



## EVALUATION OF THE NUTRITIONAL POTENTIAL OF *Ceiba pentandra* LEAVES

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### ABSTRACT

*Ceiba pentandra* is a tropical tree of the order *Malvales* and of the family *Malvaceae* which was previously separated from the family *Bombacaceae*. Its leaf has been found to possess many medicinal and nutritional properties. *Ceiba Pentandra* is huge, wide and normally found in the wild forest of West Africa in the tropical forest regions. This work was carried out to investigate the potential nutritional values of *Ceiba pentandra* leaf with a view to evaluating the nutritional importance of the plant. This was achieved by evaluating the proximate, quantitative phytochemicals and vitamin constituents of the plant. The result of the proximate analysis revealed relatively high percentage of moisture (47.37%), protein (16.81%), carbohydrate (25.23%), low percentage of fibre (4.47%), fats (2.23%) and ash (2.14%). Results of the quantitative phytochemical analysis revealed alkaloids (4.887±0.07), terpenoids (0.934±0.011), flavonoids (20.147±0.651), polyphenol (99.34±0.753) and saponin (3.91±0.119). Also, the result of the vitamin composition showed the presence of vitamin A (2.323µg/g), vitamin C (0.6863mg/100g) and vitamin E (1.8836mg/100g). In the light of this investigation, *Ceiba pentandra* has been found to contain some nutrients and this supports its ethno-medicinal uses and therefore makes it a good source of nutrients and medicine that require special attention for development.

**Keywords:** *Ceiba pentandra*, Nutrients, Proximate analysis, Vitamins and *Malvales*.

### INTRODUCTION

The need to meet nutritional requirements through adequate food supply has been a major concern over the years. Also, the need to produce foods with required nutritional combination stresses the importance of this research. *Ceiba Pentandra* is commonly known as Kapok tree of silk cotton tree. *Ceiba Pentandra* is a tropical tree of the order *Malvales* and the family *malvaceae* which was previously separated from the family *Bombacaceae* (Sofomora, 1993).

Some species can grow to 70m (230 ft) tall or more, with a straight, largely branchless trunk that culminates in huge, spreading canopy, and buttress roots. In Nigeria, it is seen in the south-east (the tropical rain forest) and it is known by the Igbo speaking people as Akpu-ota. In Nigeria, the leaves are cooked in form of slurry sauce, comparable to okra. The leaves are used as an alternative laxative and the infusion is given as a cure for colic in man and in livestock (Burkill, 2000). In Kano, Nigeria it is used for curative dressing of sores, for mature tumors in Guinea, whitlows in Congo and massage with leaf-pulp and baths in bark-decoction are considered excellent for curing evening fever especially those deemed to arise from evil influence (Daziel and Hutchechinson, 1956). The flower is used in Guinea for gonorrhoea treatments in West Africa. The young leaves are sometimes cooked and eaten in West Africa as a soup herb (Burkill, 2005). The mature leaves contain mucilage which can be obtained by boiling and is used to remove foreign bodies from the eye in Ivory Coast, or as emollient and sedative in Garbon (Burkill, 2005). In Senegal, freshly pounded leaves are steeped in water which is taken for general fatigue and lumbago. In many countries in Africa, the bark and the stem are taken as remedies for diarrhoea, localized oedemas, wash sores, furuncles *leprous macules*, to relieve stomach complaints, hernia, *blennorrhoea*, heart-trouble, asthma, gargles for gingivitis, aphtes and sometimes toothache (Burkill, 1985).

The aim of this research was to investigate the nutritional contents of *Ceiba pentandra* leaves with a view to evaluating the nutritional importance of the plant.

### MATERIALS AND METHODS

#### Collection of Test Material

Fresh leaves of *Ceiba pentandra* were collected and identified at the International Centre for Ethno-medicine and Drug Development, Nsukka, Nigeria.

#### Chemical Reagents and Sources

The chemicals used for this study included analytical grades of methanol (99%) (BDH, chemical Ltd. Poole England). Other reagents and solvents were also of analytical grade.

#### Equipment/Apparatus

- Manual grinder
- Soxhlet extractor
- Weighing balance
- Conical flasks
- Beakers (100ml, 250ml)
- Measuring cylinder (100ml) Pyrex, England
- Masking tape
- Fine white cloth
- Hand gloves
- Test tubes
- Whatman's filter paper

### METHODS

#### Preparation of Extract

Soxhlet extraction method was used in two steps; first, defatting using petroleum ether, then extraction with aqueous methanol (60/40) v/v. Briefly, 200g of the powdered leaves in tumble was placed in the Soxhlet extractor, and rotated continuously until all the extracts from the powdered leaves was obtained. The evaporator machine was used to recover the solvent. The extract was dried at room temperature and stored at 4°C.

