International Journal of Food Science and Nutrition
ISSN: 2455-4898; Impact Factor: RJIF 5.14
Received: 21-03-2020; Accepted: 26-04-2020; Published: 29-04-2020
www.foodsciencejournal.com
Volume 5; Issue 2; 2020; Page No. 113-115

Nutritional and elemental composition of awara (soya bean cake) snack eaten in northern Nigeria

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Abstract
Awara, a soy bean cake and a popular snack of people in Northern Nigeria was analyzed for its nutritional and elemental composition. This was with the view of ascertaining its nutritive, mineral or elemental values. Proximate analysis (moisture content, ash content, crude protein, crude fat and crude fiber) were determined by standard methods. Total percentage carbohydrate was determined by the difference method. Additionally, the mineral contents of the soya bean cakes were determined by atomic absorption spectrometry for Fe, Zn, Ca, and Mg while flame photometry was used for Na and K and spectrophotometry method for P. The results obtained showed that the awara snack had a protein value of 30.58%, crude fat, 24.60% and carbohydrate, 27.50%. The moisture and ash contents were also found to be 9.17 and 3.23% respectively. On the mineral compositions, the results revealed that the snack had concentrations of Ca, Mg, Na, P, K, Fe, Zn and Mn to be 256.81, 194.93, 2.88, 450.11, 269.09, 13.54, 2.13 and 0.50 mg/100g respectively. The results were indicative of a significantly high protein, fat and carbohydrate content. The mineral compositions were also comparatively high and the awara snack as a whole was concluded to be generally very high nutritionally and its consumption should greatly be encouraged.

Keywords: awara, soya beans, snack, nutrition, spectrometry

1. Introduction
Soya beans or Soy beans cake, popularly called 'Awara' in northern Nigeria is a cheap source of protein especially in the menu of resource-poor classes of the northerners. It can also be taken at any time of the day as a snack, usually made from soya beans.

Soya beans is a common legume in northern Nigeria. It is an indigenous tropical legume which serves as a dietary protein sources for a large number of people especially children (Aletor and Ojelabi, 2007) [1]. People who follow a vegetarian diet use soya beans to replace meat as a meat-analogue recipes in the form of soya flour, soya protein concentrate, and soya protein isolate. Soya ingredients are the most commonly used in meat analogues because of their characteristic functional properties, such as water-holding, gelling, fat-absorbing, and emulsifying capacities. Soya flour is the least-processed of soybean protein products. In the market, there are several types of flours available such as full-fat, defatted, toasted flour, etc. (Geerts *et al.,* 2018; Goot *et al.,* 2016) [2, 3].

Soya bean is an excellent source of protein (35-40%). The soya bean seed is the richest in food value of all plant foods consumed in the world (Kure *et al.,* 1998). It is used in the production of bread as composite flour (Dhingra *et al.,* 2002) [6]. Soya bean is used by leading infant food manufacturers in the country because of its high nutritional value. Soya bean is also processed into flour and its oil is used in local paint, cosmetics and soap making industries (Basman *et al.,* 2003) [7]. Soya bean is consumed in Nigeria as soya milk, the cake is used for livestock feeding and the flour is added to corn pudding as food for infant and children. Soya bean is a widely used, inexpensive and nutritional source of dietary protein (Basman *et al.,* 2003) [7].

Soya beans promote good health and are very rich in protein, giving them nutritional values. Some people can drink them in milk alternatives, take them in the form of supplements, consume them as cake as in Awara. Oil may also be industrially extracted from soya beans and used as an economically friendly fuel, as well as engine lubricants. (Natalie, 2019) [4].

Soya beans is a complete protein. This means that it contains all nine essential amino acids. It is an important source of protein for many people especially those who follow a vegan or vegetarian diet. According to the United States Department of Agriculture (USDA), 100 g of cooked soya beans without salt contains; 141 kilocalorie, 12.35 g of protein, 6.4 g of fat, 11.05 g of carbohydrate and 4.2g of fiber. Soya beans are low in saturated fat and high in protein, vitamin C, and folate. They are also good sources of calcium, potassium and thiamin. (Natalie, O., 2019) [4].

The objective of this research work is to determine the nutritional composition and minerals of importance of the regularly consumed snack of soya.

2. Materials and Method
2.1 Sample collection
Soya beans seed were purchased from Lafia Modern market, stored in an air tight polythene bag and transported to the laboratory for identification, authentication, preparation and analysis at Faculty of Agriculture, Nasarawa State University, Shabu-Lafia Campus, Nasarawa State.

2.2 Preparation of Awara
The soya beans were carefully selected and sorted to remove the immature and bad seeds to avoid contamination. Exactly 500g of the soya beans was soaked for 3 hours with de-ionized water in a clean plastic container, washed and ground to paste using an electric blender. 3mL palm oil and 70 mL deionized water was added to the paste and was stirred to obtain a homogeneous mixture, and sieved to separate the chaff from the soya milk. The soya milk was

heated to boil on a heating mantle at 80ºC for 25 minutes. 2 g of NaCl was melted in 10 mL deionized water, and transferred into the boiling soya milk. 2 g of grated pepper (*Capsicum spp.*) (optional) was also added, then the heat source was disconnected and the boiled soya milk was allowed to cool for about 10 minutes. The coagulated milk was sieved with a 0.5 mm mesh and water was drained off it through continuous sieving. The coagulated soya beans were then cut into smaller pieces and fried in a hot oil till it turns light brown color.

