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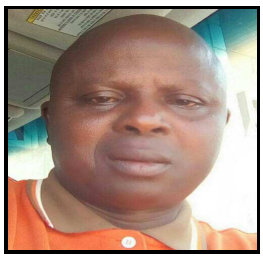

# NUTRITIONAL AND ANTI-NUTRITIONAL COMPOSITIONS OF AFRICAN STAR APPLES SEEDS OBTAINED FROM MINNA METROPOLIS IN NIGER STATE, NIGERIA

**[1,2]*Tsado Amos Ndarubu, [2]Muhammad A. Ibrahim, [3]Ibrahim Jonathan, [2]Adeshina A. Daniel, [4,5]Alawode R. Adenike, [2]Agboola R. Abdulakeem, [6]Suleiman Alfa, [2]Oluwajobi Iyanuloluwa, [7]Berinyuy B. Eustace**

[1]*Department of Biological Sciences, Niger State Polytechnic Zungeru, P. M. B 001, Zungeru, Nigeria.
[2]Department of Biochemistry, Federal University of Technology Minna, P. M. B. 65, Nigeria.
[3]Gombe State College of Health, Science and Technology, Kaltungo Nigeria.
[4]Department of Chemistry, Federal University of Technology Minna, P. M. B. 65, Nigeria.
[5]Forestry Research Institute of Nigeria-Southern Guinea Research Station, Mokwa, Niger State, Nigeria.
[6]Department of Biological Sciences, Federal Polytechnic Bida, Nigeria.
[7]Faculty of Medicine and Biomedical Sciences, University of Yaounde, Yaounde, Cameroon.

**ABSTRACT**

The proximate, mineral, amino acids and anti-nutritional compositions of African star apples seeds was carried out; this sample seed was obtained from discards of plants and prepared for use by decocting, sun drying and grinding into powder. The proximate compositions (crude fats, proteins, ash, fibre, moisture, carbohydrate), minerals (potassium, calcium, iron and copper), antinutrients (oxalate, phytate and cyanide) as well as the amino acid contents were determined using standard methods. The fats yield of 3.05±0.01%, crude protein 4.33±0.06%, crude fibre 5.99±0.34%, carbohydrate content 60.74±0.47% and calories of 1219.04±0.02kcal/100g was obtained for the sample. The seed had 32.19±0.11, 16.00±0.03, 20.90±0.02 and 2.00±0.10 mg/100g of potassium, calcium, iron and copper respectively. The seed had high concentration of essential and non-essential amino acid, and values of anti-nutrient analyzed are below the standard acceptable limit and with this it can be consumed without any harm. In conclusion, the result suggest that consumption of African star apples seeds would contribute greatly towards meeting human nutritional requirement for normal growth and adequate protection against diseases arising from malnutrition.

**KEYWORDS**

African star apples, Proximate, Mineral and Amino acids.

**Author for Correspondence:**
Tsado Amos Ndarubu,
Department of Biological Sciences,
Niger State Polytechnic Zungeru,
P. M. B. 001, Zungeru, Nigeria.
**Email:** amos.infonet@gmail.com

## INTRODUCTON

Biodiversity is of utmost important for the global food supply. However, existing biodiversity is still underutilized for exploitation of food supply and industrial applications. About 30,000 of more than 250,000 currently described plants species are edible, whereas about 7,000 have been cultivated or

collected by humans for food at one time or another. Several thousands of plant may thus be considered to contribute to food security, but the value of many plant are under estimated[1].

