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Proximate, Mineral and Phytochemical Analysis of the Leaves of *H. myriantha* and *Urera trinervis*

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Abstract: The vegetal materials were bought on 20th October, 2010 at the local Total market from Bacongo, South-Brazzaville. The proximate and phytochemical compositions of the leaves of *H. myriantha* and *Urera trinervis* were investigated in accordance with standard procedures. Mineral concentrations were determined by using flame photometer, atomic absorption spectrophotometer and calorimetry. The proximate analysis revealed high moisture (62.90%), crude protein (24.18%) and energy content values (562.19 kJ/100 g) in *U. trinervis* leaves while the carbohydrate (06.07%), crude fat (1.32%) and ash content (5.54%) were low. Similarly *H. myriantha* showed a high content of crude protein (25.37%), energy (1508.32 kJ/100 g) and carbohydrate (60.02%) however, the moisture (6.93%), crude fat (1.54%) and ash content (6.14%) were low. The minerals present in both plant leaves were phosphorus (18.97 and 18.73% for *H. myriantha* and *U. trinervis*, respectively), followed by potassium (1.25 and 1.29%), calcium and magnesium, which were found in very low concentrations (0.21-0.29%). While sodium, iron and manganese were present as trace elements (0.02-0.09%), aluminum was not detected. The phytochemical screening revealed the presence of alkaloids, glycosides, tannins, triterpenoids and steroids. Flavonoids were absent solely in *H. myriantha* while saponins and anthraquinones were not detected in both samples. The study showed that these vegetables contained nutrients, mineral elements and phytochemicals that were nutritionally important for body health. Thus they could be recommended in Congolese nutrition with nutrient and non-nutrient supplementation to help in various protective and therapeutic actions for consumers.

Key words: Proximate, mineral, phytochemical, composition, *Hippocratea myriantha*, *Urera trinervis*

INTRODUCTION

In Africa, many studies have indicated that a vast number of indigenous wild plants play a significant role in the diet of the populace (Muhammad *et al*., 2011). Vegetables are the cheapest and most available sources of important nutrients, supplying the body with minerals salts, vitamins and certain hormone precursors, protein, energy and essential amino acids (Okafor, 1983; Amaechi, 2009).

Recently in Brazzaville, increased interest has been observed in consumption of wild vegetables such as *Hippocratea myriantha* and *Urera trinervis*. They are found and commercialized in the market of Brazzaville by populations of income resources.

Urera trinervis (Hochst. ex Krauss) Friis and Immelman, family, Urticaceae, is a soft woody liane that grows up to 10 m. The plant is found along margins and in clearings of lowland evergreen forest. Urera comprises about 35 species. It is widely distributed in the lowland forest region of tropical Africa, from Ghana eastwards through Central Africa to south-western Ethiopia and South to Kwazulu-Natal, South Africa (Grubben, 2004; Hyde *et al*., 2012).

The bark fiber is used for making ropes and fishing lines. The leaves are used to treat scabies and the juice is used to treat bilious disorders. The leaf sap is drunk to treat intestinal disorders. The stems yield potable water when cut and this water is drunk to treat tachycardia (Friis and Immelman, 1987).

H. myriantha Oliv., family Celastraceae, is a climbing shrub found in the closed forest from Sierra Leone to West Cameroon and on to central Africa, Zaïre and Angola. The wood is very tough (Burkill, 1985).

The dried and pulverized leaves are taken against high blood pressure. The powdered bark is used for the treatment of dysentery and in a mixture with the powdered roots against headache and painful ribs (Burkill, 1985). In DR Congo the stems are used for tying and to lash oil

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presses. The dried, pulverized leaves, are taken against high blood pressure, they are used to ease childbirth and known to stimulate contractions of the muscles of the uterus. The powdered bark is used in mixtures for the treatment of dysentery and the powdered bark and roots in mixtures against headache and painful ribs. (Bosch, 2011). Several researches on the chemical and phytochemical composition of some cultivated vegetables from Congo have been reported by Ndangui *et al*. (2010), Kimbonguila *et al*. (2010a, b) and Matos *et al*. (2009), but no reports on the chemical and phytochemical potentials of lesser known or wild vegetables have been found.

