town, Niger State. The sample was washed with clean water and sun dry for 4 days. The dried samples were grinded to a fine powder with electric grinder (Fritsch, idar-oberstein Germany) with a mesh size of 0.5 mm and stored in a well labeled air tight polythene bag for further analysis.

Laboratory analysis

Crude fat was extracted by the soxhlet method with petroleum ether (40 - 60°C) for 8 h. Crude protein content was determined by the microkjeldahl method. These, as well as carbohydrate, crude fiber, ash and moisture contents were estimated as described by the Association of Official Analytical Chemistry (AOAC, 1990).

Phytochemical screening

The phytochemical screening for the presence of saponins, tannins, alkaloids, flavonoid, steroid and glycoside were carried out according to the methods describe by Trease and Evans (1983) and Hassan et al., (2004).

Mineral/elemental analysis

The mineral compositions of *A. senegalensis* such as copper, zinc, iron, manganese, potassium, calcium, magnesium, chromium and lead were determined using Atomic Absorption Spectrophotometer Buck 210VGC with computer readout after acid digestion of the sample (AOAC, 1990).

Amino acid analysis

3.0 g of ground sample was extracted with petroleum ether (40 – 60°C) using soxhlet extractor for six hours (Cooper et al., 2000). 30 mg of the defatted samples was weighed into a glass ampoule and 7.0 cm^3 of 6.0 mol/dm^3 hydrochloric acid was added. Oxygen was expelled by passing nitrogen into the ampoule (to avoid possible oxidation of some amino acids during hydrolysis). The ampoule was sealed with Bunsen flame and put in an oven preset at 105°C for 22 h, after which it was allowed to cool, broken at the tip and the content filtered. The filtrate was evaporated to dryness at 40°C under vacuum in a rotary evaporator. The residue was dissolved with 5.0 ml of acetate buffer (pH 2.0), stored in plastic bottle and kept in deep freezer for 24 h.

Five to ten microlitres of the hydrolysate was loaded on the Technicon Sequential Multi-Sample (TSM) amino acid analyzer (DNA 0209) made by Technicon (Ireland) Ltd. This was dispensed into the cartridge of the analyzer and the analysis lasted for 76 min (Sparkman et al., 1958).

RESULTS AND DISCUSSION

Proximate composition

The results of proximate composition of *A. senegalensis* are presented in Table 1. The results revealed high content of moisture (12.2%) when compared to 5.98% value observed in *Hibiscus sabdariffa* seeds (Anhwange et al., 2006). The value is low when compared to that reported in Afang seed (31.16%) and fluted pumpkin seed (54.8%) (Ekop, 2007). The low moisture content of *A. senegalensis* indicates that it can be stored for long time without spoilage.

Ash content indicates the level of the mineral deposit in plant materials. The ash content of the sample was observed to be high compared to those of *Gnetum africanum* (1.20%), *H. sabdariffa* seeds (5.55%) and *Mucuna urean* (6.0%). The value is within the range of 9.20 to 10.83% reported in green leafy vegetable of Nigeria (Ifon and Bassir, 1980; Ladan et al., 1996; Umar et al., 2007).

From the result, the value of fat was observed to be 24.0%. This value is similar to 28.10% fat reported in *H. sabdariffa* seed (Anhwange et al., 2006). The value is high compared to 11.99% recorded in *Corchorus olitorius*, 13.15% in *G. africanum* and 4.30% in *M. ureans* (Ekop, 2007; Idirs et al., 2009). The crude fibre content of the sample was found to be high compared to the value observed in some seed vegetable consumed in Nigeria such as Afang seed (0.80%) and fluted pumpkin seed (4.60%) (Ekop, 2007; Anhwange et al., 2006). While the value was low compared to some leafy vegetable such as *Sesamum indicum* (27.50%) and *Balanites aegyptiaca* (30.75%), the protein content of the sample (8.80%) was found to be similar to 7.70% value observed in fluted pumpkin and the value is low compared to 17.50% reported in *G. africanum* and 24.3% found in *M. ureans* (Ekop, 2007). The value is however, high compared to the 6.30% recorded in Ipomoea aquatic leave (Umar et al., 2007). Further more, the protein content of *A. senegalensis* can make a significant contribution to dietary intake. The carbohydrate value as shown in the result was high compared to19.56% observed in *C. olitorius,* and 10.56% in *B. diffusa* (Idirs et al., 2009; Ujowundu et al., 2008). Carbohydrate provides the body with a source of fuel and energy that is required to carry out daily activities. The results of the proximate analysis revealed that *A. senegalensis* is nutritious when compared to other vegetables consumed in Nigeria.

