



Proximate, Vitamins and Mineral Compositions of Locust and Soya Beans-Based *Daddawa* sold in Kano Metropolis, Kano, Nigeria

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Abstract

In this research, comparative analysis of the proximate, elemental and vitamins A and C compositions of two local condiments; locust bean-based *daddawa* and soya bean-based *daddawa* sold in Kano metropolis, north western Nigeria were carried out. The result of proximate analysis indicated higher carbohydrate, fat and ash contents in locust bean-based *daddawa* compared to soya bean-based *daddawa*. However, the protein, fiber and moisture contents were significantly higher in soya bean-based *daddawa* ($P < 0.05$). The elemental analysis revealed higher values of sodium < iron < calcium < copper in locust bean-based *daddawa*. While potassium < zinc contents were higher in soya bean-based *daddawa* ($P < 0.05$). Vitamin A content was found to be statistically higher in locust bean-based *daddawa* relative to soya bean based *daddawa* ($P < 0.05$). However, vitamin C content was higher in soya bean-based *daddawa*. Due to its good nutritional index and flavour enhancement, consumption of *daddawa* may therefore be a useful strategy to overcome protein energy malnutrition especially in rural areas where malnutrition is common.

Keywords: Locust Bean-Based *daddawa*, Soya Bean-Based *daddawa*, Proximate, Vitamins, Mineral Elements, Food additive

Introduction

Food additives are substances that become part of a food product when they are added during the processing or making of that food. They often add nutrients, help process or prepare the food, and make the food more appealing.^[1] They are primarily used for flavouring, colouring, garnishing or preserving food.^[2] Most of the man-made food additives are produced by fermentation process. Fermentation is one of the oldest methods of food processing and preservation known to man.^[3] In Africa, the art of fermentation is wide-spread including the processing of seeds, fruits and non alcoholic beverages.^[4] Food fermentation is basically aimed at producing important nutrients or eliminating anti-nutrients. This is necessary therefore to improve the prevailing

cases of malnutrition in Nigeria and other sub-Saharan countries.^[5] Various types of condiments which are products of fermented seeds that are in use in Africa and some other parts of the world depending on the available raw materials and cultural background include; *Kinema* in Nepal^[6], *Tooa-nao* Thailand^[7], *Oso* in south western Nigeria^[8] and *Soumbala* in Burkina Faso.^[9]

Locust beans cake, a popular food additive in Nigeria is a type of fermented and processed locust beans (*Parkia biglobosa*) or Soya beans (*Glycine max*) used as a condiment in cooking. Locust beans cake is known as *Iru* by Yoruba people and *Daddawa* in Hausa land. It is used in cooking traditional soups like *Egusi* soup, *Okro* soup and

Ogbono soup. It has a black appearance and a strong pungent smell.^[10, 11]

In Kano, northern Nigeria, *daddawa* is one of the most fully exploited traditional additives, used almost every day; in most food preparations, for its aroma and flavouring enhancing effects. Apart from serving as a food additive that enhances the organoleptic properties of the food, *daddawa* may also serve as a source of proteins; especially soya beans based *daddawa* which is rich in protein contents.^[12] Even though used in small quantity, *daddawa* can augment and enrich the diet and can also be recommended to people who suffer from protein energy malnutrition in the absence of protein rich diet, particularly in Africa and some parts of Asia. In general, both locust beans and soya beans-based condiments are organoleptically similar.^[12, 13] However, the popularity of soya bean *daddawa* is marred by the perception that it is prone to faster deterioration than locust bean *daddawa*; at the end of the fermentation period.^[8] Indeed, method of fermentation and handling after processing may in general interfere with nutritional properties of the condiments. In view of this, this research is geared towards providing some nutritional insight of the two condiments popularly sold in Kano metropolis, Kano, Nigeria.

Materials and Methods

Sample Collection and Preparation

The locust beans and soya beans-based *daddawa* were obtained from Rimi market in Kano metropolis, Kano state, Nigeria. The samples were identified and authenticated at the Unit of Nutrition and Dietetics, Department of Biochemistry, Bayero University, Kano, Nigeria. The samples were oven-dried and ground into powder and used for analyses.

