



Nutrients, Phytochemicals and Anti-nutritional compositions of yellow monkey kola

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ABSTRACT

Monkey kola is one of the underutilized tropical fruits found in Central and West African forests. In Nigeria, it is found in the South between the months of June and November. The aim of this study is to determine the nutrients, anti-nutrients and phytochemical composition of yellow monkey kola. Mature yellow monkey kola fruits purchased from Ogbete market Enugu State, Nigeria were analysed chemically to determine the nutrients, phytochemicals and anti-nutrients compositions using standard methods. The result showed that yellow monkey kola fruit pulp (endocarp) has values for crude protein (3.68%), ash (0.99%), moisture (90.55%), crude fibre (1.40%), fat (2.75%), carbohydrate (6.06%), potassium (358.50 mg/100g), iron (0.54 mg/100g), zinc (0.20 mg/100g), calcium (56.45 mg/100g), magnesium (33.67 mg/100g), vitamin A (55.48 IU), vitamin B1 (0.07 mg/100g), vitamin B3 (0.16 mg/100g) and Vitamin C (0.26 mg/100g). The results of phytochemical determination revealed that the yellow monkey kola contained saponin (3.07 mg/100g), alkaloid (1.99 mg/100g), tannin (16.57 mg/100g), flavonoid (6.37 mg/100g) and no value for phenol. The anti-nutrients content of yellow monkey kola were oxalate (7.90 mg/100g) and phytate (12.17 mg/100g). There is need to preserve, conserve and promote cultivation and utilization of monkey kola because of its rich nutrient content.

Keywords: Monkey kola, antinutrients, nutrients, phytochemicals, Fruits

INTRODUCTION

Tropical African sub-region is a home for many underutilized valuable fruit-tree species whose potentials have not been fully realized and monkey kola is one of them. Monkey kola grows in the humid West and Central African forests [1]. The fruits are very tasty that they are not only eaten by man but also by some wild animals like monkeys and baboons. According to [2], its caulescent follicles contain one to eight seeds depending on the species and the length of the fruit. Monkey kola has different species which can be differentiated in terms of the colour and texture of the fruit's skin, the colour and taste of the fruits. The three identified species are yellow monkey kola (*Cola lepidota* K. Schum), red monkey kola (*Cola lateritia* K. Schum) and white monkey kola (*Cola parchycarpa* k. schum). In Nigeria, species of monkey kola are common in the South, where they are generally seen in local markets during the peak fruiting season between June and November [3]. All the species are Identified by various local names, "achicha", "ochiricha", "oji eyi", "oji adaka", in South-eastern Nigeria [3]. The seeds of monkey kola fruits are oblique, ovoid with two flattened surfaces, rough and reddish brown or green and are not edible [1]. But the study by [4], revealed that the seeds of monkey kola fruits are edible since they could be used to prepare certain traditional herbal medicine to treat eye problems, heart disease and stomach problems. If the seeds can serve such purposes, it means that they may not be harmful if consumed. Fruits occupy a very important position in nutrition and health. They are rich sources of vitamins, minerals, carbohydrates, proteins, fats and water. They also contain fiber, phytochemicals and antioxidants, depending on the type of fruit. Recent findings have revealed that fruits contain bioactive compounds such as polyphenols, alkaloids, saponins and anthraquinones which have some medicinal potential [5]. Nutritional and health benefits of fruits notwithstanding, poor consumption of fruits and

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vegetables has been reported In Nigeria [6]. The poor consumption of fruits and vegetables may be as a result of cost, ignorance of their nutritional importance and their scarcity due to poor yield and loss of traditional food varieties. Increasing the use of underutilized crops is one of the better ways to reduce nutritional, environmental and financial vulnerability in times of change [6]. Improving the utilization of underutilized foods like monkey kola fruit should start with determination of their nutrients, antinutrients and phytochemical contents which will form basis for improving their cultivation and /or domestication and consumption. The utilization of the underutilized foods can also be increased by application of some traditional processes like fermentation to increase the availability and quantity of their nutrients. The aim of this study was to determine the nutrient, anti-nutrient and phytochemical compositions of yellow monkey kola fruit pulp and fermented seed.

