

DETERMINATION OF NUTRITIONAL POTENTIALS OF FRESH HENSIA CRINATA (ATAMA) LEAVES FROM DIFFERENT LOCATIONS BY ATOMIC ABSORPTION SPECTROPHOTOMETER AND ITS HEALTH BENEFITS

Umoh, Emmanuel Michael¹ Udoh, Idongesit Ignatius² & Effiong, James Okon³

^{1,2,3} Department of Chemical Sciences, Akwa Ibom State Polytechnic, Ikot Osurua, Ikot Ekpene,
Akwa Ibom State, Nigeria. emicheals_ep@yahoo.co.uk¹

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ABSTRACT

Heinsia crinata is a perennial shrub of Rubiaceae family used traditionally in the treatment of skin rashes, infertility, hypertension, wound healing, gastrointestinal disorders and boosting of libido, ovulation and bowel movement. Ayurvedic medicine makes use of medicinal plants for the treatment of diseases due to the inherent properties of secondary metabolites. The aim of the research was to determine the mineral content of Heinsia crinata in comparison to other obtained Heinsia crinata data. The fresh leaves of Heinsia crinata were processed and the digest analysed for the mineral content with atomic absorption spectrophotometer. The results obtained were: K (28.02 ± 0.02 mg/100g), Na (0.72 ± 0.15 mg/100g), Zn (11.93 ± 1.42 mg/100g), Fe (0.4 ± 0.34 mg/100g), Mg (55.93 ± 3.00 mg/100g), Mn (40.4 ± 2.30 mg/100g), Cu (3.03 ± 0.13 mg/100g) and Ca (33.12 ± 0.61 mg/100g). The results showed that Heinsia crinata had some mineral elements with the most abundant being magnesium and therefore, could be beneficial when consumed

INTRODUCTION

Vegetables contain lots of phytochemical compounds as well as minerals, vitamins, essential amino acids and fibres which are vital in the improvement of human health (Vanisha and hema, 2012, Gaga and Gaga,1999). The vegetables are the most common sources of minerals to humans which are harnessed by eating as fruits or as salads (Mensah *et al.*,2008). These vegetables contain essential elements such as calcium, sodium, potassium magnesium etc which are known for the maintenance of biochemical processes in the body. Deficiencies of these minerals result in serious health consequences such as cancer, heart diseases, hypertension (Itah, 1997). (According to Opeke, (2000), the nutritive value of vegetables is found in their mineral composition and vitamins.

Most of these minerals are found virtually in all plant (Okafor and Okoro,2004 and fruits. However, the quantity of these minerals depends on some factors such as soil composition, climatic conditions, varieties, location etc.

In Southern Nigeria, people eat a lot of vegetables such as *Lasianthera Africana* (Editan), *Gnetum Africana* (Afang) *Telferia occidentalis* (Nköng afere) and *Heinsia crinata* (Atama) (Ekezie *et al.*, 2017). The importance of these vegetables cannot be ignored as they provide the body with minerals, carbohydrates, vitamins and energy. They also help in cleansing of the colon due to their high fibre content.

Heinsia crinata is a common vegetable locally known as ‘atama’ in Efik, Ibibio and Annang tribes in Southern Nigeria. They are of two (2) types, the dark leaves and the light leaves. It belongs to Rubiaceae family. They are shrubs with woody stem and branches. The fresh and the dried leaves prepared separately in soups after eating with prepared garri, foofoo or rice leaves a sweet lasting flavour in the mouth.

The leaf extracts of *Heinsia crinata* is used in the treatment of skin rashes and other skin diseases as well as infertility, hypertension, wound healing etc. It also boosts libido, bowel movement and related gastrointestinal disorders (Edeoga *et al.*,2005, Etukudo, 2003, Fagbohun *et al.*,2012) and umbilical hernia (Etukudo, 2003).

Material and methods

Sample collection

Fresh leaves of *Heinsia crinata* were collected from a garden at Abiakpo Ntak Inyang in Ikot Ekpene Local Government Area of Akwa Ibom State and taken to the laboratory for processing and analysis.

The flesh leaves were plucked off the stems rinsed with clean water and air dried. The dried leaves were shredded into fine strands and latter blended into a course powder and stored for further analysis.

