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Composition in Mineral Elements of the Traditional Vegetables Leaves of *Cuervea isangiensis* (de wild.) N.hallé in Congo-Brazzaville

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Abstract: In this study, the proximate composition and physicochemical analyses were carried out on the vegetables-leaves of *Cuervea isangiensis* (De Wild.) N. Hallé. The results showed that the rate of mineral elements depends on the place of harvest, so for the harvested samples : locality 1 (forest 1): Magnesium 104±0.00 mg/ 100 g; Phosphor 725.50 ± 39.50 mg / 100 g; Potassium 970±0.00 mg/ 100 g; Iron 11.53 ± 0.03 mg/ 100 g ; Calcium 2.21±0.00 mg/ 100 g; for the locality 2 (forest 2): Magnesium 164.50±2.50 mg/ 100 g; Phosphor 1093±79 mg/ 100 g; Potassium 820±0.00 mg/100 g ; Iron 11.34±0.03 mg/ 100 g; Calcium 3.06±0.00 mg/100 g. In conclusion, these values compared fluently to those of the 10 vegetables-leaves clear soups show the leaves of *Cuervea isangiensis* (De Wild.) N. Hallé are rich particularly in minerals Potassium, Phosphor, Magnesium and Iron. These leaves present a big interest on the nutritional plan in the struggle against the deficiencies in micronutrients.

Keywords: C*uervea isangiensis* (De Wild.) N. Hallé, micronutrients, picking, vegetables-leaves

INTRODUCTION

Cuervea isangiensis (De Wild.) N.Hallé is a vegetable leaf that pushes to the wild state in forests (Malaisse, 1997). One finds it in six countries in Sub-Saharan Africa to know: Congo, Cameroon, Gabon, the Central Republic, the Democratic Republic of Congo, and Angola (Wilczek, 1960). To Congo - Brazzaville leaves of *Cuervea isangiensis* (De wild.) N.Hallé called by some ethnics "*Nsinga Nkuata* or *Mbumba Nkua*" are consumed raw either cooked added or even to certain similar dishes to *Gnetum africanum*. In Africa populations have recourse often to the wild species of which vegetables (Ambe, 2001) to cover their food needs and assure the food security (Jansen *et al*., 2004).

According to experts in nutrition of the French-speaking countries of sub-Saharan Africa vegetables constitute a source of micro nutriments in general (FAO-OMS, 2007). They can also constitute of by their compositions a substantial complement of mineral salts and proteins in the food (Ern, 1979). They play an extremely important role in the food regimes of all populations of the world, in particular in Africa, Asia and in Oceania where they assure the essential part of needs nutritionnelses (Batawila *et al*., 2005).

The objective of this study is to determine the composition in mineral elements of *Cuervea isangiensis* (De Wild.)N.Hallé in order to valorize this vegetable on the one hand and to contribute to the food security on the other hand in the struggle against defaulting in micronutriments.

MATERIALS AND METHODS

This study has been led to the Laboratory of Valorization of the Agroressourceses (School National Superior Polytechnic , University Marien NGOUABI) to Brazzaville and the Institute of Development Research (I.R.D. formerly O.R.S.T.O.M. French Organism of Research in Sciences and Techniques of Overseas) to Pointe - Noire of January 13 to March 3, 2012.

Plant material: Leaves - vegetables of *Cuervea isangiensis* (De Wid.) Hallé have been harvested in two different localities: forest of Makana II (30 km to the

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south of Brazzaville, capital of Congo) and the forest of Mati (130 km to the north of Brazzaville).

Gnetum africanum, vegetable leaves very consumed to Congo have been bought to the "Total market" of Bacongo (from the forest of "INONI Cliff", 150 km of Brazzaville very early in the morning).

Methods: Determination for *Cuervea isangiensis* (De wild.) N.Hallé Makana II, *Cuervea isangiensis* (De Wild.)N. Hallé Mati and *Gnetum africanum* seeds for crude protein (micro - kjeldahl) and oil (soxhlet) content were determined using the methods described by Pearson (1976), whereas the ash content was determined using the method of Pomeranz and Meloan (1994) and total carbohydrate was determined by difference. All determinations were done in triplicate.

