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Nutritional Assessment and Chemical Composition of Raw and Defatted *Luffa cylindrica* Seed Flour

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Abstract

The raw and defatted *Luffa cylindrical* seed flours were characterized with respect to their proximate, mineral and energy using standard analytical technique. The range values of the proximate analysis for raw and defatted samples were; crude protein (42.17-70.65%), moisture (5.69-6.42%), fat content (1.53-33.64%), ash content (3.87-3.92%), crude fibre (1.95-2.80%), carbohydrate (12.68-14.68%) and the available energy range was (1507.53-2177.13KJ). The minerals determined and their range values in mg/100g for raw and defatted samples were; K (910-960), Na (28-31), Zn (0.86-1.50), Mg (16-18), Fe (4.67-6.23), P (680-660), Ca (40.24-43.44), Mn (4.20-4.47) and Cu (1.10-1.24). The results revealed that crude protein was higher in defatted sample. Therefore, the seed could play valuable roles as supplemental nutrient sources to some farm products used in food formulation for animal and human most especially in developing country where hunger is endemic.

Key Words: *Luffa cylindrical*, protein, mineral, defatted and energy.

Introduction

The significance of seed legumes in the diets of animal and man in the developing countries is well documented (Oke *et al*., 1995, Agbede 2000). They are rich in nutrients such as digestible proteins with good array of amino acids and minerals (Ologhobo 1980). The percentage crude proteins of most legumes ranged from 20 to 50g/100g dry weight (Apata, 1990, Igene 1999) and have been judged as good sources of minerals (Oke *et al*., 1995). Leguminous seed have been reported to be excellent sources of energy (Del Rosario *et al*., 1981, Oke *et al*., 1995) in animal and human diets. This explains why considerable research has been directed to harnessing the potential of the seed in animal and human diets.

Luffa cylindrical L. is a member of the family Cucurbitaceae. It is a running vine with rounded leaves and yellow flowers. It is an herbaceous plant and thrives commonly with twinning tendrils (Ajiwe *et al*., 2005). *Luffa cylindrical* produces berry like fruit whose colour at tender stage is green and yellow at maturity. The fruits are smooth and cylindrical in shape with white flesh. The length of the fruit is one to two feet. In Nigeria, *Luffa cylindrical* plant grows in the wild and abandoned building structures and fences walls in towns and villages (Dairo *et al*., 2007). The sponge in the whole fruit holds the seeds, as many as 20 to 30 together. The young fruit is used as a cooking vegetable although some Gardeners grow *Luffa cylindrical* for the fibrous interior only. The fibrous netting is an excellent sponge but there are also industrial applications such as water- filters (Dairo *et al.*, 2007). The leaves used in the treatment of diseases like anemia. A tea of the leaves is used as diuretic while juice of the fruits is used against internal hemorrhage. The seeds have laxative properties. The sponge is used in the rural areas of Nigeria for washing and scrubbing of households utensils while seed are discarded.

There is little information on the nutritional and chemical compositions of *Luffa cylindrical* seed. Therefore, this work seeks to study the proximate and mineral compositions of raw and defatted seed flours.

Materials and Methods

The *Luffa cylindrical* gourds used for this study were harvested between the months of December to January from an uncompleted building in Owo, Ondo State of Nigeria. The gourds were broken and the sponge removed. They were shaken to remove the seeds from the fibre mesh of the sponge manually. The seeds were further sundried, de-shelled, milled into flour. About 500g of the flour was de-fatted using normal hexane in soxhlet apparatus according to the methods of AOAC (1990).

Proximate analysis

The raw and de-fatted samples were analyzed for proximate composition using AOAC (1990) methods. Nitrogen was determined by the micro-Kjeldahl method (Pearson 1976) and the percentage nitrogen was converted to crude protein by multiplying a factor 6.25. The carbohydrate content was determined according to James (1996). All determinations were however carried out in triplicate.

