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COMPOSITION AND EVALUATION OF NUTRITIONAL, ANTI-NUTRITIONAL PROPERTIES OF *Quassia undulata* (Guill. & Perr.) D.Dietr LEAVES

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ABSTRACT

Quassia undulata (Guill. & Perr.) D.Dietr., a perennial medicinal plant has been used locally for the treatment of fever, stomach ache, leprosy, and insanity. This study evaluated the nutritional (proximate) and anti-nutritional composition of its leaves because of the dearth information on research of its leaves. The fresh leaves were air-dried, pulverized and analyzed for their proximate composition, while the concentrations of some anti-nutrients (phytic acid, oxalate and cyanogenic glycoside) were also determined using standard analytical procedures. The proximate analysis of the leaves showed the mean values of 50.34% carbohydrate, 14.94% crude fiber, 13.24% moisture and 12.24% protein while fat and ash were present in considerable amounts. The anti-nutrient assays revealed the presence of phytic acid, oxalate and cyanogenic glycoside at 951.67±14.43 mg/100g, 636.3±10.39 mg/100g and 139.7±0.404 mg/100g, respectively. The findings from this study show that *Q. undulata* leaves are good sources of nutrients, further research could be done on its standardization and pharmacology

Keywords: anti-nutrients, medicinal plant, proximate, *Quassia undulata*, Simaroubaceae.

Introduction

Plants made up of substances which serve as precursors for drug synthesis or substances that have therapeutic purposes are called medicinal plants (Sofowora, 1982; Abolaji *et al*., 2007). Medicinal plants play essential roles in drug development and health care in different parts of the world. It has been observed that about 119 chemical substances which are of plant origin are important drugs used in many countries (Newman *et al*., 2000; Atamgba *et al*., 2015). World Health Organization recognize herbal medicine as an important component of primary health care as the use of plant extracts locally provides health care for a vast majority of the world's population (Arvind, 2016). Ethnobotanical information on medicinal plants from different communities around the world have served as sources of starting materials for the synthesis of known drugs. In some instances, synthetic analogs of natural products are produced to improve the efficacy and decrease the toxicity of parent compounds (Atamgba *et al*., 2015). The use of medicinal plants doesn't center on man alone; they are also used to treat livestock ailments (Kidane *et al*., 2018).

Quassia undulata a perennial medicinal plant of the family Simaroubaceae is known for its anti-malarial and neuroprotective activities (Ajaiyeoba *et al*., 2000; Odubanjo *et al*., 2018;). It is commonly found in tropical and subtropical parts of the world such as Africa, America and Asia (Iko and Eze, 2012). It is called *Oriji* by Yorubas in Nigeria and *Akan-*

asante hotoro by Ghanaians. Gyakari and Cobbinah (2008) reported the antibacterial and antifungal activities of its leaf and stem extracts, while its leaf decoction is also used in treating varicose veins, ankylosis, and rickets

There are some research from other researchers on other species of Quassia but nutritive information and anti nutritive properties of species undulate are limited study thereby evaluated its nutritional and anti-nutritional for further contribution for its scientific validation proximate composition while ascertaining alongside the probable presence of an anti-nutrient.

Materials and Methods

Sample Collection: The leaves of *Quassia undulata* were collected in their fresh form from Forestry Research Institute of Nigeria (FRIN) herbal garden located in Ibadan, Oyo State, Nigeria. They were identified and authenticated at the Forest Herbarium Ibadan (FRIN) with voucher number FHI-102099.

Preparation of Plant Materials: The leaves were washed under running water to remove extraneous materials and air-dried to constant weight for about 2 weeks. They were pulverized using Rico MG '601' Grinder Mixer and stored in an air-tight bottle prior to analyses.

Determination of Proximate Composition: This was conducted using the standard procedures of the Association of Official Analytical Chemists (AOAC, 2000) as described by Adeniyi and Ariwoola (2019).

Determination of Anti-nutritional Factors: Phytic acid content of the dried leaves was determined using the method of Lolas and Markakas (1975); Oxalate was determined by the procedure of Sanchez-Alonso and Lachica (1987); while Cyanogenic glycoside was determined using the alkaline picrate method of Onwuka (2005) all described by Aina *et al*., (2012).

Results and Discussion

The proximate composition of *Q. undulata* leaves is presented in Figure 1.