Oil extraction: Dried *Cuervea isangiensis* (De Wid.) N.Hallé and *Gnetum africanum* seeds were ground in has Moulinex Model Thermemix VORWERK 3300. For solvent extraction (soxhlet method, UIPAC, 1979), 50 g of grounds seeds were placed into a cellulose paper cone and extracted using hexane in a 50ml soxhlet extractor for 8 h (Pena *et al*., 1992). The oil was then recovered by evaporating of the solvent using rotary evaporator Model RE-100 series 2439 (BIBBY STERILIN STONE STAFFORDSUIRE, Made in U.K.) and residual solvent was removed by drying in an oven at 70°C for 1 h and flushing with 99.9% nitrogen. All experiments were done in triplicates and the mean and standard deviations were calculated.

Chemical analysis: The minerals (Ca, Mg, K, Na, P and Fe) were determined by atomicabsorption spectrophotometry. One gram samples, in triplicate were drying ashed in a muffle furnace at 550°C for 8h until a white residue of constant weight was obtained. The minerals were extracted from ash by adding 20.0 mL of 2.5% HCl, and this was transferred quantitatively to a 50 mL volumetric flask. It was diluted to volume (50 mL) with deionised water, stored in clean polyethylene bottles and mineral contents determined using an atomic absorption spectrophotometer (Perkin-Elmer, Model 2380, USA). These bottles and flasks were rinsed in dilute hydrochloric acid (0.10 M HCl) to arrest microbial action with may affect the concentrations of the anions and cations in the samples. The instrument was calibrated with standard solutions.

Statistical analysis: Values represented are the means and standard deviations for three replicates. Statistical analysis was carried out by Excel version 8.0 software. Significance was defined at $p<0.05$.

RESULTS AND DISCUSSION

Physical features of *cuervea isangiensis* (De Wild.) N. Hallé leaves - vegetables Results of the Table 1 show that the length of *Cuervea isangiensis* (De Wild.) N.Hallé leaves 8.85±0.87 cm is lower to those of *Gnetum africanum* measuring 10.62± 0.36 cm. The difference is meaningful $p<0.001$. *Gnetum africanum*, edible spontaneous plant constitutes at the present time to Congo-Brazzaville, the principal vegetable-leaf clear soup, according to Makosso-Vheiye *et al*. (2008). However at the level of the width (cm), of leafstalks (cm) and of the number of ribs no difference has been noted $p>0.05$. For Tchiengang and Kitikil (2004), it exists little strong information on vegetables - leaves.

Table 1: Physical Features of *Cuervea isangiensis* (De Wild.) N.Hallé vegetables-leaves and of *Gnetum africanum*

Feature physical	*Cuervea isangiensis*	*Gnetum africanum*	p-value
M±S.D.		M±S.D.	
Length (cm)	8.85±0.87	10.62±0.36	<0.001
Width (cm)	4.15±0.15	4.52±0.42	<0.05
Leafstalks (cm)	0.67±0.11	0.75±0.18	<0.05
Ribs (n)	9±1.73	9±1.0	<0.05

M±S.D. mean±standard deviation of triplication determinations; Cm: centimeters; n: number

Table 2: Content in water and organic composition of *Cuervea isangiensis* (De Wild) N.Hallé

Components	P-values
Content in water (%)	61.22
Proteins (g)	9.59±0.41[a]
Lipids (g)	4.00±0.06 [a]
Carbohydrates (g)	25.75±0.42 [a]

Proteins: N (%) ×6.25 ; a: M±S.D. mean±Standard deviation of triplication determinations

