



EVALUATION OF THE ANTINUTRIENT LEVELS OF CEIBA PENTANDRA LEAVES

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ABSTRACT

This work centers on the determination of the antinutritional compounds present in the leaf extract of *Ceiba pentandra*. Antinutrients like phytic acid, trypsin inhibitors, lectins, flavonoids, glycoalkaloids and exorphins in food materials interfere with the absorption of nutrients when ingested. *Ceiba pentandra* is a tropical tree of the order *Malvales* and of the family *Malvaceae*. The plant is normally found in the wild and the matured tree is among the tallest trees in the tropical forest regions. The qualitative phytochemical analysis of *Ceiba pentandra* revealed the presence of alkaloids, flavonoids, terpenoids, polyphenol, saponins and glycoside. The result shows the presence of some anti-nutrients like phenols ($99.64 \pm 0.153 \text{mg/g}$) in a high amount while tannins ($5.32 \pm 0.197 \text{mg/g}$), phytates ($0.35 \pm 0.043 \text{mg/g}$), oxalates ($0.086 \pm 0.023 \text{mg/g}$), cyanogenic glycoside ($0.045 \pm 0.007 \text{mg/g}$) are relatively low. The presence of these anti-nutrients; cyanogenic glycoside, phenols, oxalates, phytates and tannins may reduce the digestibility of the nutrients in the plant. It is therefore advised that people who consume much of the leaves in their diet should make it safer by devising means of extracting off these antinutrients in order reduce the health hazards that are associated with them.

Keywords: Antinutrient, *Ceiba pentandra*, *Malvaceae*, Exorphins and Food materials.

INTRODUCTION

Antinutrients are natural or synthetic compounds that interfere with the absorption of nutrients (Antia et al., 2006). Nutritional studies focus on those antinutrients that are commonly found in foods and beverages (Ugwu *et al.*, 2013). One common example is phytic acid, which forms insoluble complexes with calcium, zinc, iron and copper. Proteins can also be an antinutrient, such as the trypsin inhibitors and lectins found in legumes. These enzyme inhibitors interfere with digestion. Another form of antinutrients are the flavonoids, which are groups of poly-phenolic compounds that include tannins. This compound chelates metal such as iron and zinc thereby reducing the absorption of their nutrients, but they also inhibit digestive enzyme and may also precipitate proteins (Chang *et al.*, 2002). However, polyphenols such as tannins have anti-cancer properties, so drinks such as green tea that contain large amounts of these compounds might be good for the health of some people despite their antinutritional contents (Ihekoronye, 1999).

Traditional methods of food preparation such as fermentation, cooking, and malting increases the nutritive value of foods by reducing certain antinutrients such as phytic acid, polyphenols, and oxalic acid. Such processing methods are widely-used in societies where cereal and legumes form a major source of the diet. An important example of such processing method is the fermentation of cassava to produce cassava flour: this fermentation process reduces the level of both toxin and antinutrients in the tuber (Okaka *et al.*,2010).

Ceiba pentandra is tropical tree of the order *Malvales* and the family *Malvaceae* (previously separated in the family *Bombacaceae*), native to Mexico, Central America and the Caribbean, Northern South America and (as the variety *C. pentandra* var. *guineensis*) to tropical West Africa. Kapok is the most used common name of the tree and may also refer to the fibre obtained from its seed pods. The tree is also known as the Java cotton, Hava kapok, silk cotton or ceiba. It is found widely in Asia, Africa and Australia (Akindahunsi and Salawu, 2005), in Nigeria, it is known by the Igbo speaking people as akpu-ota. The plant is normally found in the wild and the matured tree is among the tallest seen in the tropical forest.

Ceiba trees are typically emergents, meaning their large umbrella-shaped canopies emerge above the forest. Young trunks and branches are armed with thick conical spines, and are often green due to the photosynthetic pigments. The matured tree bears hundred of pods up to 15cm long filled with fibrous seeds (Akinmutimi *et al.*, 2006).

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, 1985). In Kano, Nigeria it is used for curative dressing of sores, for matured tumors in Guinea, whitlows in congo, massage with leaf-pulp and baths in bark-decoction are considered excellent for evening fever especially those deemed to arise from evil influence (Daziell and Hutchechinson, 1956). A bark-decoction is given to rickety children, bark sap is given to sterile women to promote conception by reason of the fecundity of the seed in Ivory Coast-upper (Burkill, 1985). The seed contains oil used as vegetable oil in some parts of the country. It also contains fatty acid, glycosides, saponins and steroids (Sarkiyayi *et al.*, 2009).

