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Proximate composition, phytochemical screening and elemental analysis of mistletoe (*Tapinanthus bangwensis*) leaves

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ABSTRACT: There seem to be little or no literature about the nutritional composition of the widely used Mistletoe (*Tapinanthus bangwensis*) leaves, a hemi- parasitic ever green plant that has been used traditionally in Nigeria and other parts of Africa as antihypertensive and antidiabetic agents. Biochemical studies with a view to assess the nutritional potentials of *Tapinanthus bangwensis* leaves were carried out by evaluating the proximate composition, phytochemical constituents and mineral elements of the plant. Proximate composition of the leaves showed that it contained moisture (59.34%), crude fat (1.74%), crude protein (15.32%), crude fibre (12.33%), ash (6.00%) and carbohydrate (64.25%). Phytochemical screening revealed the presence of saponins, flavonoids, tannins, and cardiac glycosides. Elemental analysis of the leaves (mg/100g dry matter,DM) indicates that *Tapinanthus bangwensis* contained appreciable levels of Ca (3100mg/100g), K (3450mg/100g), Na (5260mg/100g), P (960mg/100g), Mg (40mg/100g), Fe (1080mg/100g) and Zn (80mg/100g) respectively. There were no significant values detected for lead (Pb) and cadmium (Cd). The results of the present research reveal that the leaves of *Tapinanthus bangwensis* contain phytochemicals and mineral elements that may be responsible for their possible therapeutic uses.

Key words: Mistletoe, *Tapinanthus bangwensis*, proximate composition, phytochemicals, mineral elements.

Introduction

In recent years, there has been a gradual revival of interest in the use of medicinal plants in developing countries because herbal medicines have been reported to be safe with little or no adverse side effect especially when compared with synthetic drugs. Thus, a search for new drugs with better and cheaper constituents from plant origin is a natural choice. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body (Edeoga *et al*., 2005).

Plants have played significant roles in maintaining the health and quality of human life for thousands of years. The majority of the earth's inhabitants in the developing world rely on traditional medicine for their primary health care needs and a major part of this therapy involves the use of plants, plant extracts, or their active principles (Craig, 2001).

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Herbaceous plants produce and contain a variety of chemical substances that act upon the body (Shayoub, 2003). Medicinal plants and herbs are of great importance to the health of individuals and communities. Despite the existence of herbal medicines over many centuries only relatively small number of plant species has been studied for their application. However, in the recent past, an increasing research evidence is getting accumulated which clearly indicate the positive role of traditional medicinal plant in the prevention or control of some metabolic disorders like diabetes, heart diseases and certain types of cancer (Zang, 1996).

A scientific investigation of traditional herbal remedies for metabolic disorders may provide valuable lead for the development of alternative drug and therapeutic strategies. Mistletoe is the common name for a group of hemi-parasitic plants in the order Santalales that grow attached to and within the branches of a tree or shrub. The leaves of mistletoe (*Tapinanthus bangwensis*) have been used traditionally in Nigeria and other parts of Africa as antihypertensive and antidiabetic agents. Various researchers have reported the hypotensive, hypoglycemic and hypolipidemic effect of mistletoe (*Tapinanthus bangwensis*) leaves, which lowers the blood pressure, blood glucose and lipid profile.

This work is therefore aimed at evaluating the proximate composition, phytochemicals and mineral elements of Mistletoe (*Tapinanthus bangwensis*) leaves.

Materials and Methods

The leaves of mistletoe plant (*Tapinanthus bangwensis*) used for this study were obtained from orchard of orange trees (*Citrus sinensi*) in a garden located at the Faculty of Social Sciences, University of Benin, Benin City, Nigeria. The plant leaves were thereafter identified by a Botanist from the Department of Botany, Faculty of Life Sciences, University of Benin, Benin City. A sample was subsequently deposited in the herbarium.

The plant leaves were dried at room temperature and milled under aseptic condition into powder form and preserved in a well labeled air tight container for proximate composition, phytochemicals and elemental analysis.

Proximate analyses were carried out according to the procedure of Association of Official Analytical Chemist (A.O.A.C., 1990). Phytochemical screening were by the method of Odebiyi and Sofowora, (1979), and the minerals were determined using the Atomic Absorption Spectrophotometer (AAS) after acid digestion of the samples; however magnesium and calcium were determined by complexometric titration using the method of Black and Goring, (1953).

Statistical analysis

All data were expressed as mean ± SEM. Analysis of variance (ANOVA) was used to test for difference. P values < 0.05 were taken as indicative of significant difference.

