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Nutritional and Anti-Nutritional Factors of Bullet Pear (Canarium Schweinfurthii)

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Abstract:*Bullet pear (Canariumschweinfurthii) was analyzed to determine its nutrient composition and anti-nutritional factors. Proximate composition on dry weight basis revealed the following values: moisture 7.12%; fat 40.26%; crude protein 17.52%; crude fibre 11.44%; ash 3.16% and carbohydrate 20.50%. The vitamin C content was 13.78mg/100g, while the mineral content stood at, calcium 557mg/100g; sodium 55mg/100g, magnesium 200mg/100g and iron 550mg/100g. Anti-nutritional factors showed the following low values: tannin 0.65mg/g; saponin 0.47mg/g; phytate 0.62 mg/g; oxalate 0.68mg and alkaloid 0.78mg/g.*
Keyword:*antinutritional factors, bullet pear, nutritional properties, extracts,quality*

I. Introduction

Bullet pear (Canariumschweinfurthii) is a tropical fruit with unique characteristics and belongs to the family of Burseraceae. It is known as 'ubengba' in Igbo; 'atile' in Hausa and 'origbo' in Yoruba. Bullet pear is among the group of trees generally referred to as acid tree fruits due to the presence of one or more of several organic acids like oxalic acid, glutamic acid, oleic acid, linoleic acid and aspartic acid being the commonest (Anon, 1972).

It is cultivated in the tropical regions such as New Guinea, Cameroun, Nigeria, on account of its pulp although the tree is a good source of wood. The pulp of bullet pear is softened by dipping in hot water or hot ash or grilling in oven. It is often eaten alone or in conjunction with boiled or roasted maize (Okpeke, 1992). The oil extracted from bullet pear is used in crude form for cooking and local body cream. The meal could also be used as animal feed, thus increasing production and consumption of animal protein. Obasi and Okoli (1993) noted that the fruit has considerable nutritional value that makes it a useful supplement to both human food and animal feed.

Despite these apparent potentials, there is gross neglect and under-utilization of this economic fruit. The use is limited mostly to rural dwellers and this result in post-harvest wastage because of its high perishaility.

In many parts of the world especially in developing nations, legumes and most oilseedsconstitute important sources of dietary protein. However, their nutritional significance is often vitiated by the presence of anti-nutritional factors. Successful application of bullet pear in modern food products is hinged on a thorough understanding of its nutritional and anti-nutritional factors. Although researches on the composition of similar fruits like African pear (Dacryodesedulis) abound (Okafor et al. 1996, Omati and Okiy 1987), information on the nutritive value of bullet pear has been fragmentary. Oyenuga (1969) listed several of the protein rich foods in Nigeria which could be effectively used to combat protein shortage but unfortunately, the nutritive value of many of those foods have been little studied.

This present work was therefore undertaken to make a thorough study of the nutritional and anti-nutritional factors of bullet pear. It is envisaged that a systematic study of its nutritive value and anti-nutritional factors may enhance its use in effectively meeting part of the protein and other nutrient needs of humans.

II. Materials and methods

Sample Collection and Preparation: The bullet pear (Canariumschweinfurthii) fruits were collected from a forest at Anara in IsialaMbano Local Government Area of Imo State. The fruits were washed with clean water to remove dirt. The edible potions (flesh) were separated from the seed with a kitchen knife. The flesh was oven-dried in a Gallenkamp Moisture Extraction Oven (Model OVH500) for 24 hours at 600C to a moisture content of 7%. The dried flesh was ground to powder in a domestic grinding mill. The resulting meal was used for the experimental analysis.

Proximate Analysis:The percentage moisture, crude protein, fat, crude fibre and ash contents were determined by the conventional methods of AOAC (1990), while carbohydrate was estimated by the difference method.

Minerals and Vitamins Determination: The vitamin C content of the test samples was determined by the method of Pearson (1976). Sodium and Iron were analyzed by the standard procedures of AOAC (1990).

Calcium and Magnesium contents were determined by the EDTA complex iometric titration method described by James (1995).