2.3 Proximate Analysis of Awara

The moisture content, ash content, crude protein, crude fat and crude fiber were determined by standard methods (AOAC, 2000) [8]. Total percentage carbohydrate was determined by the difference method. This method involved adding the total values of crude protein, crude fat, crude fiber, moisture and ash constituents of the sample and subtracting it from 100. The value obtained was the percentage carbohydrate of the sample. The calorific and fatty acid values were respectively determined from the evaluations;

Calorific value (kcal/100g) ((carbohydrate x 4) + (crude lipid x 9) + (crude protein x 4))

Fatty acids (0.8 x crude fat/lipid).

2.4 Minerals Analysis

Mineral contents of soya bean were determined by atomic absorption spectrometry (Fe, Zn, Ca, and Mg), flame photometry (Na and K) and spectrophotometry (P), according to standard methods (AOAC, 2003) [9].

3. Result and Discussion

Table 1: Proximate Composition of the soya bean cake

Composition	Value
Moisture	9.17 (%)
Ash	3.23 (%)
Crude protein	30.58 (%)
Crude fat/oil	24.60 (%)
Crude fiber	4.92 (%)
Carbohydrate	27.50 (%)
Calorific Value	453.72 Kcal/100g
Fatty acids	19.68 (%)

Table 2: Mineral composition of the soya bean cake

Composition	Value (mg/100 g)
Ca	256.81
Mg	194.93
Na	2.88
P	450.11
K	269.09
Fe	13.54
Zn	2.13
Mn	0.50

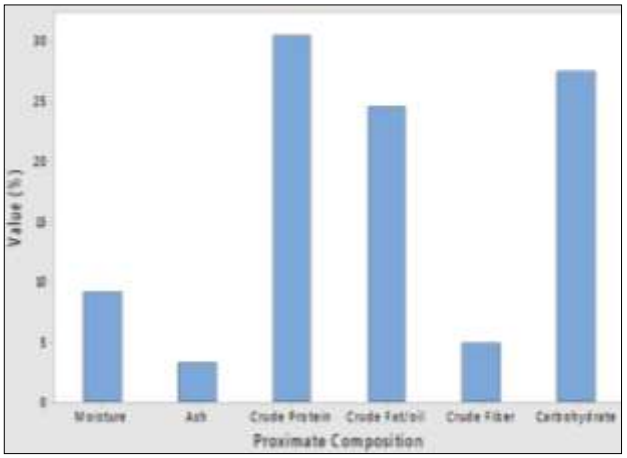

Fig 1: Proximate Composition of Awara Snack

Table 1 and figure 1 shows the proximate composition of the soya bean cake or snack. The result showed that the snack was rich in nutrients with protein (30.58 %), crude fat (24.60 %) and carbohydrate (27.50 %) respectively. The moisture content was found to be 9.17 %. The value for moisture content was higher than the value reported by Etiosa *et al.*, 2017. The slight difference in values may be due to the processing methods. The ash content (3.23%) was also higher than the 2.0% reported by Aletor and Ojelabi (2007) [1]. The low ash content in the bean cake indicated that the total inorganic matter and mineral content maybe low.

From the chart, the snack was generally of a high nutritional value since the percentage of crude protein, carbohydrate, crude fat/oil were comparatively high. Similarly, the percentage moisture, ash and crude fiber contents were significantly good.

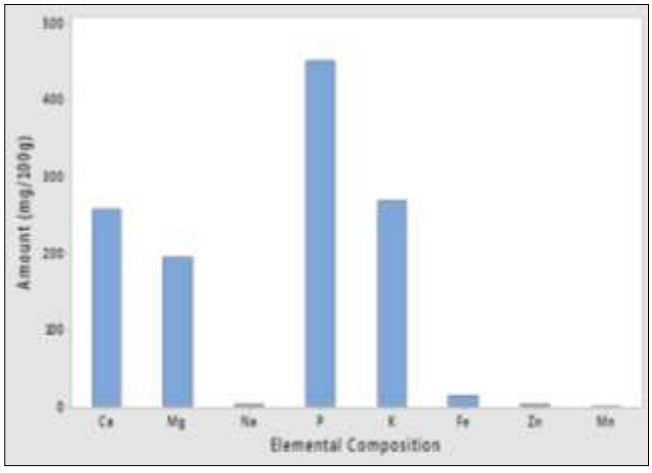

Fig 2: Elemental Composition of Awara Snack

Table 2 and figure 2 shows the elemental/ mineral composition of the snack. Phosphorous, potassium, calcium

and magnesium were between 195-450 mg/100g of the snack which is significantly high. The amount of Iron, sodium, zinc and manganese ranged between 0.50-14.0 mg/100g of the snack. Though these figures were less than those for P, K, Ca and Mg, they are however significant because they are required in trace amounts in the body.

Table 1 also shows the evaluated total calorific value and the fatty acid contents of the awara snack to be 453.72 kcal/100g and 19.68 % respectively. The high calorific content is indicative that the snack is highly nutritious and would be a good food supplement for Ca, K, Mg and P.

4. Conclusion

The Awara snack characterized showed the presence of proteins, carbohydrates, fats/oils, fibers and mineral elements such as Ca, Na, P, K, Fe, Zn, Mn and Mg. Generally, the amount of protein > carbohydrate > fats & oil > fibers. As regards the mineral elements, P > K > Ca > Mg > Fe > Na > Zn > Mn.

The results generally showed that the snack was not only highly nutritive for proper body growth and development but could also be used as a food supplement such as calcium for strong bones and teeth as well as provision of the other dietary elements for optimal health. Its consumption is therefore encouraged, more so, it is cheap to prepare.

5. Acknowledgment

The Authors would like to thank the management and entire staff of the analytical laboratory services of the Faculty of Agriculture, Nasarawa State University, Lafia Campus, for sponsoring the analysis and provision of reagents.

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