The aim of this study was to determine the anti-nutritional compounds that are present in the leaves of *Ceiba pentandra* with a view to assessing its level in the plant.

MATERIALS AND METHODS**COLLECTION OF TEST MATERIAL**

Fresh leaves of *C. pentandra* were obtained from Opi village in Nsukka LGA of Enugu State, Nigeria. The plant was collected and identified by Mr. Onyeukwu of the *herbarium* Unit of Department of Botany University of Nigeria, Nsukka, Enugu State, Nigeria .

CHEMICAL REAGENTS AND SOURCES

The chemicals used in this study were of analytical grades and products of methanol (BDH, chemical Ltd. Poole England).

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 filter paper

PREPARATION OF EXTRACT

Ceiba pentandra leaves were air dried and ground. A weighed quantity of 50.0g of the powdered leaf was immersed in 250ml of absolute ethanol for 36 hours and then extracted using soxhlet extractor.

Qualitative Phytochemical Screening of Ceiba pentandra

The phytochemical analysis of the plant was carried out according to the method of Harborne (1973).

Anti-Nutritional Analysis of Ceiba pentandra

The presence of anti-nutrients such as tannin, phytate, cyanogenic glycoside, oxalate and phenols were determined according to AOAC (1990) Methods.

RESULTS

Results of the Phytochemical Analysis of *Ceiba pentandra*

ALKALOIDS	+	STEROIDS	-
FLAVONOIDS	+++	TERPENOIDS	-
GLYCOSIDES	+++	ACIDIC COMPOUNDS	-
SAPONINS	+++		
TANNINS	+++		
RESINS	-		

Key:

- =Absent

+ =Relatively low abundance of compound

++ =Moderately abundance of compound

+++ =Relatively high abundance of compound

The result of phytochemicals shown above indicated the presence of alkaloids, flavonoids, glycosides, saponins, tannins and terpenoids. But, Flavonoids, glycosides, saponins and tannins were relatively high in concentration whereas, steroids, resins and acidic compounds were not present in the sample analysed.

Anti-nutrients Present	amount present
Cyanogenic glycoside	0.045±0.007
Phenols	99.64±0.153
Oxalates	0.086±0.023
Phytates	5.32±0.197
Tannins	0.35±0.043

Table 1. The result of antinutrient of Ceiba pentandra

From the results in table1.above, it was observed that the leaf of *Ceiba pentandra* contains high amount of phenol compared with the low levels of phytates, tannins, oxalates, and cyanogenic glycosides in decreasing order.

DISCUSSION

Anti -nutrients are substances, to which we are all exposed to through food and water that reduces food nutrients needed for good health (Reddy and Pierson, 1998; Ugwu *et al.* , 2013). Antinutrients inhibit digestive enzymes, some cause problems by creating a greater need for certain nutrients, while others make nutrients to be excreted more rapidly from the body (Reddy and Pierson, 1998).

There are recognizably more toxic plants than animals. These toxic plants and animals contain compounds that have medicinal and pharmacological properties which have been successfully explored by traditional herbalists (Ugwu *et al.*, 2013). Some of the intrinsic toxic principles found in foods include trypsin inhibitors, gossypol, cyanogenic glycosides, oligosaccharides, goitrogens, antivitamins and other specific factors found in the roots, tubers of other foods.

The phytochemical analysis of *Ceiba pentandra* revealed the presence of the active components of the plant like alkaloids, flavonoids, glycosides, saponins, tannins and terpenoids. Also, it shows the absence of steroids, resin and acidic compounds. It shows that flavonoids, Glycosides, saponins and tannins were in relatively high concentration than other phytochemical analysed.

However, the presence of some anti-nutrients like cyanogenic glycoside, phenols, oxalates, phytates and tannins were also confirmed. These are the chemical compounds that reduce or inhibit the digestion of the nutrients when eaten. Tannic acid can also reduce the effectiveness of digestive enzymes.

CONCLUSION

In conclusion, the results shown in this work suggests that the plant contains a reasonable amount of anti-nutrients; cynaogenic glycoside, phenols, oxalates, phytates and tannins which may reduce their digestibility. Therefore, it is advisable for people to explore ways of reducing these antinutrients for the sake of maintaining good health.

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