Table 2. Phytochemical screening of *A. senegalensis.*

Parameters	Petroleum ether extract
Tannins	-ve
Saponins	+ve
Steroids	+ve
Alkaloids	-ve
Flavoinod	+ve
Glycoside	+ve

+ve = Present, -ve = absent.

Table 3. Mineral composition of *A. senegalensis*.

Parameters	Concentration (mg/g)
Calcium	1.35
Potassium	0.47
Magnesium	0.24
Zinc	0.48
Iron	1.80
Copper	0.29
Manganese	0.13
Lead	1.10
Chromium	< 0.10

Phytochemical screening

The results of the phytochemical screening of *A. senegalensis* are presented in Table 2. Saponins, flavonoid steroid and glycoside were the major phytochemicals identified in the sample extract while tannins and alkaloid were absent. These phytochemicals exhibit diverse pharmacological and biochemical actions when ingested by animals (Amadi et al., 2006).

Saponins have been reported to have hypocholesterolemic effect (Price et al., 1987) and this may aid in the reduction of the metabolic burden that would have been placed on the liver. Flavoniod has anti-oxidation effects in animals while glycoside reduces the intake of certain minerals by forming complex compound which is indigestible (Enwere, 1998), although, the concentration of these chemicals in edible vegetable are reduce during the processing period which includes steaming, boiling and soaking (Piorreck et al., 1984).

Mineral composition

The mineral constituents of *A. senegalensis* are shown in Table 3. From the results, the values of potassium, calcium, magnesium, zinc and copper was observed to be 0.47, 1.35, 0.24, 0.48 and 0.29 mg/g, respectively. These values are low compared to those reported in *G. africanum* seed, *C. olitorius* leaves, *B. diffusa* and *C. nudiflora* leaf vegetables (Ekop, 2007; Idirs et al., 2009; Ujowundu et al., 2008). The results in Table 3 revealed that *A. senegalensis* has poor mineral deposit and cannot serve as mineral supplement in food diet. The iron and manganese content of the sample was observed to be comparable with those of *G. africanum, B. diffusa* and *C. nudiflora* as reported by Ekop (2007), their values are also lower than their RDA values.

Lead was also observed to be present in the sample and this may be due to the exposure of the farm site to the busy express road. Based on this result, the need for supplementary diet rich in mineral content is necessary for a singular ration, to avoid metal deficiency syndrome like rickets and bone clarification of bones, as a result of calcium deficiency. Distorted enzymatic activity and poor electrolyte balance of the blood fluid are related to inadequate Na, K, Mg and Zn as they are the most required elements of living cells.

Table 4. Amino acid composition of *A. senegalensis*.

Amino acid	Concentration (mg/g)	FAO/WHO standard (mg/g)
Lysine	28.5	30.0
Histidine	23.2	
Arginine	37.4	
Aspartic acid	71.8	
Threonine	22.8	15.0
Serine	32.9	
Glutamic acid	86.1	
Proline	21.2	
Glycine	34.5	
Alanine	51.7	
Cystine	10.6	
Valine	37.8	26.0
Methionine	12.5	15.0
Isoleucine	35.1	25.0
Leucine	56,6	20.0
Tyrosine	29.0	39.0
Phenylalanine	37.2	25.0

Amino acids composition

Table 4 shows the amino acid present in the sample. The result revealed seventeen amino acids (essential and non- essential) in their various proportions. The essential amino acids observed in the sample are comparable with Food and Agricultural Organization/ World Health Organization (FAO/WHO) standard (2007). Compared to the reference standard of amino acids profile for children and adults (WHO/FAO/UNU, 1985), the sample is rich in all the essential amino acids. Phenylalanine, threonine

and leucine values are lower than 63, 34 and 66 mg/g, respectively, needed in children.

The amino acid content of *A. senegalensis* are observed to be similar to those reported in *Sesamum indicum* and *Balanites aegyptiaca* leafy vegetable consumed in Nigeria (Kubmarawa et al., 2007) and that of two non conventional leafy vegetables consumed in Cameroon (Richard et al., 2007). The result reveals high concentration of all the essential amino acid which plays important roles in body development and growth. Leucine is responsible for regulating the blood sugar concentrations, growth and repairs of muscles/tissues (Anhwange et al., 2004). Phenylalanine which is also present in the sample is used by the brain to produce norepinephrine, a chemical that transmit signals between the nerve cell and the brain. Isoleucine helps in the development of hemoglobin. Lysine insures the adequate absorption of calcium and help in the formation of collagen. Generally, amino acids are the building block of protein. They help in body growth and development, also in muscles/tissues repairs.

Conclusion

This study has revealed that *A. senegalensis* consumed in Nupe land Nigeria can contribute useful amount of nutrients including amino acids to human diet, however, it has low deposit of mineral elements. The anti-nutritional factors are negligible as they would be reduced to a tolerable limit during the period of processing.

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