Worldwide, natural sources are increasingly becoming important in nutrition and commerce because they are sources of protein, dietary energy, anti-oxidant, bio-fuels and raw material for the manufacture of industrial products. Protein energy malnutrition is among the serious problems tropical developing countries are facing today. The average Nigerian does not consume enough protein of animal origin and animal protein is more efficient than plant protein in providing the amino acid necessary for tissue development repair and function[2]. African Star apples popularly known as 'Agbalumo' in the south western part of Nigeria are common plant found growing in the wild and cultivated in the southern part of Nigeria. Botanical name is *Chrysophyllum albidum*, a wild tropical tree belonging to the Sapotacae family can be find in diverse eco-zones in Nigeria and in other tropical African countries such as Uganda, Niger Republic, Cameroon and Cote d'Ivoire[3]. It's a dark yellowish fruit with semi-circular seeds, a popular seasonal fruit normally consumed with its pericarp in the West Africa region. The fruit is mostly cultivated in the rural areas and is very common during the months of December to April. Nutritional and anti-nutritional factor of wild seeds should be known in order to encourage their increase cultivation and consumption. The lack of nutritional information and inadequate development of nutritionally improved product of wild seed has direct bearing on nutrition[4]. The aim of this research is to determine the nutritional and anti-nutritional compositions of this plant seeds.

## MATERIAL AND METHODS

The fruits of African Star apples seed were collected from Minna metropolis in Niger state. The fruit were separated from the seed. The seed were washed with clean water, dry and ground into powder form using electric grinder. The grinded samples were store in a well labeled air –tight container at ambient temperature for further analysis.

### Methods

### Proximate Analysis

Standard analytical methods of AOAC[5], was used to determined moisture, crude protein, ash content, crude fibre, crude fat and carbohydrate was determined by difference.

### Minerals Analysis

Sodium and potassium were determined using Gallenkamp Flame analyzer, while calcium, magnesium, iron, manganese, zinc, chromium and copper were determined using Buch Model 205 Atomic Absorption Spectrophotometer. Phosphorus level was determined using the phosphovanadomolybdate colorimetric techniques on JENWAY 6100 Spectrophotometer[5].

### Anti-nutritional Analysis

Oxalate, phytate and cyanide contents was determined using the methods of Mathew *et al*[6].

### Amino acid profile

The amino acid profile date palm sample was determined using methods described by[5]. From the ground sample, 0.50g was defatted with chloroform and methanol mixture in a ratio of 1:1. Then, 0.25g of the defatted sample was put into a glass ampoule, 7cm3 of 6 M HCl prepared from 36% BDH stock solution was added and oxygen expelled by passing nitrogen into the ampoule. This was put in the oven at 105°C for 22 h, allowed to cool and filtered. The filtrate was then evaporated to dryness at 40°C under vacuum in a rotary evaporator. The residue was dissolved with 5 cm3 acetate buffer (pH 2.0) and loaded into the amino acid analyser and the samples were determined by ion exchange chromatographic (IEC) method using the Technicon Sequential Multi-sample Amino acid Analyzer (Technicon Instruments Corporation, New York).

### Statistical Analysis

Data generated in triplicates were expressed as mean ± standard deviation using SPSS version 16 statistical packages.

## RESULTS AND DISCUSSION

Table No.1 shows the result of proximate composition of African Star apples seed. Fats play a vital role in maintaining health skin and hair, insulating body organs against shock, maintaining body temperature and promoting health cell function. It is also essential in diets as they increase