Digestion of the sample (AOAC, 2000)

1gof the processed *Heinsia crinata* was weighed into a conical flask and 10ml of concentrated Trioxonitrate (V) acid (HNO₃) added followed by 20ml of (Hcl) Hydrochloric acid. The mixture was swirled gently to mix and heated to completion using a heating mantle until the colour changed from brown to pale yellow. The digest was allowed to cool. 30ml of distilled water was added and shaken to obtained a homogenous mixture. It was filtered using the Whatman filter paper into a 100ml volumetric flask and made up to 100ml and stored.

Analysis

The sample was analyzed using Buck scientific Atomic Absorption Spectrophotometer. The aliquots of the sample were analyzed for calcium, magnesium, manganese, potassium, zinc, copper, sodium and iron using their individual lamps.

Results and Discussions

Analysis of calcium, magnesium, manganese, potassium, zinc, copper, sodium and iron was done in duplicates of the sample. The results of the mineral content of *Heinsia crinata* are as shown in table 1. The concentrations of the elements area expressed in mean SD \pm mg/100g with values from previous work.

Table 1: Table of mineral elements from experiment and literatures.

Element(s)	Experimental data. mg/100g	Tamuno diepriye <i>et al.</i> , 2019 mg/100g	Ekpo <i>et al.</i> , 2011 mg/100g	WekhKe <i>et al.</i> , (2002) mg/100g
Potassium	28.02 \pm 0.02	0.44	16.40	309.00 \pm 6.08
Sodium	0.72 \pm 0.15	0.62	0.00	53.00 \pm 1.00
Zinc	11.93 \pm 1.42	0.28	0.00	*ND
Iron	0.41 \pm 0.34	0.40	30.5	53.34 \pm 3.05
Magnesium	55.93 \pm 3.00	0.60	23.90	157.34 \pm 2.30
Manganese	40.45 \pm 2.30	*ND	0.00	*ND
Copper	3.03 \pm 0.13	*ND	0.00	*ND
Calcium	33.52 \pm 0.61	4.00	22.20	301.67 \pm 2.89
Phosphorus	ND	ND	12.50	48.67 \pm 0.58

ND = Not determined

The experimental results revealed that the most abundant element was magnesium 55.93 \pm 3.00mg/100g followed by manganese 40.45 \pm 2.30 mg/100g, calcium 33.52 \pm 0.61 mg/100g, potassium 28.02 \pm 0.02mg/100g, zinc \pm 11.93 \pm 1.42 mg/100g while the least concentration was found in iron 0.41 \pm 0.34 mg/100g.