Mineral analysis

Sodium and potassium were determined using flame photometer (Model 450, Corning UK). All other metals were determined by Atomic Absorption Spectrophotometer (Perkin-Elmer model 403, Norwalk CT, USA) (ASTM 1985). Phosphorous was determined by Vanado molybdate colourimeter method (James 1996).

Results and Discussion

Table 1 gives the proximate composition of raw and de-fatted *Luffa cylindrical* flour. The crude protein content for raw and defatted samples was 42.17±0.2 and 70.65±2.5 g/100g respectively. The desirable attribute of defatted sample was the high protein content; this might be due to the fact that more protein cells were opened during extraction process. However the values were high when compared with 20.40-22.40% reported for protein-rich-foods such as soybean, cowpea, pigeon peas groundnut and some oil seeds (Oshodi *et al.*, 1993). This is also higher than 24.70 reported for chickpea (Sanchez-Vioque e*t al.*, 1998).

However, the crude protein of raw sample was in agreement with the value reported by Olaofe *et al.*, (2008). Proteins are essential component of diet needed for the survival of animals and human and the basic function in nutrition is to supply adequate amount of amino acids (Pugalenthi *et al.*, 2004). *Luffa cylindrical* could therefore be used as alternative source of protein in diet supplement especially in the areas where majority of populace live on starchy food and cereals.

The moisture contents for raw and defatted samples were in the range of 5.69±0.50-6.42±0.4 g/100g. These values were higher than the 3.46% reported for gourd seed and *Bombcapsis glabra*, but compared with 5.02% reported for Pumpkin seed (Olaofe *et al.*, (1994). This is an indication that *Luffa cylindrical* seed might not be susceptible to microbial attack, thus, it can withstand long storage and transportation. The ash content ranged between 3.87g/100g for raw sample and 3.92g/100g for defatted sample. Ash content gives an idea about the inorganic content from where mineral content could be obtained. The ash content was moderate and similar to the values reported for some Nigerian grains (Oshodi and Adeladun 1991), and it compared favourably with the range value of 3.00-5.8% reported for those of legumes like cowpea, groundnut, and fluted pumpkin seed (Ayodele *et al*., 2000, Mbofung *et al*., 2002). This implies that the *Luffa cylindrical* seed could provide essential, valuable and useful minerals needed for good body development.

The fat contents for raw and defatted samples were 33.64±0.7 and 1.53g/100g respectively. The fat content in raw sample was in close agreement with 31.45% reported by Abitogun and Olumayede (2008). The fat content is higher than range values of 14.05-20.30% reported for soybean, locust bean and cotton seed, which are commercially exploited and classified as oil seed (Ayodele *et al*., (2000). The low fat content in defatted sample implies that, it could be used for preparation of animal feed. Nevertheless, *Luffa cylindrical* is a better source of oil and could be grouped under oil rich plant hence, could be refined to edible vegetable oil for domestic and industrial applications (Abitogun and Olumayede, 2008).

The crude fiber for both samples ranged between 1.95-2.80g/100g. Fibre is desirable in the maintenance of human health and has been known to reduce cholesterol level in the body (Eromosele and Eromosele 1993). The values were in close agreement with 2.8% reported for gourd seed but lower than 2.4% reported for soybean (Akintayo *et al.*, 2002). The low level of fibre in *Luffa cylindrical* indicates that it might be desirable in their incorporation in weaning diet. The carbohydrate content for raw and defatted samples was 12.68 and 14.68g/100g respectively. High carbohydrate feed is desirable; deficiency causes depletion of body tissue (Barker 1996). The carbohydrate content in raw sample was higher than 6.93% reported for pumpkin but lower than 33.00% reported for *Bombcapsis glabra* (Olaofe *et al.*, 1994).The low carbohydrate content of the sample might be ideal for diabetic and hypertensive patients requiring low sugar diets. The calculated metabolizable energy for raw and defatted samples was 2177.13KJ and 1507.22KJ respectively. This implies that the sample was concentrated source of energy within the recommended energy dietary allowance for children (Aremu *et al*., 2005). The value of raw sample was higher than 1595.34-1692.85 KJ for some legumes (Aremu *et al*., (2006).