This study aimed to investigate the proximate, mineral and phytochemical compositions of the leaves of two wild plants in order to assess their nutritive and medicinal values.

MATERIALS AND METHODS

Plant materials: The vegetal materials were bought at the local Total market from Bacongo, South-Brazzaville on 20th October, 2010. The plant materials were identified by Makita from the department of Botany, Faculty of Sciences, Marien NGOUABI University and were authenticated by Nkouka Saminou from the National Herbarium of the Vegetal Research Centre of Brazzaville (ex-OROSTOM-Congo), where voucher specimens are conserved. The leaves were air-dried for 21 days and milled into a powder. The powder was stored under dry conditions before analysis.

Chemical analysis

Proximate analysis: The moisture content was determined by drying at 105°C in an oven, until a constant weight was reached. For total ash determination, the plant samples were weighed and converted to dry ash in a muffle furnace at 450 and at 550°C for incineration. The Crude fat content was determined by extraction with hexane, using a Soxhlet apparatus. All these determinations were carried out according to AOAC (1990). Kjeldahl method was used for crude protein determination. Carbohydrate content was determined by calculating the difference between the sum of all the proximate compositions from 100%. Energy values were obtained by multiplying the carbohydrate, protein and fat by the Atwater conversion factors of 17, 17 and 37, respectively (Kilgour, 1987).

Mineral analysis: Mineral analyses were carried out according to Martin-Prevel *et al*. (1984). Elemental analyses were carried out using an atomic absorption spectrophotometer and a flame photometer to determine calcium, sodium, potassium and magnesium content. Aluminum, iron and phosphorus were determined calorimetrically. The concentration of each element in the sample was calculated on a dry matter basis.

Preparation of extracts: Extraction of bioactive compounds was carried out in the solvent mixture ethanol-chloroform according to the procedures described by Harborne (1998) and Biyiti *et al*. (1988). Twenty grams of air-dried, powdered sample was weighed and transferred into a beaker, then 300 mL of ethanol-chloroform (2:1) mixture was added and after agitation were allowed to extract at laboratory temperature for 24 h. The mixture was then filtered and the filtrate evaporated and concentrated using a boiling water bath. The solvent extracts thus obtained were submitted to phytochemical screening.

Preliminary phytochemical screening: Qualitative analysis was carried out following the methods described by Trease and Evans (1989); Harborne (1998) and Kokate (2001). The concentration of each compound was determined according to Mariita *et al*. (2010). Phytochemical analysis was conducted to determine the presence of alkaloids, anthraquinones, flavonoids, glycosides, tannins, triterpenoids, steroids and saponins.

RESULTS AND DISCUSSION

Proximate composition: The proximate composition of *U. trinervis* and *H. myriantha* leaves (Table 1) showed the highest moisture content value (62.90%) for *U. trinervis* while *H. myriantha* showed the lowest value (06.93%). The high moisture content of *U. trinervis* (62.90%) recorded in the present study was in line with the 59.16% recorded for some varieties of cassava (Megnanou *et al*., 2009) but it was significantly higher than the value ranged between 5.28 and 9.28% for some plant species (Dike, 2010) and the 5.9% for *M. oleifera* (Yameogo et al., 2011) which were favorably compared with that of *H. myriantha* (06.93%). However,

Table 1: Proximate composition of the leaves

	Percentage composition (%)	
Parameters	*U. trinervis*	*H. myriantha*
Moisture	62.90	06.93
Crude fat	1.32	1.54
Crude proteins	24.18	25.37
Carbohydrate	6.07	60.02
Total ash	5.54	6.14
Energy (kJ/100 g)	562.19	1508.32

Table 2: Mineral composition of the leaves

	Content (%)	
Element	*U. trinervis*	*H. myriantha*
Calcium	0.21	0.22
Magnesium	0.27	0.29
Potassium	1.25	1.29
Sodium	0.02	0.04
Manganese	0.02	0.03
Iron	0.085	0.09
Aluminium	0.00	0.00
Phosphorus	18.97	18.73

all the values found in the present study were lower than the 81.38% for *B. oleracea* (Kale) (Emebu and Anyika, 2011).