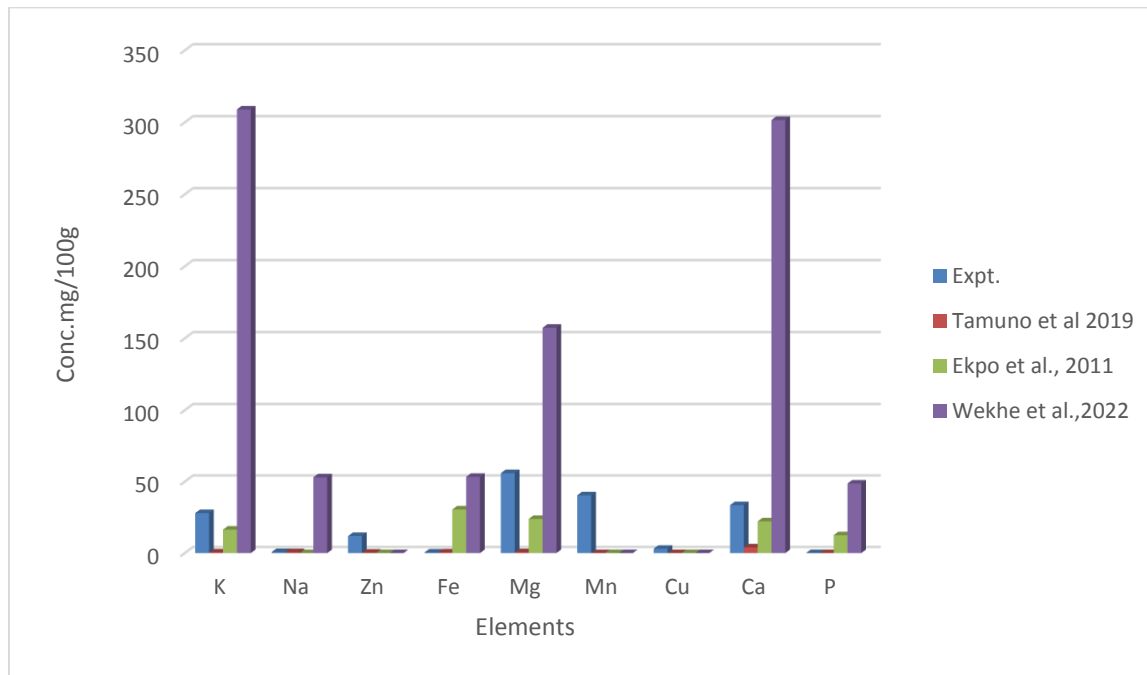


Figure 1: A plot of concentration mg/100g against elements from different locations.

In comparison of experimental data with the works of Tamuno diepreye *et al.*, (2019) Ekpo *et al.*, 2011 and Wekhe *et al.*, (2022) (Figure 1), the most abundant mineral element was potassium with 309 ± 6.08 mg/100g followed by experimental 28.08 ± 0.02 mg/100g, Ekpo *et al.*, 2011 and the least Tamino diepreye *et al.*,(2019) 0.443 mg/100g. Sodium concentration was highest for Wekhe *et al.*, (2022) followed by experimental result. Iron had the largest concentration of 53.34 mg/100g in Wekhe *et al.*, (2022) followed by Ekpo *et al.*, (2011) with 30.5 mg/100g with Tamuno diepreye *et al.*, (2019) and the experimental result having the least concentrations. For magnesium, the highest concentration was 157.34 mg/100g for Wekhe *et al.*, (2022) followed by Experimental result of 55.93 mg/100g and 23.90 mg/100g for Ekpo *et al.*, (2011). Calcium had the largest concentration of 301.67 mg/100g in Wekhe *et al.*, (2022) followed by 33.52 mg/100g and 22.2 mg/100g for the experimental and Ekpo *et al.*, (2011) respectively. According to mineral composition data of *Hiensia crinata* obtained from Wekhe *et al.*, (2002), concentrations were very high for all the minerals while the least concentrations were from Tamuno diepreyes' data. These differences may be due to nature of soil composition, climatic variation, age of plant, genetic constitution of the plant and plant species.

Elements: importance and deficiencies.

Sodium

They are known to control osmotic pressure and water metabolism and in the maintenance of acid-base equilibrium of the body and membrane potentials, nerve impulses transmission and absorptive processes of amino acids, pyrimidine and bile salts. Low levels of sodium in serum causes

hyponatremia and this occurs in acute Addison disease (Hay and Swenson,1985). Deficiency results in dehydration of body fluids and body cramps (Frasseto *et al.*, 2001).

Potassium

Potassium like sodium serves as an important cation in intracellular body fluid and in the control of acid base balance, regulation of osmotic pressure, conduction of nerve impulse, muscular contractions especially the cardiac muscle and especially in glycogenesis (Murray *et al.*, 2000).

Zinc

Zinc helps in collagen formation and protein synthesis. It is very important in human growth, immune functions and prevention of the formation of free radicals. It also protects the liver and is an important component required for bone formation (Sander, 2013). Its deficiency results in decreased sense of smell and taste, thin brittle nails, hair loss, increased cholesterol and increased susceptibility to illness and infection which leads to frequent cold and slow healing of wounds (Sander, 2013).

Iron

Iron is a micro element needed in small quantities with important roles in the body such as in the formation of hemoglobin, control of infections and offers cell mediated immunity (Bhaskaran, 2001). It is also required for proper myelination of spinal cord and white matter of cerebellar folds in the brain (Larkin and Rao,1990) and in the synthesis and packaging of neurotransmitters, their uptake and degradation into other iron containing proteins which may directly or indirectly alter brain function (Beard, 2001). Higher consumption of iron leads to toxicity which results in free radical production which may result in heart diseases or cancer (Sander, 2013).