Methods

The proximate and elemental analyses of locust beans and soya beans-based *daddawa* were carried out using the method of AOAC.^[14] Determination of vitamins C and A were carried out using the method of Rutkowski and Grzegorzczak.^[15]

Statistical Analysis

Data were analysed using Graph ad In stat 3 statistical software (2000) version. Values with $P < 0.05$ were considered statistically significant.

Results

The results of proximate composition, vitamins A and C content, sodium and potassium levels and calcium, zinc, copper and iron concentrations of locust beans-based *daddawa* and soya beans-based *daddawa* sold in Kano metropolis are presented in figures 1, 2, 3 and 4 respectively.

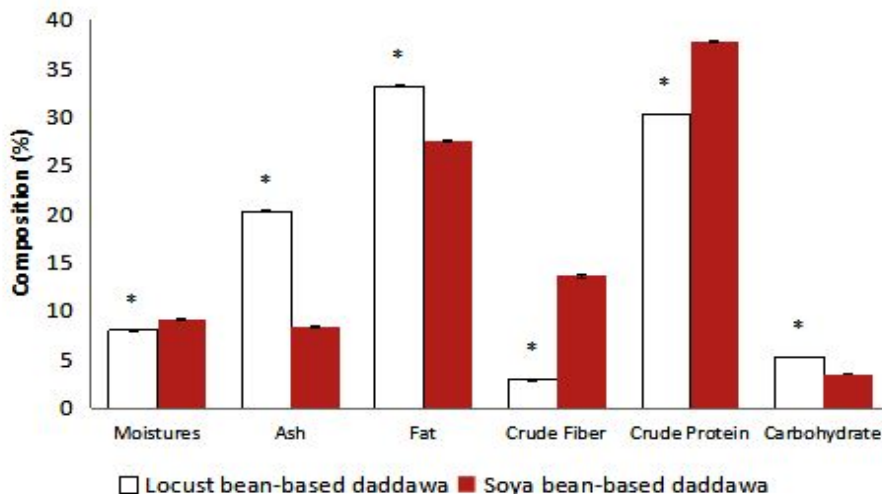


Figure 1: Proximate Composition of Locust Bean-Based *Daddawa* (LBB) and Soya Bean-Based *Daddawa* (SBB) (Values are expressed as mean \pm Standard deviation of triplicate determinations.

*' indicates statistical difference when LBB was compared with SBB at $p < 0.05$)

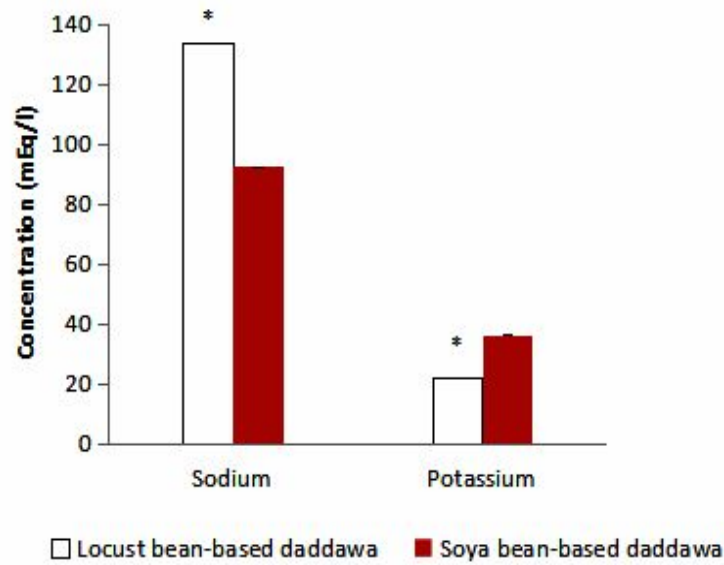


Figure 2: Vitamin C and A Concentrations in Locust Bean-Based Daddawa (LBB) and Soya Bean-Based Daddawa (SBB)

(Values are expressed as mean \pm standard deviation of triplicate determinations.