Determination of Anti-nutritional Factors: The Folin-Denis spectrophotometric method described by Pearson (1976) was used to evaluate the tannin level of the bullet pear. Alkaloid content was analyzed by the gravimetric method of Harborne (1973). The procedure described by Onwuka (2005) was adopted for phylate determination. Saponin value was evaluated according to AOAC (1984) while oxalate was analyzed the method described by Onwuka (2005).

III. Results and discussions

Proximate composition of bullet pear

The result of the proximate analysis is summarized in Table 1. The data revealed that bullet pear is very rich in oil (40.26%). The high oil content suggests that the fruit can be exploited as raw material for the manufacture of edible oil, margarine and some pharmaceutical products. Agu and Oshilaya (1998) noted that bullet pear oil compared well with other existing oils as edible vegetable oil. According to the report, the oil contains several fatty acids like oleic, linoleic, palmitic and stearic acids. Its relative high fat content makes it an important source of cheap energy to the consumers.

The protein content is 17.52% although Agu and Oshilaya (1998) had reported a higher protein content of 21.63%. This could be due to varietal differences or analytical procedure. The high protein level of the bullet pear shows that the pulp can be useful seed protein supplement in baked products and other several foods. This will help to meet the protein needs of a good proportion of people especially children who consume this fruit heavily, thereby reducing the problem of protein energy mal-nutrition.

The crude fibre content obtained from the bullet pear is 10.44%. This is lower than the value of 17.90% recorded for African pear Omoti and Okiy (1987). Adequate consumption of fibre diets is reported to have beneficial effect on the muscles of the large and small intestine (Fisher and Beider, 1977). Other advantages of adequate fibre diets include reducing obesity, prevention of diverticular diseases, reducing constipation, lowering cholesterol concentrations and reducing blood sugar for diabetics (Onimawo and Egbekun, 2003). Consumption of this fruit therefore will greatly enhance the health status of the people especially the rural dwellers who are avid consumers.

The proximate composition data in Table 1 revealed a high ash content of 3.16% for bullet pear. The high ash value is a reflection of the rich mineral content of the fruit pulp. Minerals are needed for proper body development and functioning (Davidson et al., 1975).

The carbohydrate content was found to be 20.50%. Like most oilseeds, bullet pear is relatively low in carbohydrates. This can make it a good blend with starchy foods.

Table1: **Proximate Composition of Bullet pear on dry weight basis**

Parameter	Value (%)
Moisture	7.12±0.01
Fat	40.96±0.09
Crude Fibre	11.44±0.03
Ash	3.16±0.02
Carbohydrate	20.50±0.02

Values reported are means of triplicate determination ± standard deviation

Mineral and Vitamin Composition of Bullet Pear

The data in Table 2 shows the mineral and vitamin contents of bullet pear. The calcium content was found to be 577mg/100g, indicating that the fruit is a rich source of calcium. According to Onimawo and Egbekun, (1998), calcium is required in the body for proper bone formation, maintenance and growth, tooth formation and contraction of muscles. This result points out that bullet pear has the potentials of meeting the calcium needs of individuals when consume it alongside other calcium-rich foodstuffs.

The mineral composition result gave sodium content of 55mg/100g for the bullet pear. This shows that the fruit is not a good source of sodium. The incidence of sodium deficiency in human body is rare because sodium is present in a variety of food we consume. Also the habit of adding salt to most of our diets further reduces the chances of deficiency. Stane and McWilliams (1977) stated that sodium is needed for the maintenance of osmotic pressure, acid-base balance, and relaxation of muscles and transmission of impulses.

The value obtained for iron is 550mg/100g. With the high iron content of bullet pear, and its relative cheapness, rural pregnant women and children should be encouraged to consume much of it. The pulp can also be incorporated into manufactured products like baked goods as a means of iron supplementation. Iron is an essential component of haemoglobin and myoglobin (Davidson et al., 1975), and aids in transporting oxygen in and carbon (IV) oxide out of the body.

The data in Table 2, revealed the magnesium content of bullet pear to be 200mg/100g. Magnesium is essential to the body for the conduction of nerve impulse, retention of calcium in the teeth and adjustment to cold environment (Onimawo and Egbekun, 1998). Bullet pear if consumed alongside other plant sources like nuts, cereals and green vegetables can meet the magnesium needs of the body.