Content in Proteins, Lipids, and carbohydrates of *Cuervea isangiensis* (De Wild.) N. Hallé: Data of the Table 2 reveal that *Cuervea isangiensis* (De Wild.) N. Hallé contains a quantity important of organic compounds: proteins 09.59±0.41 g for 100 g of dry matter; lipids 4.00±0.06 g for 100 g of dry matter and glucides 25.75±0.42 g for 100 g of dry matter. These values are fluently superior to those of certain vegetables clear soups in the world as those of *Momordica balsamina* (melon) with: proteins 4.2 g for 100 g of dry matter; total glucides: 6.4 g for 100 g of dry matter (FAO, 1970). Proteins are nutriments formed of amino acids bringing nitrogen, indispensable to the growth and the renewal of proteins of the organism (Dorosz, 2000). Lipids play an essential role in the cellular membrane constitution (Grubben, 1975). Carbohydrates are fuels giving the necessary energy to maintain the temperature of the organism and to work (Lathan, 1979).

Content in ashes (g), in magnesium (mg) and in iron (mg) for 100g of dry matter of *Cuervea isangiensis* (De Wild.) N. Hallé according to the locality of harvest: The Table 3 gives values of *Cuervea isangiensis* (De Wild.) N.Hallé with: Ashes 10.04± 0.02 g for 100 g of dry matter (locality 1), 13.65±0.16 g for 100 g of dry matter (locality 2). Magnesium: 104±0.00 mg for 100 g of dry matter (locality1), 164.50±2.50

Table 3: Variation of the content in ashes (g), in magnesium (mg) and in iron (mg) of vegetables-leaves of *Cuervea isangiensis* (De Wild) N.Hallé according to the locality of harvest

Elements	Locality 1 M±S.D.	Locality 2 M±S.D.	p-value
Ashes	10.04±0.02	13.65±0.16	<0.001
Magnesium, Mg	104±0.00	164.50±2.50	<0.001
Iron, Fe	11.53±0.03	11.34±0.37	<0.05

M±S D. mean±standard deviation of triplication determinations; Locality 1: Sample harvested in the forest of Makana II to 30 km to the south of Brazzaville, capital of Congo; Locality 2: Sample harvested in the forest of Mati, to the north of Brazzaville to 130 km

Table 4: Content in mineral salts of vegetable grooves *Cuervea isangiensis* (De Wild.) N.Hallé according to localities in mg/100g of M S

Salts minerals	Locality 1 M±S.D.	Locality 2 M±S.D.	p-value
Potassium, K	970±0.00	820±0.00	<0.001
Phosphor, P	725.50±39.50	1093±79	<0.001
Calcium, Ca	2.21±0.00	3.06±0.00	<0.05
Sodium, Na	0.00±0.00	20±0.00	<0.001

M±S D: mean standard deviation of triplication determinations; Localité1: Sample harvested in the forest of Makana II, to 30 km to the south of Brazzaville; Locality 2: Harvested sample of Mati to 130 km to the north of Brazzaville; M S: dry matter

Table 5: Content in ashes (g), magnesium (mg) and in iron (mg) of *Cuervea isangiensis* (De Wild) N.Hallé and of *Gnetum africanum* vegetables- leaves

Elements	*Cuervea isangiensis* M±S.D.	*Gnetum africanum* M±S.D.	p-value
Ashes	10.04±0.02	5.96±0.07	<0.001
Magnésium, Mg	104±0.00	160±0.00	<0.001
Fer, Fe	11.53±0.03	20.38±0.35	<0.001

M±SD: mean± standard deviation of triplication determinations

Table 6: Content in mineral salts (in mg/100 g de MS) of *Cuervea isangiensis* (De Wild.) N.Hallé and *Gnetum africanum* vegetables - leaves

Salts mineral	*Cuervea isangiensis* M±S.D.	*Gnetum africanum* M±S.D.	p-value
Potassium, K	970±0.00	1170±30	<0.001
Phosphor, P	725.50±0.00	1340.50±39.50	<0.001
Calcium, Ca	2.21±0.00	0.52±0.00	<0.05
Sodium, Na	00±0.00	00±0.00	<0.05