* indicates statistical difference when LBB was compared with SBB at $p < 0.05$)

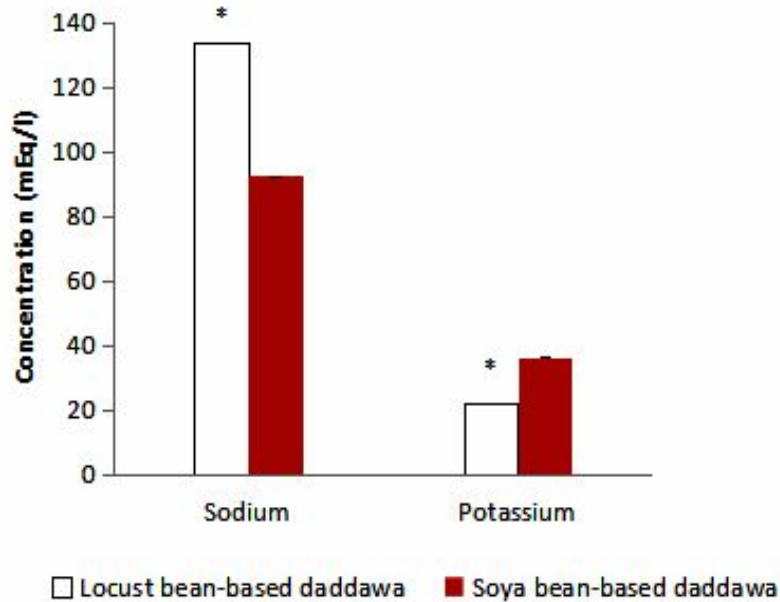


Figure 3: Sodium and Potassium Concentrations in Locust Bean-Based Daddawa (LBB) and Soya Bean-Based Daddawa (SBB)

(Values are expressed as mean \pm standard deviation of triplicate determinations.

* indicates statistical difference when LBB was compared with SBB at $p < 0.05$)

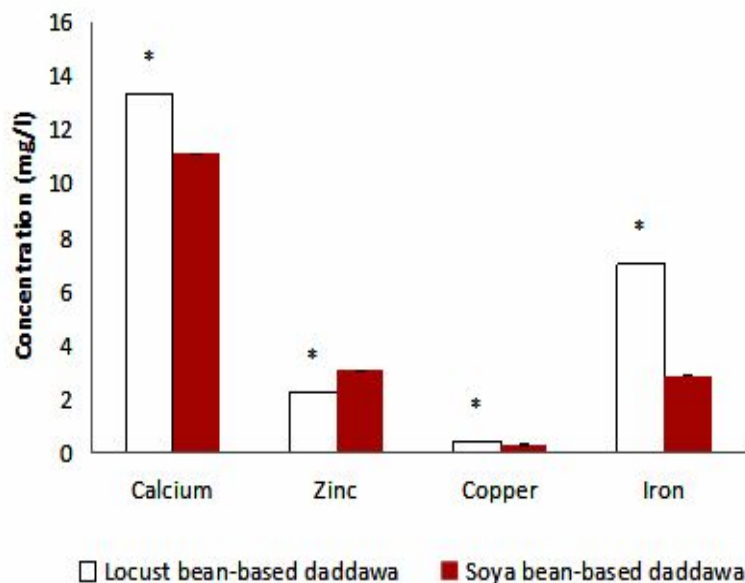


Figure 4: Calcium, Zinc, Copper and Iron Concentrations in Locust Bean-Based *Daddawa* (LBB) and Soya Bean-Based *Daddawa* (SBB) (Values are expressed as mean \pm standard deviation of triplicate determinations.

* indicates statistical difference when LBB was compared with SBB at $p < 0.05$)

Discussion

Proximate Analysis

The proximate analysis showed that all the two condiments have high moisture content, particularly the soya beans *daddawa*, which can encourage microbial growth and enhance spoilage by organisms such as bacteria and fungi, if not properly stored, although, it was previously reported by Kolapo *et al.* [16] that fatty acids content in soya bean *daddawa* are more likely to deteriorate faster than those of locust bean *daddawa*. The fiber and protein contents were higher in soya bean *daddawa* relative to locust bean *daddawa* as previously reported by [12, 17, 18] Dietary fiber is important in regulation of digestion and intestinal absorption of nutrients, indirectly preventing obesity. [19, 20] Protein is critical in both biochemical and physiological processes. Hence *daddawa* may serve as a source of protein in the diet of a poor family especially in rural areas [11] where protein energy malnutrition is common. The carbohydrate and ash contents of locust bean *daddawa* were higher than those of soya bean *daddawa*. These values were in conformity with

Ikenebomeh *et al.* [10] Carbohydrate and fat are respectively the primary and secondary sources of energy to the biological systems.

