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Proximate Composition and Some Mineral Elements Content of Calabash (*Leginerea vulgaries*) Seeds

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ABSTRACT

Proximate composition, some mineral elements and crude fibre content of *Leginerea vulgaries* (calabash) seeds were determined. Na and K were estimated using flame photometer, Ca and Mg were determined titrimetrically and the rest elements were estimated by atomic absorption spectrophometric method. Standard analytical methods were used to determine proximate composition and crude fibre. The results (in g/100g sample) obtained were 1.8±0.14 for moisture, 14.3±0.14 for crude protein and 67.5±3.53 for crude lipid. Others were total carbohydrate (7.65±0.99), ash (8.75±1.77), crude fibre (3.25±1.06) and caloric value (695.30kcal/100g). The seeds are rich in K (2025mg%) and Na (700mg%). Ca, Mg, Cu, Zn, Fe and Mn were 205mg%, 260mg%, 3Omg%, 63mg%, 250mg% and 175mg% respectively. It may be important to study the availability and nutritional quality of the nutrients in this seed for possible inclusion in humans and animal feeds.

INTRODUCTION

Seeds of edible grain legumes are utilized in a variety of ways; the actual nutritional value of seeds may be influenced by the way they are actually used (Smartt, 1990). Food legumes containing two or three times the amount of protein in cereal offer the most practical means of eradicating protein malnutrition of the cereal-based diet of the populations of Mediterranean areas (Bahl, 1988). Imported protein supplements like soybean meal and many species of legumes that are potentially adapted to the dry land agricultural regions of Tropical countries are used in diets of humans, poultry and highly producing ruminants. Continuous efforts are in progress to achieve improvements in the yield and use of leguminous crops, which would result in greater availability of protein leading to reduction in imports of protein supplements (Gatel, 1994). *L. vulgaries* is an oily leguminous plant cultivated in some part of Northern Nigeria for the ball-like "fruit" which is used as household container. In the Northwestern states of Nigeria it is planted between August and October. The seeds are used in the study area as source of oil and the lipid free extract is used to feed animals or processed into cake for human consumption.

The importance of evaluating the nutritional value of this seed starting with the proximate composition, energy value and some important mineral element content cannot be over emphasized. The present paper reports data on the proximate composition, energy value, fibre content and some mineral elements composition of this important oil seed.

MATERIALS AND METHODS

Plant Materials

The seeds of *Leginerea vulgaries* were obtained from Gayari in Gummi Local Government Area of Zamfara State in April 2001. The plant material was identified by the villagers as calabash (*koriya*, its name in Hausa, the local dialect) and authenticated as *Leginerea vulgaries* in the Herbarium of the Botany Unit of the Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria.

Chemicals and Reagents

All the chemicals and reagents used for this work were of analytical grade. Boric acid catalyst was purchased from May and Baker Laboratory Chemicals, England. All other chemicals were purchased from BDH Chemicals Ltd, England.

Proximate Chemical Analysis of the Seeds

The Moisture content was determined as the difference in weight before and after drying to a constant weight in a drying cabinet set at 70°C (AOAC, 1975). Crude fat content of the seeds was estimated by repeated extraction of the sample with petroleum ether in a soxhlet extractor. At the end of the extraction the thimble and its content was dried at 60°C to a constant weight. The difference in weight of the dried sample before and after extraction was taken as the weight of the crude fat (AOAC, 1975). Crude protein was determined using Micro-Kjeldahl method (AOAC, 1975). The ash content of the seeds was determined by incinerating a known weight of the dried sample in a Muffle Furnace at 600°C for 20hours (AOAC, 1975). The total carbohydrate was calculated by subtracting the values of crude protein, crude fat

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and ash from 100g of the dried sample (AOAC, 1975). The caloric value of the seeds was calculated based on the Atwater conversion factors of 4, 4, and 9 for crude protein, total carbohydrate and crude fat respectively (AOAC, 1975). Crude fibre was determined according to the method described by AOAC (1975).

Estimation of Mineral Element Composition

Known weight of the dried, ground sample was completely digested (wet ashing) by Micro-Kjeldahl method (AOAC, 1975). The solution obtained was used for mineral element determination. Calcium and magnesium were determined by titrimetric method. Sodium and potassium were estimated by flame photometric method. Copper, zinc, iron and manganese were determined using Atomic Absorption Spectrophotometric (AAS) method.