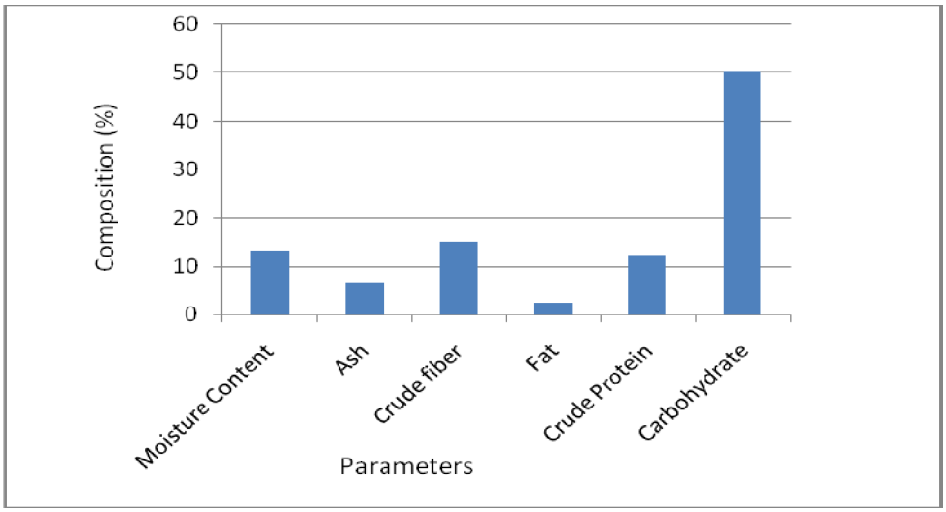

Figure 1: Proximate composition of *Quassia undulata* leaves

Table 1: Concentration of anti-nutritional factors in *Q. undulata* leaves

Anti-nutrient	Concentration (mg/100g)
Phytic acid	951.67±14.43
Oxalate	636.3±10.39
Cyanogenic glycoside	139.7±0.404

Data are presented as mean ± standard deviation of three replicates.

From the results in Figure 1 and Table 1, it can be seen that *Q. undulata* leaves are repositories of both nutrients and anti-nutrients. The proximate analysis revealed that the dried leaves contain moisture content of 13.24%. Moisture content determines stability of products; it also determines the shelf life and resistance to microbial attack (Akpabio and Ikpe, 2013; Adeniyi and Ariwoola, 2019). Ash content of 6.68% was found in the leaves, this gives an insight to the presence of minerals. Crude fiber which prevents diverticulosis and also helps in removal of undigested food according to Asuk *et al*. (2015) was found to be present at 14.94%. A low-fat content of 2.56% was discovered in the leaves, fats help in transporting fat-soluble vitamins and protect internal tissues (Akpabio and Ikpe, 2013). The leaves contained 12.24% protein; proteins help in building and maintenance of the body. They also facilitate the production of enzymes and antibodies that are involved in several metabolisms. A significant level of carbohydrate - 50.34% was discovered in the leaves. Carbohydrates serve as energy source and aid the proper functioning of the intestinal tract (Adeniyi and Ariwoola, 2019).

Anti-nutrients are substances that have debilitating effects (such as poisoning, nutrient unavailability, to name a few) on an organism's health; usually, a large amount of nutrients and anti-oxidants are required for their neutralization (Inuwa *et al*., 2011; Aina *et al*., 2012). Of all the anti-nutrients studied, phytic acid had the highest concentration of 951.67±14.43 mg/100g; 636.3±10.39 mg/100g of oxalate was discovered, while cyanogenic glycoside had the least value of 139.7±0.404 mg/100g. Pikuda and Ilelaboye (2013) report lethal dose of cyanide to range from 12 – 50 mg, lethal oral dose of oxalic acid in humans has been reported to be 15-30 grams (NIOSH, 2014).

The knowledge of the anti-nutrient composition of consumables is of utmost importance to prevent the deleterious effects that can be caused by their high concentrations. Oxalates can bind to proteins to form complexes as such reducing their bioavailability; they also bind with calcium to form calcium oxalate which can cause kidney stones (Aina *et al*., 2012). High concentration of cyanogenic glycoside alters the synthesis of ATP in the electron transport chain and causes respiratory poisoning (Musa *et al*., 2011; Aina *et al*., 2012; Musa, 2012). Phytic acid combines with essential minerals to form insoluble salts thereby rendering the minerals unavailable for absorption (Inuwa *et al*., 2011). Despite the adverse effects of high phytate concentration in humans, some of its beneficial effects on the gastrointestinal tract and other tissues (due to its chelating ability) have also been discovered. For beneficial health effects, phytate should be reduced to

about 25 mg/100g or less (Abdoulaye *et al*., 2011). Food processing such as fermentation, malting and toasting have been found to reduce the concentration of anti-nutrients. (Wakil and Kazeem, 2012; Okafor *et al*., 2018)

Conclusion

This study on *Quassia undulata* leaves show that they contain essential nutrients that can be utilized by both man and animals. The concentration of anti-nutrients detected can be reduced to minimal levels by food processing techniques. This study unravels the hidden potentials of this plant in relation to its nutrients and the composition of its anti-nutrients values. Further research should be conducted on toxicity and clinical studies will ascertain more of its ethno-pharmacological potentials.

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