Magnesium

Magnesium is very vital in cell proliferation which contributes in DNA and RNA synthesis serving as catalyst to several key enzymes systems involved in energy metabolism and protein synthesis (Wardlaw, 2004). It also helps in the dilation of arteries by decreasing blood pressure and thereby preventing abnormal heart rhythm (Fagholum *et al.*, 2012). Magnesium is a cofactor of hydrolase, decarboxylase and transferase enzymes (Murray *et al.*, 2000). Deficiency of magnesium results in interference in the distortion of transmission of muscles and nerve impulses which may lead to irritability and elevated symptom of PMS (premenstrual syndrome).

Manganese

Is an essential micro nutrient required for normal growth, development and cellular homeostasis (Erikson *et al.*, 2005) and in prevention of neuro-generative diseases (Bowman *et al.*, 2011). It serves as a cofactor of hydrolase, decarboxylase and transferase enzymes (Murray *et al.*, 2000). It also involved in urea formation, pyruvate metabolism and the glucotransferase of connective tissue biosynthesis (Chandra, 1990). Deficiency of manganese can lead to neuro degenerative diseases and poor growth.

Copper

Copper helps in hemoglobin formation and neurological systems (Tan *et al.*,2006). According to FAO (2001), it also helps in red blood cells and energy metabolism, elastin formation which is very vital in bones, muscles and connective tissues formation (Tan *et al.*,2006). It also helps in the incorporation of iron in hemoglobin and absorption of iron from the gastro intestinal tract and transfer of iron from tissues to the plasma (Murray *et al.*, 2000). Copper deficiency is related to cardiac hypertrophy and sudden cardiac failure. Others are anemia, bone disorders, neonatal ataxia, depigmentation, abnormal growth of hair, impaired growth and reproductive performance, heart failure and gastro-intestinal disturbances (Malhotra, 1998).

Calcium

Calcium According to WHO (2004), it helps in proper functioning of the nervous system, heart muscles, blood clotting and bone formations and teeth. Also, according to Micro-nutrient initiative (2017), deficiencies in pregnant women can lead to death due to hypertension disorders, pre-eclampsia and eclampsia. In children it causes rickets due to insufficient calcification of calcium phosphate of the bones in growing children. In adults it causes osteomalacia, a generalized demineralization of bones which contributes to osteoporosis (Hay and Swenson, 1985, Murray *et al.*, 2000).

Phosphorus

Phosphorus is an essential component of bones, teeth, cartilage, nuclei acids, ATP and some key enzymes. It helps in energy and cell metabolism including the buffering action in body fluids (Hay and Swenson, 1985). According to Hay and Swenson (1985), Malhotra, (1988) and Murray *et al.*, (2000), phosphorus helps in energy exchange inside living cells involving the forming and breaking of high energy bonds linking oxides of phosphorus to carbon or carbon nitrogen compounds.

Conclusion

The results revealed the presence of potassium, sodium, zinc, iron, magnesium, manganese, copper, and calcium in fresh *Heinsia crinata* (atama). Humans depend on vegetables for the supply of minerals, vitamins and nutrients which boosts the human system and also fights infections and diseases due to the presence of secondary metabolites.

Atama leaves, a vegetable, have lots of nutritive components although they differ from others due to the varieties used, locations, soil compositions and climatic variations.

Frequent consumption of *Heinsia crinata* (atama) supplies energy, protein, minerals and fibres for the maintenance and proper metabolic processes for the improvement of human health.

