

African Traditional Legumes

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Summary

Africa has a number of traditional legumes that provide an affordable and significant source of protein. These legumes include cowpea, chick pea, marama and ground nut beans. Consumed regularly, legumes contribute to a healthy diet, and would help to manage metabolic diseases such as diabetes mellitus. Legumes are consumed cooked as whole grains or processed in various ways to reduce cooking time, improve the nutritive value by inactivating antinutritional factors and to improve the palatability of the products. This paper will highlight current developments in utilisation of some traditional legumes such as cowpeas, marama beans, chickpeas and ground nut beans.

Introduction

Africa has a number of traditional legumes which include cowpea (*Vigna unguiculata*), chick peas (*Cicer arietinum* L.), ground nut beans (*Vigna subterranea*) and marama beans (*Tylosema esculentum*). The seeds have a wide variety of shapes and colours as illustrated by Figure 1. Marama beans are a perennial legume that grows in arid and semi arid regions of Southern Africa. The seeds are still collected from the wild. The other legumes have been relatively exploited by development of improved varieties and a variety of traditional and conventional food products.



Figure 1. Pictures of dry seeds of (Clockwise) ground beans, marama beans and cowpeas.

Legumes are an affordable source of protein and have the advantage of having low glycaemic index, high levels of dietary fibre and potential antioxidant activity. Consumed regularly, legumes contribute to a health diet, and would help to manage metabolic diseases such as diabetes mellitus (1).

These legumes are consumed as cooked whole grains or processed in various ways to reduce cooking time, improve the nutritive value by inactivating antinutritional factors and improve the palatability of the products. Commonly used processes include dehulling, milling and heat treatments such as boiling and roasting. Legumes have also been processed into fried and baked snack products such as fritters (*akara*), cookies,

chips and muffins. Research efforts target increased legume utilisation by exploring ways of producing convenience products and legume based ingredients such as starch, protein concentrates and possibly phenolic extracts for use in food products.

Developments in the utilisation of traditional African legumes

Composition of African traditional legumes

Most grain legumes contain substantial amounts of protein and negligible amount of fats as illustrated in Table 1. The protein found in these legumes is rich in lysine yet deficient in sulphur containing amino acids hence the need to consume the products with cereal products to improve the quality of the protein.

Table 1. Composition of selected African traditional legumes (g/100g product).

Legume	Water	Fat	Protein	CHO
Cowpeas	8.9 ^a	1.16 ^b	24.0 ^a	44.5 ^a
Chickpeas ^b	11.5	5.45	22.1	60.7
Bambara beans ^c	8.0	6.5	19	63
Marama beans ^d	4.6	33.5	34.1	24.1

Source: ^a [2], ^b [3], ^c [4], and ^d [5]

Utilisation of whole seeds

Legumes are consumed as matured fresh seeds that are usually consumed as a vegetable. The seeds are usually boiled and seasoned according to preference. However the large proportion of the legumes are utilised as dry seeds. This is the form that presents more opportunities for diversification. The predominant mode of utilisation of dry traditional African legumes especially cowpeas, chickpeas and bambara beans is through boiling to make a stew. The seeds are either soaked before cooking to

reduce the cooking time which varies from 30 to 180 min) depending on variety and type (2). Following boiling the seeds are used as a stew in combination with other foods such as fish, meat and vegetables. In addition, the cooked seeds are also prepared into a soup. However this form of preparation faces the challenge of long cooking time. Through research, processes such as micronisation (2) and canning (5, 6) have been explored to produce convenient products. These products would allow consumers to use these legumes in their dishes or meals without spending a long time in preparation. Micronisation refers to an infrared pre-cooking process that produces dry seeds that can be easily stored at room temperature.

Legume paste based products

Traditional African legumes have been processed to make fried or steamed savoury balls. The traditional methods involve soaking, dehulling and wet milling of the cotyledons. Depending on the product being produced the paste is seasoned according to taste and is whipped to incorporate air for fried fritters (*akara*) or it is made into balls which are fried or steamed. In some cases the milled cotyledons are made into balls and steamed, fried or blended with minced meat to make meat balls (Figure 2).



Figure 2. Products made from coarsely ground cotyledons of ground beans (Clockwise from top: Deep fried cotyledons, steamed balls, steamed and fried balls, steamed balls in sauce and fried balls).

These products are consumed as snacks or used as a part of a main meal.

Legume flour based products

Flours from traditional African legumes are used to make a number of products including baked products. The flours have been used as a component of composite flour where they are mixed with either wheat or other cereal grains such as sorghum and maize. A number of products have been produced which include muffins, cookies and breads (Figure 3).



Figure 3. Pictures of corn bread and fritters made using 75% maize flour and 25% cowpea

Composite flours could also be used to prepare porridges and gruels. It has been observed that for optimum performance of cowpea flour in these products to be attained there is need for pre-treatment of the cowpeas (7). These pre-treatments include sprouting and heating (toasting). The treatment helps to reduce the beany flavour that is commonly associated with legume seeds. At the same time the heating helps to modify the functionality of the legume flour so that the baked product does not have a hard texture (8).

Flours from traditional legumes can also be incorporated in a variety of products such as noodles and as extenders in comminuted meat products such as chicken nuggets (9) and meatballs (10).

Potential functional ingredients from legume seeds

Functional ingredients present an opportunity for further utilisation of African traditional legumes. In general legume starches are slowly digested as compared to other sources of starch such as cereals, roots and tubers. In addition pre-cooking treatments such as micronisation of legumes prior to incorporation into food products reduces the rate of starch digestion thus further decreasing the glycaemic index of the starch. The legume starches are uniquely resistant to breakdown during heating as such they can be used as thickeners for sauces.

Other potential functional ingredients from traditional African legumes include protein-rich flours or concentrates, dietary fibre and phenolic compounds. The by-product produced during the extraction of protein or starch from these legumes is rich in fibre and antioxidants.

As indicated earlier on, marama beans are still underexploited, and research is currently being undertaken as part of an EU funded project to develop value-added marama bean based food products/ ingredients. The products under exploration include roasted marama beans, marama bean oil, marama milk, protein-rich marama bean flours, dietary fibre and phenolic compounds. Since dehulling is a pre-requisite for marama bean processing; the seed coats are generally regarded as a waste product. However, seed coats have been found to be a good source of phenolic compounds with high antioxidant activity (Van Zyl, 2007).

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