Vitamins

Locust and soya beans-based *daddawa* appear to have an appreciable amount of vitamins A and C. The higher content of vitamin A in fermented food substrates could be attributed to the fermentation processes carried out by microbial contents as previously reported by Steinkraus. [5] Vitamin A helps in reproductive process, maintenance of good eye sight and enhances resistance to infections while vitamin C is critical in collagen synthesis, antioxidant property, maintenance of connective tissues and promoting the process of wound healing. [21, 22, 23] Locust bean *daddawa* has the highest fat content, which also makes it a source of fat soluble vitamins.

Mineral Element Analysis

Minerals and trace metals are required in humans in trace amounts to maintain good health and excess of

it might be toxic.^[24] The analysis of mineral compositions of locust bean-based *daddawa* indicated high contents of sodium, calcium, copper and iron compared to soya bean-based *daddawa* in which potassium and zinc contents were higher. The higher content of most mineral elements found in locust bean *daddawa* could be a reflection of its higher ash content. Mineral elements are components of complex macromolecules and often serving as cofactors of many metallo-enzymes.

Zinc for example, is distributed widely in plant and animal tissues and occurs in all living cells. It functions as a cofactor and is a constituent of many enzymes like lactate dehydrogenase, alcohol dehydrogenase, glutamate dehydrogenase, alkaline phosphatase, carbonic anhydrase, carboxypeptidase, superoxide dismutase, DNA and RNA polymerases. Zn dependent enzymes are involved in macronutrient metabolism and cell replication.^[24, 25] Potassium is the principal cation in intracellular fluid and functions in acid-base balance, regulation of osmotic pressure, conduction of nerve impulse, muscle contraction particularly the cardiac muscle, cell membrane function and Na⁺/K⁺-ATPase. Potassium is also required during glycogenesis.^[24, 25, 26]

Locust bean *daddawa* is also a good source of iron and sodium. Iron functions as a component of haemoglobin in the transport of oxygen in the system. In cellular respiration, it functions as essential component of enzymes involved in biological oxidation such as cytochromes. It is an important constituent of succinate dehydrogenase and some iron-containing proteins.^[26, 27] Iron is required for proper myelination of spinal cord and white matter of cerebellar folds in brain and is a cofactor for a number of enzymes involved in neurotransmitter synthesis, packaging up-take and degradation.^[28, 29, 30]

Sodium salt of glutamine is the principal ingredient in seasoning. High content of sodium makes a condiment a strong seasoning agent; therefore with the highest quantity of sodium in locust bean *daddawa*, it is expected to be the most pungent condiments and expected to have a good taste. Sodium is part of the resting membrane potential of

a cell (i.e. the difference in electrical charge between the inside and outside of a cell). Sodium also allows for nerve cell function; without it the brain would not be able to send messages and the muscles would not move.^[21, 25] The concentrations of calcium and copper in locust bean *daddawa* are also relatively higher than those of soya bean *daddawa*. Calcium is a major constituent of the bone. It also plays a key role in blood clotting cascade. The blood concentration of calcium has to stay relatively constant for the muscles and heart to function. It is a coordinator among inorganic elements; if excess amounts of K, Mg, or Na are present in the body, calcium is capable of assuming a corrective role. If the amount of calcium is adequate in the diet, Fe is utilised to better advantage by sparing action.^[21, 31]

Copper is a constituent of enzymes like cytochrome oxidase, amine oxidase, catalase, peroxidase, ascorbic acid oxidase, cytochrome oxidase, plasma monoamine oxidase, lactase, uricase, tyrosinase, cytosolic superoxide dismutase etc. and it plays a role in iron absorption.^[28] It is an essential micro-nutrient necessary for the haematologic and neurologic systems.^[32] It is necessary for the growth and formation of bone, formation of myelin sheath in the nervous systems, helps in the incorporation of iron in haemoglobin, assists in the absorption of iron from the gastrointestinal tract (GIT) and in the transfer of iron from tissues to the plasma.^[27, 33]

Conclusion

Soya and locust bean-based *daddawa* sold in Kano metropolis, north-western Nigeria contain significant amount of nutrients such protein, fats, iron, sodium, zinc, potassium, calcium, copper and vitamins A and C that can enrich the diet in addition to flavour enhancement. Consumption of *daddawa* may therefore be a useful strategy to overcome protein energy malnutrition, especially in rural areas where malnutrition is common.

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