# Nutritional composition of the African locust bean (Parkia biglobosa) fruit pulp

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#### ABSTRACT

Nutritional and anti-nutritional composition of the African locust bean (*Parkia biglobosa*) fruit pulp were determined using standard methods. Results showed a moisture content of 8.41%, protein 6.56%, fat 1.80%, crude fibre 11.75%, ash. 4.18% and carbohydrate of 67.30%. Sugar content was found to be 9.00 °Brix; total caroteniods, 49,175ug/100g and ascorbic acid (Vitamin C) of 191.20mg/100g. Anti-nutritional factors/toxins analyzes showed a phytic

acid content of 60.00mg/100g; crude saponins, 17.80mg/ 100g; tannins, 81.00mg/100g; total phenols, 204.60mg/ 100g and hydrocyanic acid (HCN) content of 17.30mg/ 100g.

**Key words:** Nutritional, anti-nutritional contents, toxins, African locust bean, fruit pulp.

#### **INTRODUCTION**

**R**ural dwellers in developing countries like Nigeria cannot afford animal products which are rich sources of protein because they are either too expensive or simply unavailable. Staple diets consist mainly of cereal grains or starchy roots and tuber crops thus leading to various health problems associated with protein and vitamin / mineral deficiencies. In the search for plant protein and vitamin substitutes, the African locust bean (Parkia biglobosa) has found very popular use especially in the fermented 'dawadawa' form, which is a product of the seeds However, the yellow dry powdery fruit pulp called 'Dorowa' in Hausa has not attracted much attention. Many workers (Fetuga et al. 1974; Campbell-Platt,1980; Eka, 1980; Odunfa,1986; Oke and Umoh, 1987) have reported the nutritional adequacy of the African locust bean seeds with a proximate composition of 30.00% protein, 15.00% fat, 4.00% crude fiber, 2.00% ash and 49.00% carbohydrate. According to Uwaegbute

(1996) the powdery fruit pulp contains more carbohydrate than the seeds, the carbohydrates being primarily reducing sugars (19.00%), non-reducing sugars (9.00%) and other complex carbohydrates (36.00%).

The fruit pulp of the African locust bean is sweet to the taste, which indicates the presence of natural sugars and thus a potential energy source. The attractive yellow colour indicates the presence of phyto-nutrients, possibly carotenoids, which are important precursors of retinol (vitamin A). It has a sour taste which indicates the presence of ascorbic acid (vitamin C). Literature reveals that the fruit pulp is used in rural Africa during emergencies, when the grain stores are empty, which is an indication of its edibility and non-toxicity (Owoyele et al. 1987; Akoma et al. 2001). It may also be used as an ingredient in the preparation of various stews, soups and sauces for the consumption of cereals; pressed into cakes and preserved for later use or used in the preparation of some indigenous

drinks (Akoma Muller, 1988); and is more than adequate to meet the FAO/WHO recommended daily allowance of protein of 0.59g/kg body weight for an average healthy individual and 0.88g /kg body weight for children aged 1 to 10 years (Shakuntala and Shadaksharaswamy, 1987).

Carbohydrate content was found to be 67.30%. This is much higher than the seeds (49.49%) as reported by Fetuga *et al.* (1974); and is in agreement with the findings of Uwaegbute (1996) that the fruit pulp contains more carbohydrates than the seeds. It is also higher than most legume seeds with only lentils and bambara groundnuts coming close with a value of 65.0% (Muller, 1988). Though proteins and fats also provide energy, carbohydrates are much cheaper and more easily digested and absorbed. (Fox and

Cameron 1989). With this content of carbohydrate the African locust bean fruit pulp is a potential good source of energy given the recommended daily energy intake (Muller, 1988).

The crude fiber was found to be 11.75%, which is on the high side. Though crude fiber does not contribute nutrients or energy, it is a source of dietary fiber which is essential for good bowel movement and helps in preventing obesity, diabetes, cancer of the colon and other ailments of the gastro-intestinal tract of man. Though the crude fiber obtained for the fruit pulp is less than that of the seeds (18.00%) as reported by Uwaegbute (1996) it is much higher than for most food legumes, which range from 2.10% in groundnuts to 7.60% in kidney beans (Ihekoronye and Ngoddy, 1985). This makes the African locust beans fruit pulp a potential good source of dietary fiber.

Crude fat was found to be 1.80%. This is in conformity with most legumes, which apart from groundnuts (45.30%), soyabeans (17.70%) and winged bean (17.00%), all have less than 3.00% fat with lentils having as low as 0.60%

(Ihekoronye and Ngoddy, 1985). Stein (1982) also reported a fat content of 0.50% for Mediterranean locust bean (*Ceratonia siliqua*) fruit pulp. This low fat content is an indication that the fruit pulp can store for long periods at the right temperature and moisture without spoilage by rancidity, which is characteristic of many legumes.