Results and Discussion

The result of the proximate composition of mistletoe leaves (Fig. 1) showed that it contained moisture (59.34 ± 0.76%), ash (6.00 ± 0.57%), crude fat (1.74 ± 0.00%), crude protein (15.32 ± 0.44%), crude fibre (12.33 ± 0.67%), and carbohydrate (64.25 ± 0.39%) dry matter respectively. The caloric value was 333.94 ± 0.01kcal.

The moisture content of *Tapinanthus bangwensis* leaves is high when compared to those of some medicinal plants. But quiet low when compared to those of *Ipomoea batatas* 82.21% (Antia et al, 2006). High moisture content promotes susceptibility to microbial growth and enzyme activity (Adejumo and Awosanya, 2005).

The ash content of *Tapinanthus bangwensis* leaves was lower than that of some leafy vegetables commonly consumed in Nigeria such as *Talinum triangulare* (20.05%). It is however moderate when

compared to other vegetables such as *Occimum graticimum* (8.00%) and *Herbiscus esculentus* (8.00%) (Akindahunsi and Salawu, 2005). The moderate ash content is a reflection of the mineral contents preserved in the plant. The result therefore suggests a high deposit of mineral elements in the leaves.

The crude fat (1.74%) is low when compared to those of *Talinum triangulare* (5.90%), *Baseila alba* (8.71%), *Amaranthus hybridus* (4.80%), *Calchorus africanum* (4.20%) (Ifon and Basir, 1979; Akindahunsi and Salawu, 2005). Comparing it with the value obtained from other leaves shows that *Tapinanthus bangwensis* leaves contain low fat content. Dietary fats function in the increase of palatability of food by absorbing and retaining flavours (antia et al, 2006). A diet providing 1-2% 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 artherosclerosis, cancer and aging (Davidson *et al*, 1975; Kris-Etherton *et al.*, 2002).

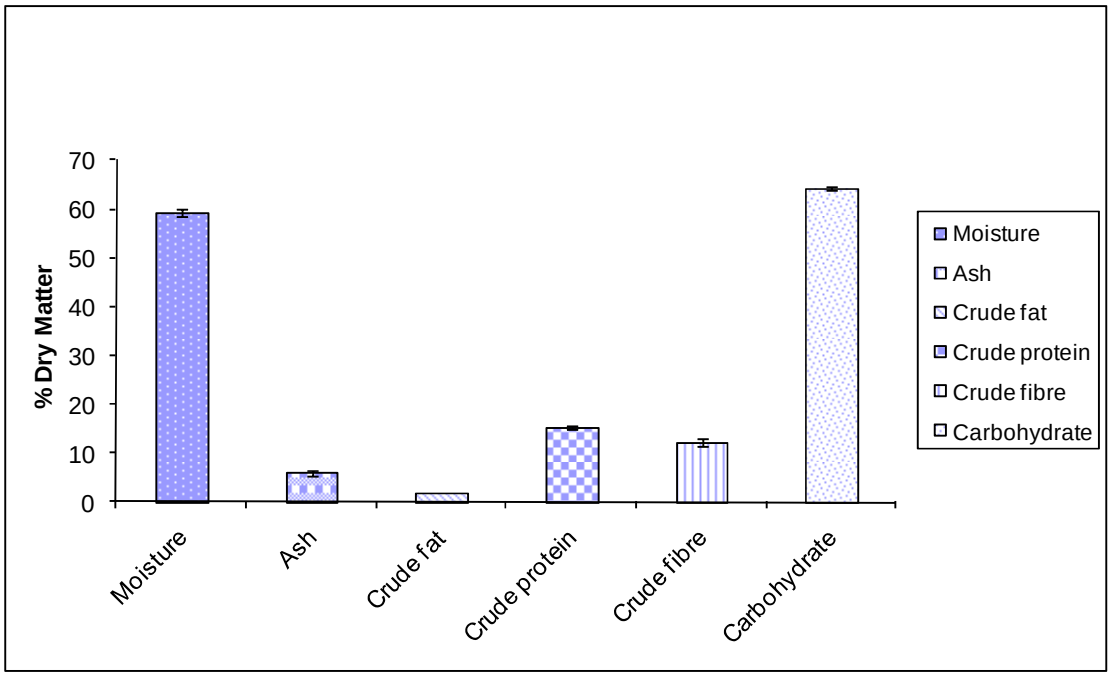

Figure 1: A Bar Chart Showing the Proximate Composition of Mistletoe (*Tapinanthus bangwensis*) Leaves.

Table 1: Phytochemical Screening of the Leaves of Mistletoe (*Tapinanthus bangwensis*).