References

- AOAC (2000) Official Methods of Analysis. (17th Ed.), Gaithersburg, MD, AOAC International Method, Washington, USA, pp. 92303
- Beard, J. L (2001). Iron biology in immune function, muscle metabolism and neuronal Functioning *Journal of Nutrition* 131: 5685-5695.
- Bhaskaran, P. (2001) Immunobiology of mild nutrient deficiency. *British Journal of Nutrition*, 85: 75-80,
- Chandra RK (1990). Micro-nutrients and immune functions: An overview. *Annal New York Academy of Science*. 587: 9-16.
- Edeoga, H. O, Okwu, D. E, Mbaebie, B. O (2005) Phytochemical substituents of some Nigerian medicinal plants. *African Journal of Biotechnology* 4 (7): 685-688
- Ekpo, F.E., Asuquo, M.E. and Uwanta, E. J. (2012). Comparative study of nutrients and Anti- nutrients of *Gnetum africanum* (Afang) and *Heinsie crinita* (Atama) *Global Journal of Pure and Applied Sciences* 18 (1&2) 37-41
- Etukudo, I (2003) *Ethnobotany: Conventional and Traditional Use of plants*; Verdict Press: Uyo, Nigeria.
- Hays VW, Swenson MJ (1985). Minerals and Bones. In: *Dukes' Physiology of Domestic Animals*, Tenth Edition pp. 449-466.
- Fagbohun, E. D, Lawal, O. U, Ore, M. E (2012) The Proximate, mineral and photochemical Analysis of the leaves of *Ocimum gratissimum* L., *Melanthera Scandens* A. and *Leea guineensis* L. and their medicinal value. *International Journal of Applied Biological Pharmaceutical Technology* 3: 15-22.
- Frasseto, I., Morris, R.C. Jr., Shellmayer, D. E., Todd and Sebastian, K. A. (2001). Diet, Evolution and aging- The patho-physiologic effects of the post agricultural inversin of the and aging: The patho-physiologic effects of the post agricultural inversin of the potassium to sodium and base to chloride ratios in the human diet. *Europian Journal of Nutrition* 40:200-213
- Gaga, T. C, Gaga, H. E (1999) Nutritive value and of blanching on trypsin and chymotrypsin inhibitor activities of selected leafy vegetables. *Plant Foods Human Nutrition* 54(3): 271-283.
- Itah, A. Y (1997) Bactericidal and bacteriostatic effect of edible leafy vegetable extract on Growth of canned food borne bacteria. *Trans Nig Society Bio Conserv* 6: 103-111.
- Larkin, E. C, Rao, C. A (1990). Importance of fetal and neonatal iron; adequacy for normal development of central nervous system, In: *Brain behavior and iron in the infant diet* (Dobbing J ed), London, UK pp. 43-63.
- Malhotra, V. K (1998). *Biochemistry for Students*. Tenth Edition. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India.
- Mensah, J. K, Okoli, R. I, Ohaju Obodo, J. O, Eifediyi, K (2008) Phytochemical, Nutritional and medicinal properties of some leafy vegetables consumed by Edo people of Nigeria. *African Journal of Biotechnology* 7(14): 2304-2309.

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- Murray RK, Granner DK, Mayes PA, Rodwell VW (2000). Harper's Biochemistry, 25th Edition, McGraw-Hill, Health Profession Division, USA.
- Okafor, J. C (1983). Horticultural promising indigenous wild plants species of the Nigerian Forest Zones. *Acts Horticulture* 123;165-177
- Okafor, D and Okoro, S., 2004. The useful plants of west Tropical Africa. Vol. 4 Families M. R. Royal Botanic Garden, Kew p.805.
- Okezie, E., Amadike, U., Ogungide, A. A. and Atani, C. S. (2017). Proximate, Antinutritional and Mineral Estimation of Some Selected Consumed Green Vegetables in Afaha Eket, Akwa-Ibom State, Nigeria *American Journal of Food Science and Technology* 5(5):182-191
- Opeke, I. O., 2000. A hand book of West African weeds. International Institute of Tropical Agriculture, Ibadan 1-26.
- Sander, C. (2013). Minerals your body need and their functions". Hub pages.com.
- Tan, J. C, Burns, D. L, Jones, H. R (2006). Severe ataxia, myelopathy and peripheral neuropathy Due to acquired copper deficiency in a patient with history of gastrectomy. *J. Paenteral Nutrition*. 30: 446-450.
- Vanisha, S.N. and Hema, M (2012). Potential functions of lemon grass (*Cymbopogon citratus*) in health and disease. *International Journal of Pharmaceutical and Biological Achieves*, 3(5):1035-1043.
- Wardlaw, G. M., Hampl, J. S., Disilvestro, R. A. (2004). Perspectives in Nutrition. Pp. 413-445. McGrawhill-USA.
- World Health Organisation (2004). Vitamins and mineral requirement in nutrient. Report of a joint FAO/WHO Expert consultation. World Health Organisation of the United Nations, Geneva, Swizaland.
- W.W.W. Micronutrient initiative
W.W.W. FAO.org