the pleasant to taste of food by absorbing and retaining their flavours[7]. The crude fat of the studied seed was 3.05±0.01%. The value obtained in this work was low compared to that recorded by Anwar *et al*[8] on grape seeds (46.2%). This high value indicated that the seeds are poor source of oil and cannot be rely upon for industrial application. The crude protein content of the sample was 4.33±0.06%. The protein content recorded in this work was low to reported protein content of orange, grape and white roselle seeds which were found to be 20.20, 21.40 and 22.70% respectively by Gerner and Poiters[9]. The protein content in this sample showed that the sample can be regarded as good sources of protein hence the cake can be modified into protein concentrate feeds for livestock. The seed of the studied plant was found to have ash content of 0.50±0.07%. The sample with the highest ash content had the highest probability of being the one with the highest mineral contents, as the ash content of grape was taken as a rough measure of the mineral contents of the food material[8]. The result of the ash content of studied seed was lower when compared with that of citrus seeds (4.60%) reported by Anwar *et al*,[8]. The moisture content of the 25.39±0.20% was recorded for African Star apples seed. The value was high compared to other fruit seed like citrus seed. This indicated that the African Star apples seed cannot be preserved for a reasonable period of time without the risk of microbial deterioration and spoilage. The long shelf-life promised here is an added advantage over other sources of protein like beef, egg and fish which are easily prone to spoilage if proper care is not given to them. The crude fiber content of 5.99±0.34% was recorded for the studied seed. The value agreed with 5.0-58% reported by Anwar *et al*[8]. The fibre content of African Star apples seed was lower than that of orange seeds (11.0%) and grape seeds (7.50%). The physiological role of crude fibre in the body is to maintain an internal distension for proper peristaltic movement of the intestinal tract[10].

From Table No.2, the metallic composition of African Star apples seed was determined. Calcium contents of African Star apples seed was 16.00±0.03mg/100g. This concentration was however, in agreement with what was obtained for the melon seeds reported by Anwar *et al*[8]. The zinc and copper contents from the table tended to have the least of metallic composition, but the value agreed with that of citrus seeds 1.00-9.00mg/100g reported by Brown *et al*[11]. From the table, the potassium level of African Star apples seed was about 32.19±0.10mg/100g. This level was higher than the reported for the melon seeds 25.0mg/100g[12]. In the case of iron content in the plant, it was observed that African Star apples seed has high content of iron. However, the iron content of melon seeds was lower than the value obtained from this work. It was also observed that copper content obtained from this studied was 20.90±0.20%. However, this value was higher than 11.0-19.0mg/100g reported by Anthony[13], for the melon seeds. Generally, from Table No.2 above, it was observed that, the plant seed was rich in phosphorus, calcium, sodium, potassium and iron contents while zinc and copper were not as much in the present studied.

Table No.3 shows the anti-nutritional factors present in the seed. The seed was very low in anti-nutritional factors such as cyanogenic glycoside (hydrocyanic acid), phatate and oxalate, from the result cyanide content was 5.40mg/100g was below the established toxic level. While oxalate and phyate contents of 79.30 and 9.00mg/100g respectively were said to be low, though the values were below the permissible limit established by WHO. However, it is known that high content of these anti-nutrients exert negative effects on the bioavailability of some mineral nutrient[14].

Table No.4 shows the data of amino acid composition of the analyzed seed samples. The seeds are rich in both essential and non-essential amino acids. The levels of some of the essential amino acid are comparable to that of FAO/WHO[15]. The results therefore show that these seed proteins would compliment well with those protein sources that are low in hysine, value, methionine, threonine, lencine and isoleucine. Isoleucine content in the sample was 2.51g/100g which is high compared to the values observed in *C. nudiflora* 1.2g/100g[16]. According to the FAO/WHO limit 2.50g/100g, the entire samples are good source of Isoleucine. Isoleucine help in the development and repair of muscles, hemoglobin act as energy regulator[17]. The