RESULTS AND DISCUSSION

The results of the proximate composition of calabash seeds and the crude fibre content are presented in Table 1. The results are presented as mean ± standard deviation of five different determinations.

Table 1. Proximate Composition and Fibre Content of Calabash Seeds

Parameter	Composition
Moisture	1.8±0.14
Crude protein	14.3±0.14
Crude lipid	67.5±3.53
Total carbohydrate	7.65±0.99
Ash content	8.75±1.77
Crude fibre	3.25±1.06
Caloric value (Kcal/100g)	695.30

In the current study the crude lipid content of *L. vulgaries* is about 68% of the dry weight of the seed, indicating that the seed is a very rich source of crude lipid. Ground nut seeds also an oil leguminous seed was reported to contain 27% protein, 45% crude lipid and 10% carbohydrate. Other oil rich crop plants found readily in this part of the world include *Glycine* max (Cheema *et al*, 1991), *Sesamun indicum* (Alan, 1989) and melon. In the North Western region of Nigeria, *L. vulgaries is* cultivated for the purpose of obtaining calabash that is used as container for varying purposes. These "plates" are use to serve *nono* (fermented milk), *fura* (malted millet porridge mixed with milk) and for various household chores among others. Because of the realization of the high lipid content of the seeds, however, the local population around Gummi area of Zamfara State extracts oil from the seed for human consumption. The residue is used for feeding animals or transformed into cake similar to ground nut cake and use for human consumption. Though the carbohydrate and protein content of the seeds are about 9 and 14% respectively, the lipid free residues may contain up to 24 and 44% respectively. This compared favourably with groundnut cake, which is about 40% crude protein of the lipid free residue (Fielding and Matheron, 1991). The protein content of the calabash seed cake is higher than that of cottonseed, sunflower, and palm kernel cakes (Fielding and Matheron, 1991). The significance of this result cannot be overemphasized. The calabash cake may therefore serve as good source of protein for formulating animal feeds for the growing animal and poultry production especially in the tropics.

L. vulgaries being a very rich source of crude lipid may serve as a good source of raw material for industrial production of oil and oil products, including margarines. Crude lipid is usually a combination of neutral fats, fatty acids, steroids, fat soluble vitamins, carotenoids and other fat soluble fractions of plant materials; as such the concentration of these compounds in calabash seed may be studied for possible extraction.

The fibre content of *L. vulgaries* is low (3.25±1.06) but is comparable to the fibre content of *Glycine max* (5%) (Smith, 2001). The need for fibre as the source of roughages for both man and mono-gastric animals cannot be overemphasized. The bulking effect of fibre in the diet especially its effects on stool volume, softness, frequency and regularity are thought to be due to its water holding capacity (Okaka *et al*, 1992). The metabolisable energy (caloric value of about 700Kcal/100g) is high because of the high lipid content of the seeds. This value compare well with the values for groundnut (Smith, 2001). The metabolisable energy of this seed is about twice and thrice the values of maize and soya bean meal respectively (Smith, 2001). Increased concentration of energy in diet decreases food intake. Provided the diet is adequate in other essential nutrients this may have the advantage of reducing cost especially in animal production (Smith, 2001).

The result of some mineral element composition of *L. vulgaries* is presented in Table 2

Table 2. Mineral Element Composition of Calabash Seeds

Element	Amount (mg%)
Sodium	700±24.1
Potassium	2025±35
Magnesium	260±23
Calcium	205±7.0
Copper	30±3.2
Zinc	63±18
Iron	250±27
Manganese	175±13.5

The mineral element composition of calabash seeds indicated that potassium is highest (2025mg%). Mg, Ca and Fe are between 10 and 12% of the value for K. Sodium content of the seeds is about 34% of the value for Potassium. The Cu (30mg%), Mn (175mg%) and Zn (63mg%) contents of *L. vulgaries* are equally high

Hadjipanayiotou and Economides (2001) reported that legume seeds were rich sources of K (1.22%) and P (0.52%) and their Ca content was only around 25 and 10% of their P and K content, respectively. Overall, food legumes were good sources of Ca (0.14%), P, Fe (123ppm) and Cu (15ppm).

The proximate composition and mineral element content of the seed of *L. vulgaries* indicated that the seed is a rich source of oil, protein and some mineral elements. It may be worthwhile to further study the quality and availability of these nutrients. This will provide an index to possible utilization of this foodstuff as sources of certain nutrients for humans and the growing animal productions in our communities.

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