M±S.D. Mean±standard deviation of triplication determinations, a: Sample of *Cuervea isangiensis* (De Wild.) N.Hallé, locality 1, Makana

mg for 100 g of dry matter (locality 2). One notes for a same species a difference (p<0.001) enters the two localities of harvest, (Soro *et al*., 2012) on the works of vegetables - leaves (Amaranth, nightshade) noted the same phenomenon: the content in silly - carotene of these vegetables - leaves varied a place of harvest to another. The magnesium plays a very important role in the normal working of cells, the transmission the nervous impulse, the contraction of muscles, the formation of antibodies, and the action of many enzymes (Fallon *et al*., 1999). The quantity of iron found in *Cuervea isangiensis* (De Wild.)N.Hallé is very important: Fe 11.53±0.3 mg for 100 g of dry matter (locality 1) and 11.34±0.37 mg for 100 g of dry matter (locality 2) with p<0.05. Iron plays a very important role in the constitution of hemoglobin and it is a constituent of the muscle myoglobine. The deficiency of iron makes an anemia, with paleness, of the pantings and a seric decrease. Needs of iron vary per day according to age between 7 and 8 mg per day (Dorosz, 1999)? In general, 100 g of vegetables - leaves provide per day 4 to 7 mg of sufficient iron for a child and constitute a non negligible contribution for an adult (Diouf *et al*., 1999).

Content in mineral salts: *Cuervea isangiensis* (De Wild.) N.Hallé has a rate raises in mineral elements (Table 4). The quantity is valued for: Potassium 970± 0.00 mg for 100 g of dry matter (locality 1) and 820± 0.00 mg for 100 g of dry matter (locality 2) p<0.001; for the phosphor 725.50±39.50 mg for 100 g of dry matter (locality 1) and 1093±79 mg for 100 g of dry matter (locality 2) p<0.001. The quantity of calcium, That in *Cuervea isangiensis* (De Wild.) N.Hallé is 2.21 ±0.00 mg for 100 g of dry matter (locality1) and 3.06± 0.00 mg for 100mg of dry matter (locality 2). The content in sodium, Na is: 0.00±0.00 mg for 100 g of dry matter (locality 1) and 20±0.00 mg for 100 g of dry matter (locality 2). Potassium k+ as the sodium Na+, plays an essential role in the permeability of the cell membrane. Needs in potassium are valued per day between 0.5 to 3 g (Kleiner and Greenwood-Robinson, 2000). The calcium plays a structural role in the bone, participle to the good progress of the muscular contraction and the one of various enzymatic relations (Riché, 1998). The phosphor is quantitatively the mineral salt most important after the calcium. It plays a plastic role because it constitutes in combination with the calcium, the mineral plot of bones. Needs of the calcium are per day of the order 800mg at the adult (Dorosz, 1999).

Composition of the content in mineral salts of Cuervea isangiensis (De Wild.)N.Hallé with other vegetables: Results of the Table 5 show a superior content in ashes of *Cuervea isangiensis* (De Wild.) N.Hallé 10.04±0.02g for 100 g of dry matter against 5.96±0.07 g for 100 g of dry matter for *Gnetum* africanum; the difference is meaningful. The quantity of magnesium, Mg (104±0.00 mg for 100 g of dry matter) and of iron, Fe (11.53±0.03 mg for 100 g of dry matter) is lower to values of *Gnetum africanum*.

The rate in calcium, (Table 6) of *Cuervea isangiensis* (De Wild.) N.Hallé 2.21±0.00 mg for 100 g of dry matter are superior to the one found in *Gnetum africanum* (0.52±0.00 mg for 100 g of dry matter), however quantities of *Cuervea isangiensis* (De Wild.) N.Hallé in potassium, K (970±0.00 mg for 100 g of dry matter) and in phosphor P (725.50±39.50 mg for 100 g of dry matter) are lower to those of *Gnetum africanum* (respectively: phosphor P: 1170±30 mg for 100 g of dry matter, phosphor: 1340.50±249.50 mg for 100 g of dry matter).