The ash content of 4.18% is within the range for most legumes of 2.00% in peas to 5.00% in soyabeans. This figure is much higher than the 1.00% obtained for the fruit pulp of the Mediterranean species by Stein (1982); and is an indication that the African locust bean fruit pulp is a potential good source of minerals required by the body.

Results of some chemical properties of the African locust beans fruit pulp are shown in Table 1. The sugar content was found to be 9.0 °Brix. Apart from imparting sweetness, sugar acts as a preservative when present in food in high concentration by making water unavailable to microorganisms. It is also a ready source of energy since it is more easily digested and absorbed than other complex carbohydrates. It is also an indication of the sensory appeal of the fruit pulp.

Hydrogen ion concentration (pH) of 5.22 suggests that the fruit pulp is a slightly acidic food material this means that enzymic and microbiological activities would be inhibited to some extent, thus having a positive influence on protein stability.

Total carotenoids amounted to 49,175jug/ 100g. This value is much higher than that obtained for some commonly consumed foods like yellow maize (200ug/100g), plantain (800fag/100g), cabbage (2000|ug/100g), mango (3,000ng/100g) and carrots (12,000u£/100g) as reported by Muller (1988). Carotenes are usually converted to retinol (Vitamin A) in the small intestine, and its colour also makes food more attractive to the eye. This value of carotenoids indicates that the fruit pulp is a potential source of vitamin A given that the recommended daily intake is 750ug/100g per 65kg adult human (Muller, 1988).

Vitamin C (ascorbic acid) content was found to be 191.20ug/100g, which is quite high and in agreement with the value of 200mg/100g reported by Muller (1988) for locust bean yellow pulp. This is higher than most regularly consumed foodstuff as reported by Gaman and Sherrington (1999); and adequate compared to the recommended daily intake of 30mg/65kg body weight adult human (Olson and Hodges, 1987). Vitamin C is very useful in collagen synthesis, facilitates iron absorption and participates in biosynthesis of glucocorticoids.

Results of anti-nutritional factors / toxins are shown in Table 1. Phytic acid content was found to be 60.00mg/100g. This is in conformity with S1.00mg/ 100g as reported by Osagie (1998) for locust bean seeds. Though the smallest toxic dose of phytates in man is not known, it appears that high doses are required for any appreciable effect in man (Aremu, 1989). Me Cance and Widdowson (1935) found no apparent effect in human subjects fed 2.00g of phytate except that as much as 50% of dietary phytate phosphorus was rendered unavailable to the body, being excreted unchanged. This result is consistent with the findings of Thompson and Erdman (Jr) (1982) as well as Nkama and Gbenyi (2001).

Saponin content was found to be 17.80mg/ 100g. which could be a contributory factor to the foaming characteristic of the fruit pulp. This is much lower than in other everyday foodstuffs like lima beans (24.50mg/100g) and millet (19.47mg/ 100g) as reported by Osagie (1998) and therefore considered to be safe. In addition, although saponins have been shown to be highly toxic under experimental conditions, acute poisoning is relatively rare, both in man and animals (Tannenbaum, 1979).

Tannin content was found to be 81.00mg/ 100g, which is much lower than some everyday consumed legumes like lima beans (140.00mg/ 100g) and pigeon pea (100.00mg/100g) as reported by Osagie (1998). Total phenols were also found to be 204.60mg/100g, which is lower than 12,160.00mg/100g for lima beans as reported by Osagie (1998), and therefore considered to be acceptable and safe.

Hydrocyanic acid (HCN) content was found to be 17.30mg/l00g, which is far below the lethal dose for man of 50-60mg/kg body weight/day as reported by Balagopalan *et al.* (1988).

### CONCLUSION

This work has shown that the African locust bean fruit pulp is a potentially good source of food which can compete favourably with most cereals and legumes. The chemical composition indicates that it is a good source of macro and micro-nutrients. The bright yellow colour and high sugar content imparts sensory appeal to the pulp. All anti-nutritional factors and toxins analyzed are found to be present in acceptable and safe levels.

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## Fig.l Flow Chart for the production of African locust bean fruit pulp flour.

Nutritional Composition of African Locust Dean
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Parameter Composition.		
Nutritional properties		
Moisture content (%)	8.41	
Crude protein (%)	6.56	
Crude fat (%)	1.80	
Crude fibre (%)	11.75	
Ash (%)	4.18	
Carbohydrate (%)	67.30	
Sugar content (°Brix)	9.00	
Hydrogen ion cone. (pH)	5.22	
Total carotenoids (fag/100g)	49,175.00	
Ascorbic acid (mg/l00g)	191.20	
<b>B.Anti-nutritional factors/toxins</b>		
Phyticacid(mg/100g)	60.00	
Crude saponins (mg/l00g)	17.80	
Tannins(mg/100g)	18.00	
Total phenols(mg/100g)	204.60	
HCN(mg/100g)	17.30	

**Table 1:** Nutritional and anti-nutritional composition of the African locust bean (*Parkia biglobosd*) fruit pulp.

Values are means of duplicate determinations.

Nutritional Composition of African Locust BeanGerna	h et a	l
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