

Original Research Article

Evaluation of the proximate contents of Bambara Groundnut *Vigna subterranea* (L.) Verdc) grown in Madobi LGA, Kano state, Nigeria

Abstract

Introduction: Evaluating the proximate composition of locally utilized crop with nutritional and industrial potentials is a timely gesture. **Aim:** The study was to determine the proximate contents of Bambara Groundnut (*Vigna subterranea* (L.) Verdc) grown in Madobi LGA, Kano state, Nigeria. **Design and Methodology:** Samples were collected from different localities of the LGA to constitute composite sample out of which representative sample was drawn for proximate composition evaluation according to standard methods of AOAC. **Results:** The Bambara groundnut grown in the study area show the mean percentage (%) protein (18.83 ± 0.49), lipids (7.05 ± 1.82), fiber (5.74 ± 1.09), carbohydrate (63.37 ± 2.57), moisture (12.59 ± 1.14) and ash (3.52 ± 0.22). The result indicates that Bambara groundnut grown in Madobi could be an excellent source of protein, lipid, carbohydrate and mineral elements. **Conclusion:** it can be concluded that Bambara groundnut grown in Madobi LGA, Kano State, Nigeria has nutritional potentials that can alleviate nutritional problems in the area and beyond when properly explored.

Key words: Bambara groundnut, Madobi LGA, proximate composition.

Introduction

Bambara groundnut (*Vigna subterranea* (L.) Verdc. or *Voandzeia subterranea* (L.) Thouars) is one of the most valuable food crops in Africa and other parts of the world and has been identified as the third most important grain legume in semi-arid Africa (Chomchalow, 1993). It is resistant to high temperature and is suitable for marginal soils where other leguminous crops cannot be

grown(Collison *et al.*, 2000). In addition, it makes very little demand on the soil and has a high nutritive value. For these reasons, it is not prone to the risk of total harvest failure even in low and uncertain rainfall. Due to its high protein value, it is a very important crop for poor people in Africa who cannot afford the expensive animal protein (Baryeh, 2001). It is a nutritionally balanced seed containing essential amino acids such as isoleucine, leucine, lysine, methionine, phenylalanine, threonine and valine (Ihekoronye and Ngoddy, 1985; Alhassan *et al.*, 2013). Large seeds are preferred over smaller ones, e.g. for use as snack and smaller seeds are ground into flour for use in various recipes.

Bambara groundnut is a leguminous plant, often considered an inferior food eaten by peasants, described as being ‘poor man’s meat’. They never assumed the importance of a staple food as did the cereal crops like wheat, rice, maize, or barley. Yet, they play an important synergistic role with staple foods both in meeting nutritional requirements and fertilizing the soil (Young, 1991). Of all foods, legumes most adequately meet the recommended dietary guidelines for healthful eating. They are high in carbohydrate and dietary fiber, mostly low in fat, supply adequate protein while being a good source of vitamins and minerals (Messina, 2000). The importance of grain legumes in the world is high due to their significance in human and animal nutrition. Legume seeds can also become an industrial raw material with a wide range of non-food applications (Kozłowska *et al.*, 1998). This work is aimed at determining the proximate contents of Bambara groundnut grown in Madobi LGA, Kano state, Nigeria.

Materials and Methods

Material:

Reagents used such of analytical grade obtained SIGMA chemical company includes; Concentrated Sulphuric acid, Concentrated Hydrochloric acid, Concentrated Nitric acid,

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Boric acid, Sodium hydroxide pellets, Methyl red, Sodium chloride, Potassium chloride, Chloroform and Methanol.

Equipment used ~~are~~ includes; Weighing balance (Mettler Toledo), Top loading balance (pm – 16 – K), Hot air oven (Kotterman D3165), Spectrophotometer (Spectrum Lab 752s).

Sample collection and preparation

The sample of Bambara Groundnut ((*Vigna subterranea*(L.) Verdc) used in this research was collected from different farmers in Madobi LGA, ~~of~~ Kano state, Nigeria, to constitute a composite sample. Representative sample (1 kg) was dried and the seeds were removed from the hulls and brought to the Biochemistry laboratory, Bayero University Kano. The sample was ground to powder and stored in plastic container.

Determination of proximate composition

The proximate composition of Bambara groundnuts were analyzed using the methods described in AOAC (2005).

Principles of the proximate content determination:

For moisture it involves the measurement of weight ~~lost~~ loss due to evaporation of moisture in hot air oven and the weight ~~lost~~ loss after drying to a constant weight. ~~gives the quantity of the samples' moisture content,~~ ash Ash content was determined by igniting a known amount (5.0g) of dried material – (moisture free) in a muffle furnace. This is based on the fact that all organic matter can be eventually burnt to produce water and carbon (IV) oxide. For crude Fat, the dried sample was placed in continuous extractor (soxhlet) and subjected to extraction with acetone. The organic soluble substances thus removed are collected in a flask, dried and weighed. For Carbohydrates content, the digestible carbohydrate content the sample involves mainly free sugars, oligosaccharides and some polysaccharides are first hydrolyzed into their

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constituent monosaccharides by the use of acids. The monosaccharides are then extracted and reacted with anthrone to form a complex which absorbs at 620nm (Pomeranz and Meloon, 1978). Crude Protein was determined from the total nitrogen content of the sample, which is mainly from the protein and other non-protein nitrogenous compounds such as amides and ammonium compounds, the crude protein content is obtained by multiplying the nitrogen content of foods by 6.25.