Chemical Compounds	Result
Cardiac glycosides	++ ve
Flavonoid	++ ve
Tannin	++ ve
Alkaloid	-ve
Saponin	+ve
Anthraquinone	-ve

-ve = Compound not detected
+ve = Compound detected
++ve = Higher amount of compound detected

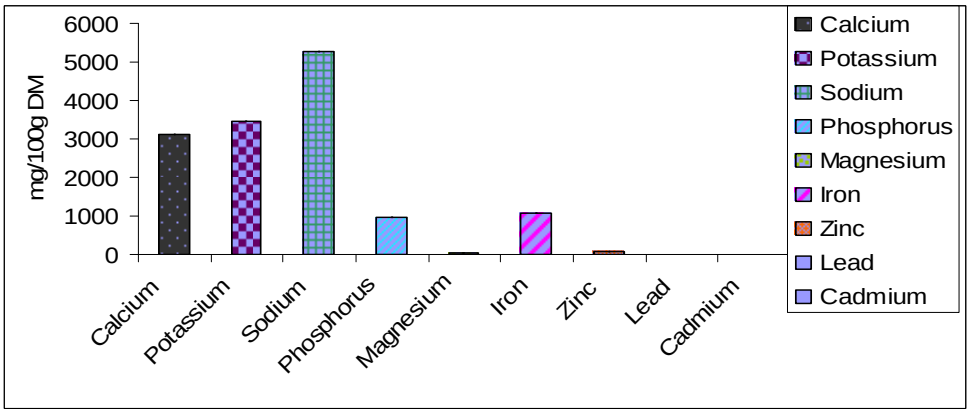

Figure 2: A Bar Chart Showing the Mineral Composition of Mistletoe (*Tapinanthus bangwensis*) Leaves.

DM = Dry Matter

The composition of crude protein compared favourably with and in most cases surpassed those for most medicinal plants (Abolaji *et al*., 2007). This is indicative of the potential benefit of *Tapinanthus bangwensis* as proteins are essential for the synthesis of body tissues and regulatory substances such as enzymes and hormones (Vaughan and Judd, 2003).

The crude fibre content of *Tapinanthus bangwensis* leaves (12.33%) is high when compared to *Talinum triangulare* (6.20%), *Piper guineeses* (6.40%), *Corchorus olitorius* (7.0%), bitter leaves (*Vernonia amygdalina*), 6.5% (Akindahunsi and Salawu, 2005). Non starchy vegetables are the sources of dietary fibre (Agoston *et al*, 1995) and are employed in the treatment of diseases such as obesity, diabetes, cancer and gastrointestinal disorders (Saldanha, 1995).

The caloric value obtained (333.94kcal) is high when compared to that of *Moringo oleifera* 305.62kcal (Ibok *et al*, 2008). The caloric value of *Tapinanthus bangwensis* leaves makes it a good source of energy for all people compared to some vegetables such as pumpkin leaves, taro leaves, mushrooms, tamatoes (FAO, 2006b).

Phytochemical screening (Table 1) revealed the presence of saponins, flavonoids, tannins, and cardiac glycosides. These are known to exhibit medicinal activity as well as physiological activity (Sofowora, 1993). Various studies have shown that saponins although non toxic can generate adverse physiological responses in animals that consumes them. They exhibit cytotoxic effect and growth inhibition against a variety of cell making them have anti-inflammatory and anticancer properties. They also show tumour inhibiting activity on animals (Akindahunsi and Salawu, 2005).

Flavonoids have been shown to have antibacterial, anti-inflammatory, antiallergic, antimutagenic. Antiviral, antineoplastic, antithrombotic and vasodilatory activity (Allan and Miller, 1996). The potent antioxidant activity of flavonoids and their ability to scavenge hydroxyl radicals, superoxide anions and lipid peroxy radicals may be the most important function of flavonoids (Allan and Miller, 1996).

Tannins recorded in this study has a wide variety range of usage, ranging from antiviral (Brune *et al.*, 1989), antibacterial (Akiyama et al., 2001), antiparasitic (Herbert and Albrecht, 2005) as well as inhibition of HIV replication in infected H9 lymphocytes with little toxicity as in epigallitannins. Cardiac glycosides are used in treatment of congestive heart failure and cardiac arrhythmias. These glycosides are found as secondary metabolites in several plants and in some animals.

Elemental analysis of the leaves (mg/100g dry matter (DM) indicates that *Tapinanthus bangwensis* contained appreciable levels of Ca (3100mg/100g), K (3450mg/100g), Na (5260mg/100g), P (960mg/100g), Mg (40mg/100g), Fe (1080mg/100g) and Zn (80mg/100g) respectively (Fig. 2). There were no significant values detected for Lead (Pb) and Cadmium (Cd). These inorganic elements play an important role in physiological processes involved in human health. The present study has provided some

biochemical information on the proximate composition, phytochemicals and elemental composition of Mistletoe (*Tapinanthus bangwensis)* leaves. The study therefore confirms local claims on the efficacy of the plant leaves by our forefathers.

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