The carbohydrate content value of *H. myriantha* (60.02%) was significantly higher than that of *U. trinervis* (6.07%). However, the carbohydrate content value of *H. myriantha* was favorably compared with the 59.70% for *E. guineensis* (Dike, 2010), 62.94% for *C. frutescens* (Otunola *et al*., 2010) and 61.25% for *V. mombassae* (Emmanuel *et al*., 2011). This content value was found to be significantly higher than the 15.40% found in *A. hybridus*, the 30.40% in *C. pepo* and the 30.38% in *G. africana* (Iheanacho and Udebuani, 2009). It was also found to be lower than the 94.20% in *T. triangulare* (Dike, 2010) and the 89.45% in *G. aqualla* (Muhammad *et al*., 2011).

The high carbohydrate content of *H. myriantha* leaves suggest that they can be considered as a potential source of energy.

The result also showed that the leaves contained an appreciable and comparable amount of crude proteins (24.18 and 25.37% for *U. trinervis* and *H. myriantha*, respectively). The high protein content values recorded for both leaf types were found to be similar to the 24.90% for *S. Africana* but lower than the 33.21% for *M. angolensis* (Emmanuel *et al*., 2011) and the values ranged from 26.25 to 60.38% for mushroom species, except *L. laccata* (Egwim *et al*., 2011). However they were higher than 20.27 and 17.24% for *F. asperifolia* and *F. sycomorus* respectively (Nkafamiya *et al*., 2010). The high protein values recorded in this study suggest that the leaves can be ranked as a potential source of plant protein and therefore could be used as a protein supplement in the Congolese diet.

The fat content values of *H. myriantha* (1.54%) and *U. trinervis* (1.32%) were very low and found to be similar to 1.15% recorded in *A. Digitata* (Dike, 2010) and 1.70% in *G. aqualla* (Muhammad *et al*., 2011). These values were found to be very low when compared to the 24.0% recorded for *A. senegalensis* (Yameogo *et al*., 2011). The low fat content of the samples studied suggests that the plants cannot serve as oil vegetables but may be useful for individuals on weight-reducing diets (Emebu and Anyika, 2011).

The energy values of both samples were very high. That of *H. myriantha* (1508.32 kJ/100 g) was significantly higher than that of *U. trinervis* (562.19 kJ/100 g). This value was favorably compared to those reported for *H. ulmoides* and *V. ferruginea* leaves (504.48 and 516.80 KJ/100 g, respectively) (Andzouana and Mombouli, 2011) but significantly higher than the 56.46 Kcal/100 g reported for Kale (Emebu and Anyika, 2011). The energy value of *H. myriantha* was higher than that reported for *P. mildbraedii* (1086.44 kJ/100 g) (Akinyeye *et al*., 2010) and would assure food security for Congolese children.

The ash content values of the samples (6.14 and 5.54% respectively) were favorably compared to the range of 5.43 to 5.75% reported for some edible woody plants (Emmanuel *et al*., 2011). However, these values were lower than the range of 17.44 to 33.60% for *mushroom* species (Egwim *et al*., 2011) and higher than the range of 0.38-1.9% for selected vegetables grown in Peshawar (Bangash *et al*., 2011).

The results showed that the leaves contained appreciable amounts of nutrients such as protein, energy and carbohydrate that determined the nutritional value of the leaves.