The bullet pear has vitamin C content of 13.78mg/100g. The level of vitamin C in any fruit depends on the stage of ripeness. Vitamin C helps in the development and maintenance of healthy tissues, aids the absorption of iron by the body, prevents infections and facilitates healing of wounds. Bullet pear may not be a good source of vitamin C for the body because the fruit is usually cooked before eating, and vitamin C is heat-labile. Other fresh fruits like orange, mango, pineapple and pawpaw can supply vitamin C to the body.

Table 2: Mineral and Vitamin C Content of Bullet pear

Parameter	Quantity (mg/100g)
Calcium	557±3.09
Sodium	55±0.81
Magnesium	200±0.24
Iron	550±2.60
Vitamin C	13.78±0.02

Values reported are means of triplicate determination ± standard deviation

Anti-Nutritional Factors of Bullet Pear

The data in Table 3 summarizes the anti-nutritive factors of bullet pear. The phytate level is 0.62mg/g. This is lower than 2.01% found in soybeans (Temple et al, 1990). Phytic acid forms insoluble salt with essential minerals like calcium, magnesium and iron in food, rendering them unavailable for absorption into the bloodstream (Bingham, 1978). Phytates are destroyed by proper heat treatment (Bressani, 1985) and hydrolysis. The anti-nutritional factors shown in Table 3 indicate that the level of oxalate is 0.68mg/g. Oxalate is found in fruits, vegetables and cereals. It is of concern because high oxalate in diet can increase the risk of renal calcium absorption. Onimawo and Akubor (2005) reported that on a dry weight basis, Nigerian vegetables might be superior to milk as gross sources of calcium except that the calcium is not available due to the presence of oxalic acid which is bound as insoluble calcium oxalate. According to Walker and Kochers (1979), oxalic acid in food can be completely eliminated by cooking sufficiently.

The study reveals the tannin level of bullet pear as 0.65mg/g. Addey and Eteshola (1984) reported tannin value of 0.16% for tiger nut seeds which are consumed raw as a human food. Tannin may decrease protein quality by decreasing digestibility and palatability. Other nutritional effects of tannin include damage to the intestinal tract, toxicity of tannins absorbed from the gut and interference with the absorption of iron and a possible carcinogenic effect. Onimawo and Akubor (2005) stated that tannins are responsible for the astringency of many foods such as apples, pears, tea and cocoa.

Saponin content of the bullet pear stood at 0.47mg/g. Saponins are characterized by their bitter or atrigent taste, foaming properties and their hemolytic effect on blood cells. Although saponins are highly toxic to fish and other aquatic cold blooded animals, acute saponin poisoning in humans is rare. According to Onimawo and Akubor (2005), while there are suggestions that the consumption of saponin should be encouraged because of their hypocholestorolemic activity (cholesterol lowering), forage saponins have been reported to cause toxic and aneroxic effects in rats and swine. Saponins are not destroyed by cooking, however alkaline washing or dry scouring and abrasive dehulling have been suggested as techniques for saponins reduction in legumes (Onimawo and Akubor, 2005).

The alkaloid content is 0.78mg/g. This low level of alkaloid cannot cause any nutritional problems to consumers of bullet pear, since the pear is usually boiled before eating. Osagie (1985) reported that simple boiling removes alkaloids present in most cultivated species of plant foods. Alkaloids are basic natural products occurring in plants, generally found in the form of salts with organic acids. Onwuka (2005) stated that about 10-20% of all higher plants probably contain alkaloids.

Table 3: Anti-nutritional Factors of Bullet pear

Anti-nutritional Factors	Quantity (mg/g)
Tannin	0.65±0.01
Saponin	0.47±0.02
Phytate	0.62±0.01
Oxalate	0.62±0.02
Alkaloid	0.78±0.03

Values reported are means of triplicate determination ± standard deviation

IV. Conclusion

Bullet pear (Canariumschweinfurthii) is very rich in essential nutrients and minerals. The anti-nutrients contained in the pear are present in very low quantities. These anti-nutritional factors do not constitute any health problem to consumers of bullet pear since they are mostly destroyed during boiling. The study therefore suggests that the fruit has great potentials in making significant contributions to both human and animal nutrition as well as in industries, hence the need to improve its production and consumption while further research is advocated, especially on its protein quality.

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