MATERIALS AND METHODS

Procurement of materials and identification

Yellow monkey kola fruits (*Cola lepidota*) were purchased from Ogbete market Enugu, Enugu State, Nigeria and were identified botanically in the Department of Plant science, University of Nigeria, Nsukka, Enugu State.

Preparation of samples for analysis

The fruits were inspected and sorted to remove the ones damaged by insects and the ones that were infected by injuries or insects. The back of the fruits (the outer covering) were removed manually using knife. The fruits were cut open to remove the seeds. Wet analysis was done on the pulp without drying. The seeds were cut into smaller sizes and were soaked in water for 24 hours (fermentation) after which wet analysis was also carried out on them.

Proximate Analysis

The standard method of the Association of Official Analytical Chrmist [7], hot air oven method 925.10 of analysis was used to determine the moisture content of the fruit. The AOAC (2002) method was used to determine the ash content. The micro Kjeldahl method described by [8], was used in the determination of the crude protein. Nitrogen was converted into protein content using $N \times 6.25$. The crude fat was determined using Soxhlet extraction for 24 hours. Crude fibre was determined using the procedures described by [8]. The carbohydrate content of the sample was obtained by difference. The alkaline precipitation-gravimetric method described by [9], was used to determine the alkaloid content of the fruit. Flavonoid was determined using the [10]. Saponin was determined according to [11] method. In determination of tannin, one gram of the sample was extracted with 300ml diethyl ether for 20 hours at room temperature. The residue was boiled for two hours with 100ml distilled water, cooled and filtered. The extract was adjusted to a volume of 100 in a volumetric flask. Then, the tannin content of the sample was extracted colorimetrically using Folin Denis reagent by measuring the solutions absorbance at 760nm using tannic acid as the standard. Phenol was analyzed using the procedures described by [12] and adopted by [7]. The minerals were determined using [7], except for potassium and magnesium. Potassium determination was carried out using the method of Jacobs and Heffmann [9]. Magnesium was analyzed by complexometric titration with EDTA in the presence of an indicator, Solochrome Black (Eriochrome Black T) method. The procedure of [13], was used to determine vitamin A content. Other vitamins were determined using the procedures described by [7]. The [7], method was also used to determine oxalate and phytate contents.

RESULTS

Proximate Composition of yellow monkey kola.

Table 1 showed the proximate composition of the samples. From the table below yellow monkey kola fruit pulp had values for crude protein (3.68%), ash (0.99%), moisture (90.55%), crude fibre (1.40%), fat (2.75%), and carbohydrate (6.06%).

Table 1: Proximate Composition of yellow monkey kola fruit in percentage

Samples	Crude protein	Ash	Moisture	Crude fibre	Fat	Carbohydrates
Pulp	3.68±0.57	0.99±0.01	90.55±0.64	1.40±0.28	2.75±0.35	0.64±0.35
Seed	14.31±0.42	2.00±0.00	76.90±0.27	3.50±0.42	1.54±0.04	1.76±0.23

Values = Mean ± SD (SD = standard deviation) of duplicate determination.

Mineral composition of the *Cola lepidota*

Table 2 showed the mineral composition of the samples. The pulp had values for potassium (358.50 mg/100g), iron (0.54 mg/100g), zinc (0.20 mg/100g), calcium (56.45 mg/100g) and magnesium (33.67 mg/100g). The fermented seed contained Potassium (607.00±1.41mg/100g) and magnesium (607.00±1.41mg/100g).

Table 2 Mineral Composition of yellow monkey kola fruit

Samples	Potassium (mg/100g)	Iron (mg/100g)	Zinc (mg/100g)	Calcium (mg/100g)	Magnesium (mg/100g)
Pulp	358.50±2.12	0.54±0.03	0.20±0.01	56.45±2.19	33.67±1.03
Seed	607.00±1.41	1.25±0.35	0.90±0.01	208.09±0.51	123.25±1.06

Values = Mean ± SD (SD = standard deviation) of duplicate determination

Vitamin Composition of Cola lepidota

Table 3 showed the vitamin composition of the pulp and fermented seed of yellow monkey kola (Cola lepidota).