Mineral composition: The result of mineral analysis of the leaves (Table 2) indicated that the minerals detected were calcium, magnesium, potassium, sodium, iron, manganese and phosphorus. The leaves showed a high level of phosphorus content (18.97 and 18.73%) for *U. trinervis* and *H. myriantha*, respectively) followed by potassium (1.25 and 1.29%)while calcium and magnesium were detected in much lower amounts in both samples (0.21-0.29%). Sodium, manganese and iron were detected as trace elements (0.02-0.09%). Aluminum was not detected. Beside phosphorus, the result showed the low mineral level of the leaves. The phosphorus content of both samples was considerably higher than the 0.35% reported for *S. rebaudiana* leaves (Tadhani and Subhash, 2006) and the range of 0.17-0.23% for Nigerian sesame seeds (Obiajunwa *et al*., 2005). These content values were lower than the 25.70% recorded in *Z. officinale* (Adanlawo and Dairo, 2007). The potassium content values recorded in this study were in line with the 1.33% recorded in the leaves of *H. ulmoides* however these values were lower than the 4.39% in *V. ferruginea* (Andzouana and Mombouli, 2011). Further analysis of the results showed that the calcium, magnesium and Manganese, sodium and iron content values fell within the range of 0.05 to 0.53 % and 0.01 to 0.04% reported for rice, maize, millet grains (Kouakou *et al*., 2008) and *H. ulmoides* and *V. ferruginea* leaves (Andzouana and Mombouli, 2011), respectively. The iron and the

Table 3: Phytochemical constituents of the leaves

	U. trinervis	*H. myriantha*
Phytochemical	$C_2H_5OH/CHCl_3$ (2:1)	$C_2H_5OH/CHCl_3$ (2:1)
Alcaloides	+++	++
Anthraquinones	-	-
Flavonoides	++	-
Glycosides	+++	+++
Saponins	-	-
Triterpenoids	+	+++
Steroids	+	+
Tannins	++	+++

-: Negative result,+: Low concentration, ++: Moderate concentration, +++: High concentration

manganese contents of both samples studied were lower than their RDA values (1.37 and 2.94 mg/day for males and females, respectively) according to FAO/WHO (1988). The potassium content in this study was higher than the range of the requirement of this element for animals (0.2-0.6% dry weight basis) (Kawo *et al*., 2009).

The plants contained nutritionally important minerals. It is suggested that the leaves can be recommended as part of the daily nutrition for Congolese population.

Phytochemical constituents: The phytochemical analysis (Table 3) revealed that alkaloids, cardiac glycosides, tannins, triterpenoids and steroids were present in both plant leaves. Flavonoids were not detected in *H. myriantha* while anthraquinones and saponins were completely absent in both plant leaves. The results showed that cardiac glycosides were present in a significantly high concentration in both samples. Alkaloids were detected in *U. trinervis* in a high concentration while *H. myriantha* showed the presence in high concentration of triterpenoids and tannins. However, flavonoids, tannins and also alkaloids were found in moderate amounts in *U. trinervis* and *H. myriantha*, respectively. As steroids in both the studied leaves, triterpenoids were detected as trace compounds in *U. trinervis*. Further analysis of the results showed that *U. trinervis* contained most of the tested phytochemicals, while *H. myriantha* contained appreciable amounts of these phytochemicals.

Plant foods contain constituents such as flavonoids, saponins, etc, which have been assessed for their biological effects (Krishnaswamy and Raghuramulu, 1998). For instance, Edeoga and Enata (2001) reported that alkaloids are powerful pain relievers, have an antipyretic action, a stimulating effect and can act as topical anesthetic in ophthalmology. Cardenolides have been used in the treatment of congestive heart failure (Oloyede, 2005) and cardiac arrhythmia (Ngbede *et al*., 2008). Tannins are known to have antiviral, antibacterial and anti-tumor properties. Terpenoids and steroids are known to possess antibacterial and antineoplastic properties (Oduro *et al*., 2009). The presence of secondary metabolites in the leaves suggests that their consumption could have a preventive effect on woman body and help to treat related diseases by providing indicated properties to the vegetables.

CONCLUSION

The study revealed that *U. trinervis* and *H. myriantha* leaves contained appreciable amounts of nutrients, such as phosphorus, energy, protein and phytochemicals. This indicates that the leaves are nutritionally important, since their consumption provides essential nutrients and non-nutrients need for human body health development and also contribute to the medicinal value of the leaves and thus might be of medicinal and industrial importance (Kunle and Egharevba, 2009). Therefore, the leaves could be recommended as a constituent of human diet in Congo with pharmaceutical potentials and health benefits to consumers.

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