Table 7: Comparison of the nutritional compositions of *Cuervea isangiensis* (De Wild) N. Hallé and of other vegetables- leaves (data in mg pour100g of dry matter)

Nom scientifique	Name	Potassium (mg)	Calcium (mg)	Phosphor (mg)	Magnésium (mg)	Fer (mg)
Moringa oleifera [b]	Moringa	325	525	78	101	6.8
Chichorium endivia [c]	Endive	nd	60	36	nd	1.2
Dancus carota [b]	Carrot	324	38	36	13	0.4
Hibiscus esculenta [b]	Okra	195	68	73	37	0.7
Allium cepa [b]	Onion	154	21	32	9	0.2
Solanum lycopersium[b]	Tomato	252	10	23	12	0.4
Spinacia cleracea [b]	Spinach	540	117	49	63	4.0
Amaranthus [b]	Amaranth	nd	280	103	nd	8.8
Manihot esculenta [b]	Cassava	nd	400	118	nd	7.6
Brassica clerecea [b]	Cabbage	448	210	84	31	1.8
C.Isangiensis [a]	Nsinga Nkuata[nl]	970	2, 21	725	104	11.53

a: Obtained values; b: Reported values (Broin, 2012); C: FAO, 1970; nd: No determined nl: Name in vernacular language

Data of the Table 7 compare the mineral salts of *Cuervea isangiensis* (De Wild.)N.Hallé to ten vegetables - leaves clear soups in the world: *Moringa oleifera*, *chichorium endira* (Endive), *Dancus carota* (Carrot), *Hibiscus esculenta* (okra), *Spinacea cleracea* (spinach), *Amaranthus* (Amaranth), *Manihot esculenta* (Cassava) and *Brassiva cleracea* (Cabbayge). It comes out again that *Cuervea isangiensis* (De Wild.) N.Hallé presents a weak content in calcium (2.21±0.00 mg for 100 g of dry matter). In spite of the Calcium, *Cuervea isangiensis* (De Wild.)N.Hallé contains strong contents in potassium (970 mg for 100 g of dry matter) in comparison to *Spinacia cleracea* (540 mg for 100 g of dry matter) and to *Moringa oleifera* (325 mg pour100 g of dry matter); the quantity of phosphor contained in *Cuervea isangiensis* (De Wild.) N.Hallé (725.50± 39.50 mg for 100 g of dry matter) is superior of *Manihot esculenta* (118 mg for 100 g of dry matter), (Broin, 2012).

Cuervea isangiensis (De Wild.)N.Hallé is rich in iron, Fe (11.53±0.03 mg for dry matter) in comparison to the *Amaranthus* (8.8 mg for 100 g of dry matter) and of *Moringa oleifera* (6.8 mg for 100 g of dry matter), (Broin, 2012).

Conclusion: This study shows that leaves of *Cuervea isangiensis* (De Wild.) N.Hallé are rich in minerals particularly in potassium K, phosphor P, magnesium Mg and iron, Fe. The elevated content in these minerals leaves of *Cuervea isangiensis* (De Wild.) N.Hallé especially presents a big interest on the nutritional plane for the struggle against defaulting in micronutriments.

REFERENCES

Ambe, G.A., 2001. The edible wild fruits of the Guinean savannas of Cote of Ivory: State of local knowledge, the Malinkés. Boitechnol. Agro. Soc. Environ., 5(1): 43-58.

Batawila, K., S. Akapali, K. Wala, M. Kanda, R. Vodouhe and K. Akpagana, 2005. Diversity and management of cuiellette vegetables to Togo. Afr. J. Food Agric. Nutr. Develop., pp: 21.

Broin, M., 2012. Nutritional Composition of Moringa Oleifera, Moringaneus. Retrieved from: http://www.moringaneus.org, pp: 1-5.

Diouf, M., M.L. Diop, K.A. Drama, E. Sene, C.O. Ba, M. Gueye and B. Faye, 1999. Protection of Vegetables Leaves Traditional African Type to Senegal. In: Chweya J.A. and P. Eyzaguice (Eds.), Biodiversity of Traditional Leafy Vegetables in Africa. International Plantation Genetic Institute (PGRI) Via Delle Sette Chiese 14200145 Rome, Italy, pp: 111-150.