The pulp had values for vitamin A (55.48 IU), vitamin B1 (0.07 mg/100g) vitamin B3 (0.16 mg/100g) and Vitamin C (0.26 mg/100g) while the fermented seed contained Vitamin A (124.07±2.74 IU).

Table 3 Vitamin Composition of Cola lepidota

Samples	Vitamin A (IU)	Vitamin B1 (mg/100g)	Vitamin B3 (mg/100g)	Vitamin C (mg/100g)
Pulp	55.48±2.98	0.07±0.01	0.16±0.02	26.72±0.01
Seed	124.07±2.74	0.10±0.00	0.20±0.00	10.79±0.28

Values = Mean ± SD (SD = standard deviation) of duplicate determination.

Phytochemical Composition of Cola lepidota

Table 4 showed the phytochemical composition of the samples. From the table, the pulp had values for saponin (3.07 mg/100g), alkaloid (1.99 mg/100g) and tannin (16.57 mg/100g), flavonoid (6.37 mg/100g) and no value for phenol.

Table 4 Phytochemical Composition of Cola lepidota

Samples	Saponin (mg/100g)	Alkaloid (mg/100g)	Tannin (mg/100g)	Flavonoid (mg/100g)	Phenol (mg/100g)
Pulp	3.07±0.29	1.99±0.47	16.57±0.33	6.37±0.69	0.00±0.00
Seed	2.10±0.01	6.89±0.04	38.82±0.24	3.46±0.12	108.71±1.79

Values = Mean ± SD (SD = standard deviation) of duplicate determination.

Anti-nutrient Composition of the Samples

Table 5 showed the anti-nutrient composition of the samples

From the table below the pulp had values for oxalate (7.90 mg/100g), phytate (12.17 mg/100g).

Table 5 Antinutrients Composition of Cola lepidota

Samples	Oxalate (mg/100g)	Phytate (mg/100g)
Pulp	7.90±0.13	12.17±0.08
Seed	197.68±1.31	184.50±2.12

Values = Mean ± SD (SD = standard deviation) of duplicate determination.

DISCUSSION

The study showed that monkey kola fruit is rich in several nutrients. The fat content of the pulp of the Cola lepidota fruit (2.75%) in this study was similar to the study by [14], on Cola parchycarpa (2.73%). The fruit contains a healthy fat because plant foods contain unsaturated fats which are healthy to the body (2.75% fat in the pulp and 1.54% fat in the seed). The fruit pulp contained high moisture of 90.55%. This is in line with the work of [15], with value 88.90% of moisture. The moisture content of the fermented Cola lepidota seed in this study is (76.90%). From the mineral result of this study, the fruit pulp was high in potassium, calcium and magnesium with values, 358.00 mg/100g, 56.45 mg/100g and 33.67mg/100g, respectively. In this study, the mineral values for zinc (0.20 mg/100g) and iron (0.54 mg/100g) were low even though the values were higher than the report by [16], but lower than that of [17]. The Anti-nutrient result of this study showed high phytate content than oxalate. The values of the vitamins in the fermented seed of Cola lepidota used in this study vitamin A (124.07IU), vitamin C (10.79mg/100g), vitamin B1 (0.10mg/100g) and Vitamin B3 (0.20mg/100g) were higher than the values reported by [14], who had no values for vitamin A (0.00 mg/100g), B1 (0.12 mg/100g), B3 (0.05 mg/100g), vitamin C (0.56 mg/100g).

CONCLUSION

From the results above, it shows that this fruit Cola lepidota provides varieties of nutrients including protein, carbohydrate, minerals, vitamins and even phytochemicals in substantial amount which the body needs to sustain life and fight against some diseases such as diabetes, cancer, hypertension and even cardiovascular diseases. This fruit

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is scarce and not very popular. It will be beneficial if more of *C. lepidota* are planted and consumed because they are also referred to as miraculous fruit because of the health benefits they provide. Consuming only the fruit may not provide the quantities of nutrients needed by our body but it will contribute a considerable amount. So it is important we consume this fruit because of their health benefits but should be in moderation because the fruit also contains antinutrients.

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