value of threonine (3.09g/100g) in the sample analyzed agree with the values reported in seed of *B. monandra, D. microcarpum and M. oleifera*[18] and higher than the recommended values by FAO/WHO (1.5g/100g). Valine content was 3.79g/100g. This value are low compared to 7.5g/100g in *V. calvoana,* 8.3g/100g in *V. amydalina* and 8.12g/100g in *V. colorata*[4], but falls within the value reported by Onwuka[16] in *C. nudiflora, D. micorcarpum* and *Balanite*seeds. According to FAO/WHO[15]. Valine helps to promote mental vigor, muscles co-ordination and calm emotions[6]. The value of leucine was 10.42g/100g. This value are high compared to 2.13g/100g *B. monandra,* 2.25g/100g in *D. micorcarptum* reported by Onwuka[16]. Leucine helps the insulin in regulating blood sugar concentration, growth and repair of muscles and tissue[16]. Phenylaline is essential amino acid that produces norepinephrine, a chemical that transmit signals between nerve cells in the brain[19]. Phenylaline content in the seed sample analyzed was 2.58g/100g. This result is lower than 5.32g/100g in *C. nudiflora* seeds reported by Onwuka[16]. The values are similar compared with standard limit (2.5g/100g) of FAO/WHO[15]. Lysine content from the result was 5.05 g/100g. This value is high when compared to those of *D. microcarpum* 2.12g/100g and *B. monandra* 2.53g/100g[6]. The values are similar to the amino acids content of seeds of *Balanite* reported by Olaefe[20]. Lysine ensures the adequate absorption of calcium and help in the formation of collagen[6]. However, the results of the amino acid composition suggest that the seed sample analyzed is good source of both essential and non-essential amino acid.

**Table No.1: Proximate analysis of African Star apples seed (mg/100g)**

| S.No | Parameters | Value |
|---|---|---|
| 1 | Ash | 0.50±0.07 |
| 2 | Crude protein | 4.33±0.06 |
| 3 | Moisture | 25.39±0.20 |
| 4 | Crude fat | 3.05±0.01 |
| 5 | Crude fibre | 5.99±0.34 |
| 6 | Carbohydrate | 60.74±0.47 |
| 7 | Calories (Kcal/100g) | 1219.04±0.02 |

Values are mean ± SD of three determinations

**Table No.2: Mineral composition of African Star apples seed (mg/100g)**

| S.No | Parameters | Value |
|---|---|---|
| 1 | Calcium | 16.00±0.03 |
| 2 | Potassium | 32.19±0.11 |
| 3 | Magnesium | 10.00±0.22 |
| 4 | Sodium | 42.13±0.10 |
| 5 | Phosphorus | 49.22±0.12 |
| 6 | Iron | 20.90±0.02 |
| 7 | Zinc | 3.80±0.33 |
| 8 | Copper | 2.00±0.0.10 |

Values are mean±SD of three determinations

**Table No.3: Anti-nutritional compositions of African Star apples seed (mg/100g)**

| S.No | Parameters | Values |
|---|---|---|
| 1 | Cyanide | 10.33±0.24 |
| 2 | Phytate | 32.00±0.50 |
| 3 | Oxalate | 10.33±0.24 |

Values are Mean±SD of three differences

**Table No.4: Amino Acid compositions of African Star apples seed (g/100g protein)**

| S.No | Amino Acid | Concentration |
|---|---|---|
| 1 | Leucine | 10.42 |
| 2 | Lysine | 5.05 |
| 3 | Isoleucine | 2.51 |
| 4 | Phenylalanine | 2.58 |
| 5 | Tryptophan | 1.00 |
| 6 | Valine | 3.79 |
| 7 | Methionine | 1.90 |
| 8 | Proline | 3.46 |
| 9 | Arginine | 5.92 |
| 10 | Tyrosine | 2.40 |
| 11 | Histidine | 2.54 |
| 12 | Cystine | 1.31 |
| 13 | Alanine | 4.90 |
| 14 | Glutamic acid | 12.65 |
| 15 | Glycine | 40.16 |
| 16 | Threonine | 3.09 |
| 17 | Serine | 3.95 |
| 18 | Aspartic acid | 10.24 |

## CONCLUSION

The present study has shown that the seed examined have high content of crude protein, fibre and fat with low carbohydrate content. The ash contents were of moderate values, the seed also contained good minerals with abundance of them in potassium, sodium, phosphorus, and calcium while they were least in copper, magnesium and manganese. The result suggest that the sample if consume in sufficient amount would contribute greatly towards meeting human nutritional requirement for normal growth and adequate protection against diseases arising from malnutrition.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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