Dorosz, P.H., 1999. Vitamins, Mineral Salts, Trace Elements. 2nd Edn., Maloine, Paris, pp: 101.

Dorosz, P.H., 2000. Table of Calories. Maloine, Paris, pp: 160.

Ern, H., 1979. Die Vegetation Togos: Gliederung, Gefährdung, Eraltung. Wildenowia, 9: 295-312.

Fallon, S., P. Connolly and M.G Enig, 1999. Nourishing Traditions: The Cookbook that Challenges Politically Correct Nutrition and the Diet Dictocrats. 2nd Edn., New Trends Publishing, Washington DC.

FAO, 1970. Table of Food Composition to the Use of Africa. FAO, Rome, Italy, pp: 218.

FAO-OMS, 2007. Report of the international shop on the Promotion of Fruits and Legumes (PROFEL). In the French-Speaking Countries of Sub-Saharan Africa, Yaoundé, Cameroon, pp: 27.

Grubben, G.J.H, 1975. The Culture of the Amaranth, vegetables-Leaves Tropical, with Special Reference to South-Dahomey. Madedeling Land Bouwhoge School, Wageningen, pp: 75-76. Landbouwhogeschool, Netherlands, pp: 223.

Jansen, V., W.S. Rensburg, S.L. Ventel, T.R. Netshiluvhi, E. Ven Der Heever, H.J. Voster and J.A. De Ronde, 2004. Role of indigenous leafy vegetables in combating hunger and malnutrition. South-Afr. J. Bot., 70(1): 52-59.

Kleiner, S. and M. Greenwood-Robinson, 2000. Food Muscle. Vigot, Paris, pp: 194.

Lathan, M.C., 1979. Human Nutrition in Tropical Africa. FAO Collection: Food and Nutrition., Rev. 1 Edn., New York, United States, 11: 305.

Makosso-Vheiye, G., J. Massamba, A. Massamba, J.P. Massamba and Th. Silou, 2008. Food Situation of households of the township of Bacongo in April-June 2007. Medicine and Nutrition, Flight 44, 2: 77-89.

Malaisse, F., 1997. To Feed Itself in African Lucid Forest: Ecological and Nutritional Approach. Agronomic Presses of Gembloux; Gembloux, Wageningen, Belgium, Netherlands, CTA, pp: 1-384.

Pearson, D., 1976. The Chemical Analysis of Foods. 7th Edn., Churchill Livingstone, Edinburgh, UK., pp: 488-496.

Pena, D.G., R.G.L. Anguiano and J.J.M. Arredondo, 1992. Modification of the AOAC method1 (CB-method) for the detection of aflotoxins. Bull. Environ. Contam. Toxicol., 49: 485-489.

Pomeranz, Y. and C. Meloan, 1994. Food Analysis: Theory and Practice. 3rd Edn., Chapman and Hall, New York, pp: 778.

Riché, D., 1998. Nutritional Guide Sports. Vigot, Paris, pp: 368.

Soro, C.L., A.A.L. Ocho-Anin, K.A. Kouadio Kouakou and C. Kouamé, 2012. Assessment of vegetable nutritional composition leaves. J. Appl. Biosci., 51: 3567-3573.

Tchiengang, C. and A. Kitikil, 2004. Given ethno nutritionnelleses and physico-chemical features of vegetables-leaves clear soups in the savanna of the Adamawa (Cameroon). Tropicultura, 22(1): 11-18.

UIPAC, 1979. Methods of Fat and Derivative Matter Analyses. 6th Edn., Lavoisier Tec. and Doc, Paris, France, pp: 190.

Wilczek, R., 1960. Flora of the Congo Belgian and Ruanda-Urundi: Spermaphyteses. Publications to the National Institute for the Agronomic Survey of the Congo-Belgian, Flight IX, pp: 159-164.