### Quantitative Phytochemical analysis of *Ceiba pentandra* leaves.

The quantitative phytochemical analysis of *Ceiba pentandra* leaves was done using the methods of Harborne (1973) and Okeke and Elekwa (2003).

### Proximate analysis of *Ceiba pentandra* leaves.

The proximate analysis of *Ceiba pentandra* leaves was done using the AOAC (1990) standard method.

### Determination of Vitamin A, C and E Contents of *Ceiba Pentandra* leaves.

The assay for vitamins was performed using Pearson (1976) method.

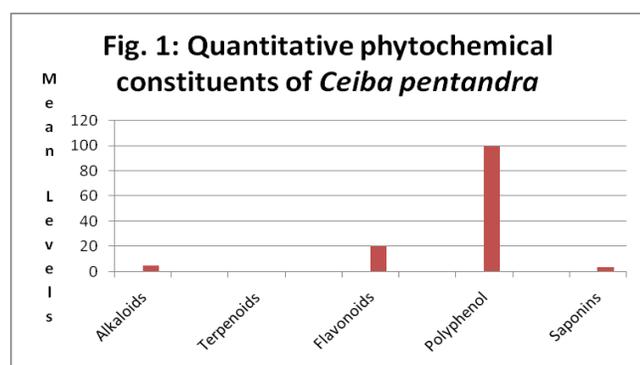
**Table 1: Micronutrient Composition of *Ceiba Pentandra* leaves.**

Test	Observation	Inference	Intensity of Extract
1 <b>Reducing sugar</b> Felling's solution A and B	Absence of a brick red precipitate	Reducing sugar absent	-
2 <b>Protein</b> (a) Million's reagent	White precipitate formed	Protein present/absence	+++
3 <b>Carbohydrates</b> Molisch test	A violet ring was observed	Carbohydrate present/absent	++
4 <b>Fats and oil</b>	Filter paper became translucent	Fats and oil present	+

**Key:** - =Absent ; +=Relative low abundance of compound ; ++ =Moderate abundance of compound ; +++=Relative high abundance of compound .

### Quantitative Phytochemical Screening of *Ceiba pentandra* leaves.

Quantitative analysis of *Ceiba pentandra* was carried out to ascertain the amount of active ingredients in the leaves. Results in Fig. 1 below shows that polyphenol (999.3±40.753) was in relatively high amount, while terpenoids (0.934±0.011) was the least in concentrations of the phytochemicals analyzed.



**Figure 1: Quantitative phytochemical constituents of *Ceiba pentandra* leaves.**

### Proximate Analysis of *Ceiba pentandra*

Proximate analysis of the plant (*Ceiba pentandra* leaf) was done to determine the percentage content of the moisture, fibre, ash, fats, protein and carbohydrates. The moisture content was found to be higher than others. This is represented in the pie chart as shown in fig. 2 below.

### Analysis of Vitamin Constituents in *Ceiba pentandra*

The leaves were also screened for the presence of vitamins. The leaves were found to be relatively rich in vitamins A, E and C as shown in Table 2 below. Vitamin E was found to be in relatively higher amount than other vitamins analyzed (2.9916mg/100mg)

## RESULTS

### NUTRITIONAL SCREENING OF *CEIBA PENTANDRA* LEAF.

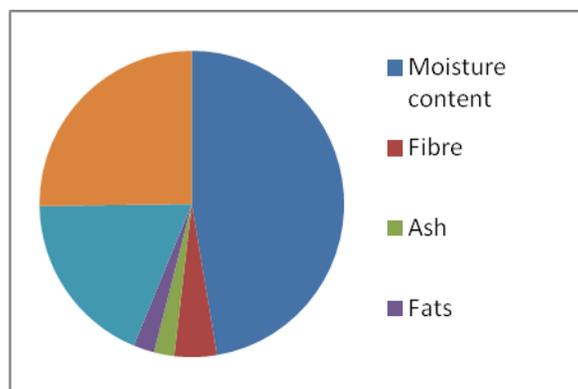
#### Micronutrient analysis of *Ceiba pentandra*

The micronutrient analysis of *Ceiba pentandra* leaves as shown in Table 1 below reveals the presence of fats and oil, protein and carbohydrates. Reducing sugar was not discovered. It also showed that protein is in relatively high amount than other micronutrients tested while fats and oil is the least in concentration of all the micronutrients tested.

- while vitamin A was found to be the least in concentration of the three vitamins analyzed (2.323ug/g).