Table 2 depicts the mineral composition of raw and defatted *Luffa cylindrca* flour. The minerals detected in the samples were Potassium, Sodium, Zinc, Iron, Magnesium, Phosphorous, Calcium, and Manganese. The most abundant minerals in both samples was potassium, the values obtained for raw and defatted samples were 910.00 and 960mg/100g respectively. This was followed by Phosphorous, the values ranged between 660.00- 680.00g/100g. The phosphorous content in raw sample was higher than 32.9±2.0 reported for whole cowpea. These values were in agreement with the report on some other legumes (Oshodi and Adeladun 1991). The values obtained for raw and defatted samples were; Sodium (28.00, 31.00g/100g), Zinc (1.50, 0.86g/100g), Iron (4.64, 6.23 g/100g), Magnesium (16.00, 18.00 g/100g), Calcium (40.24, 43.44 g/100g), Manganese (4.47, 4.20 g/100g), Copper (1.24, 1.10 g/100g). Calcium help in regulation of muscle contractions transmit nerve impulses and bone formation (Barker 1996). The recommended dietary allowance (RDA), for Calcium is 800mg/day (FNB 1974), which means that *Luffa cylindrical* might not be good source of Calcium. The presence of phosphorous, calcium and magnesium makes *Luffa cylindrical* seed flour suitable for bone formation since the deficiencies of these minerals can lead to abnormal bone development (Aletor and Aladetimi 1995). Iron is reasonably high which is required for blood formation and also important for normal functioning of the central nervous system. However, these values compares favourably with the values reported for pigeon pea by Oshodi *et al.*, (1993). The ratio of Na/K was less than one this implies that the samples will not promote high blood pressure. Food is considered “good” if the Ca/P ratio is above one and “poor” if it is less than one, therefore, the Ca/P ratio of both samples were less than one, this implies that the samples could be consider “poor”. The Ca/Mg ratio 2.50 for raw sample and 2.34 for defatted samples were higher than the recommended value of 1.00 (Adeyeye and Fagbohun 2005).

In conclusion, the results of the assessment shows that the seed can be classified as oil seed, and the defatted sample contains high percentage of protein indicating that it is a good source of protein. The results also confirm that it contain nutritionally valuable minerals such as Potassium, Phosphorous, Magnesium, Calcium and Iron. The seed flour could play valuable roles as supplemental nutrient sources to some farm product used in food formulation for animal and humans, most especially in developing countries where hunger is endemic.

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Table 1. Proximate compositions of raw and de-fatted *Luffa cylindrical* flour.

Parameters	**Raw g/100g**	**De-fatted g/100g**
Crude Protein	42.17±0.20	70.65±2.50
Moisture Content	5.69±0.50	6.42±0.40
Fat Content	33.64±0.70	1.53±0.20
Ash Content	3.87±0.10	3.92±0.50
Crude Fibre	1.95±0.20	2.80±0.07
Carbohydrate	12.68±0.70	14.68±0.34
Available Energy (KJ)	2177.13	1507.22

Mean ± Standard deviation of triplicates.

Table 2. Mineral composition of raw and defatted *Luffa cylindrical* Flour.

Minerals	**Raw mg/100g**	**Defatted mg/100g**
Potassium (K)	910.00	960.00

Sodium (Na)	28.00	31.00
Zinc (Zn)	1.50	0.86
Iron (Fe)	4.67	6.23
Magnesium (Mg)	16.00	18.50
Phosphorous (P)	680.00	660.00
Calcium (Ca)	40.24	43.44
Manganese (Mn)	4.47	4.20
Copper (Cu)	1.24	1.1
Na/K	0.03	0.04
Ca/P	0.06	0.07
Ca /Mg	2.50	2.34