The equation for the digestion, distillation and the titration processes are:



Results and Discussion

The proximate contents are presented in ~~table~~Table1. The parameters determined includes; moisture, ash, protein, lipid, fiber and carbohydrate. The result showed that Bambara groundnut is an excellent source of protein, fiber and carbohydrate. The amount of fiber determined is of interest (~~table~~ Table 1).

Table 1: Proximate contents of Bambara groundnut grown in Madobi LGA town, Kano state, Nigeria

Parameters	% proximate contents
Moisture	12.59±1.14
Ash	3.52±0.22
Protein	18.83±0.49
Lipid	7.05±1.82
Fiber	5.74±1.09
Carbohydrate	63.37±2.57

The estimated values are MEAN ± SD, n = 5.

Discussion

The moisture content of the Bambara groundnut grown in Madobi LGA found in this study agrees with that obtained by Duplex *et al.* (2004), who established a moisture content of 10.55 – 11.11% in flour of four cultivars of Bambara groundnut, and that of Yetunde *et al.* (2009) who found moisture content of 11.09% in Bambara groundnut. The ash content of 3.52±0.22 also agreed with report of Ahmed *et al.* (2010) (3.63%). The results also showed that Bambara groundnut produced in the study area contain appreciable amount of protein. The protein composition obtained is similar to those of Ferial and Azza (2011) and Duplex *et al.* (2004) with 17.70±0.44 and 18.83±0.30% values respectively. In terms of lipid composition the result obtained (7.05±1.82%) support those of Duplex *et al.* (2004) (7.71%) and Nwodo and Obinna (2011) (7.35±0.02). and it however contradicts report by Dillon (1985) that the fat content of most grain legumes do not exceed 3g/100g. Bambara groundnut may be the best among legumes in terms of fats content and may provide right amount of fat in the diet. The fiber content of (5.74±1.09) is similar to those obtained by Yetunde *et al.* (2009) (5.12%) while carbohydrate composition obtained (63.37±2.57) was similar to that of Duplex *et al.* (2004) (67.55±1.44). The results

indicates that Bambara groundnut is an excellent source of protein, lipid, carbohydrate and dietary fiber, which people that cannot afford animal protein can resort to. Nwodo and Obinna (2012) reported that Bambara groundnut is an important food source that can be exploited particularly in the developing countries where there is shortage of animal protein and under nutrition. The combinations of plant proteins can provide adequate and balanced mixture of essential amino acids (Nwodo and Obinna, 2012; Alhassan *et al.*, 2013).

The amount of fiber and carbohydrates observed in this study was also appreciable. Though dietary fibers cannot be digested by human beings, they have useful roles in providing roughage that aids digestion (Eva, 1983). Dietary fibers reduce the risk of cardiovascular diseases caused by high cholesterol level, by decreasing cholesterol levels in the body (Anderson *et al.*, 2009). Some types of soluble fibers bind to bile acids in the small intestine, making them less likely to enter the body. This in turn reduces cholesterol levels in the blood (Anderson *et al.*, 2009). Viscous soluble fibers may also attenuate the absorption of sugar, reduces sugar response after eating, normalizes blood lipid levels and, once fermented in the colon, produce short-chain fatty acids as by-products with wide-ranging physiological activities. Insoluble fiber is associated with reduced risk of diabetes, but the mechanism by which this occurs is unknown (Weickert and Pfeiffer, 2008). One type of insoluble dietary fiber, resistant starch, has been shown to directly increase insulin sensitivity in healthy people (Robertson *et al.*, 2003; Robertson *et al.*, 2005) in type 2 diabetes (Zhang *et al.*, 2007), and in individuals with insulin resistance, possibly contributing to reduced risk of type 2 diabetes and also reduces the risk of development of obesity (Johnston *et al.*, 2010; Maki *et al.*, 2012; Robertson *et al.*, 2012). The role of dietary fiber in reducing the risk of obesity is related to its unique physical and chemical properties that aid in early signals of satiation and enhanced or prolonged signals of satiety.

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Base on this study, Bambara groundnut may be used by people with diabetes and obesity, by virtue of its protein, and fiber contents. The relatively high carbohydrate content may not have significant ~~in fact~~ effect due to the fiber content, which can weaken the absorption of sugar, reduces its (sugar) response and increase insulin sensitivity. More research should therefore be carried out in order to determine the glycemic index of whole Bambara groundnut and as recipe. The finding may therefore change the neglecting attitude toward Bambara groundnut to improve production, utilization and industrialization.

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