**Table 2: Vitamin constituents of *Ceiba pentandra***

VITAMIN A	VITAMIN C	VITAMIN E
2.323ug/g	1.029mg/100g	2.9916mg/100g



**Fig. 2: Pie chart of proximate composition of *Ceiba pentandra* Leaves**

## DISCUSSION

Green vegetable are generally acceptable as good sources of nutrient and supplements for staple food in the World faced with problems of food scarcity. They are known to be an excellent sources of nutrient such as mineral and vitamins. The moisture content of *Ceiba pentandra* as showed in fig. 2 was very high although within the range of moisture content for fruits and vegetables of 60 to 83g/100g (FAO, 1968). However, high moisture contents may underscore its high perishability and susceptibility to microbial infection (Tressler et al., 1980). The values of carbohydrate > crude fiber > protein > ash > crude fat obtained were higher in this order. Fibre is useful for maintaining bulk, motility and increasing intestinal peristalsis by surface extension of the food in

the intestinal tract (Mathenge, 1997). It is necessary for good health during food digestion. The young leaf of *Ceiba pentandra* is extremely high in fibre content as revealed by this result. This was indicative of its high soluble fibre pectin (Oladejo, 2009). Soluble dietary fibres have health-promoting properties as they have been implicated in the lowering of plasma and liver cholesterol concentrations (Behall, 1986); diarrhea treatment and detoxification of poisonous metals (Cohn and Cohn, 1996). The high value of carbohydrate and protein suggest that the nutritional quality of the *Ceiba pentandra* leaf is high and this may be a veritable tool used by the villagers as a source of body nourishment. A diet providing 1 to 2% of its caloric energy as fat is said to be sufficient to human beings as excess fat consumption is implicated in certain cardiovascular disorders such as atherosclerosis, cancer and aging (Antia et al., 2006). The results of selected vitamin (s) composition of the young leaves of *Ceiba pentandra* are shown in Table 2. The reasonable values obtained for vitamins A, C and E suggest that the plant may be of help in solving or reducing the prevailing micronutrient deficiency diseases ravaging poor communities especially Sub-Saharan Africa such as blindness, cancer, and heart diseases, etc. Tocopherol (vitamin E), ascorbic acid (Vitamin C) and carotenoids (pre-cursor of vitamin A) are antioxidants which have been associated with prevention of nutritionally related diseases such as cancer, diabetes mellitus, coronary heart diseases and obesity (McDougall et al., 1996; Larrauri et al., 1996). Ascorbic acid is essential for the healthy formation of bones and teeth. It is a powerful antioxidant (Szeto et al., 2002) whose deficiency results in scurvy with swelling of the joints and gums, loosening of the teeth and hemorrhage of the skin and mucous membrane. Evidence of vitamin C playing a key role in decreasing of degenerative diseases is considered to be strong (Halliwell, 1996). The present research has provided first hand information on bioactive constituents of young leaves of *Ceiba pentandra*. The results of quantitative analysis of the leaf extracts showed substantial amounts of phenolic compounds, alkaloids, flavonoids, tannins and saponins. Flavonoids, alkaloids, phenolics and saponins are known to exhibit medicinal properties as well as physiological activities (Sofomora, 1993). Flavonoids have been shown to have anti-mutagenic, antibacterial, anti-inflammatory, anti-allergic, antiviral, anti-neoplastic, anti-thrombotic and vasodilatory activities (Alan and Miller, 1996). The potent anti-oxidant activity of flavonoids is their ability to scavenge hydroxyl radicals, superoxide anions and lipid (s) peroxy radicals and may be the most important function of flavonoids (Alan and Miller, 1996). Various studies have shown that saponins although non-toxic, can generate adverse physiological responses in animals that consume them. They exhibit cytotoxic effects and growth inhibition against a variety of cells which confers them with anti-inflammatory and anticancer properties (Iniaghe, 2009). The presence of saponins from various studies indicate their importance in pharmacy due to their relationship with such compounds like sex hormones especially in development of female contraceptive pills (Edeoga et al., 2001). This may be the reason why the infusion of the leaves of *Ceiba pentandra* is given to expectant mothers in Guinea to ensure hormonal balance. Phenolic compounds are in the class of antioxidant agents which act as free radical terminators (Shahidi and Wanasundara, 1992). Polyphenols constitute the main bioactive phytochemicals that have been proven to be effective in the prevention of certain chronic diseases such as coronary heart diseases, cancer and diabetes (Asami et al., 2003). Tannins are fairly frequently encountered in food products of plant vegetable origin such as tea and many fruits. The oxidation-inhibition activities of tannin have been known for a long time and it is assumed to be due to the presence of gallic and digallic (Ihekoronye and Ngody, 1985). The result of these bioactive constituents in the *Ceiba pentandra* further suggest the reason for the usage of the plant in curing many diseases such as colic in man, dressing of sores for mature tumours, whitlow, inflammatory diseases, cancer, mental illness, fatigue, lumbago, gonorrhoea, dysentery, anti-microbial and anti-fungal effects (Edeoga et al., 2001).

## CONCLUSION

In the light of this investigation, *Ceiba pentandra* has been found to be rich in certain nutrients and phytochemicals and this supports its ethno-medicinal usages as good sources of nutrients and medicine.

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