THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Evaluation of the Minerals, Vitamins and Amino Acids Compositions of the *Plukenetia Conophora* Root

P. B. Ayoola
Lecturer/ Researcher, Department of Science Laboratory Technology,
Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria
A. O. Olayiwola
Teaching Assistant, Analytical/Environmental Chemistry Unit, Department of Pure and Applied Chemistry,
Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria
A. G. Farombi
Lecturer/ Researcher, Department of Science Laboratory Technology,
Osun State Polytechnic, Iree, Osun State, Nigeria

Abstract:
African walnut (Plukenetia conophora Mull.Arg.) plant parts are used traditionally as anti-inflammatory, anti-asthmatic and anti-diabetics agents. The root when chewed cures chronic cough. The minerals, vitamins and amino acids compositions were determined by spectrophotometry methods using official Analytical methods. The mineral analysis revealed Ca, 19625 ± 0.10 mg/kg, Mg, 1760 ± 0.30 mg/kg, Mn, 51 ± 0.22, Cu, 15.01 ±0.01 mg/kg, Zn, 29.40 ± 0.82 mg/kg, Fe, 3275 ±0.02 mg/kg, Na, 6300 ± 0.02 mg/kg, K, 13437 ± 0.3 mg/kg. All the essential amino acids were present except tryptophan and valine while the non-essential amino acids present were glutamic acid (1.89 ±0.08 g/100protein), cysteine (2.06±0.02 g/100protein), tyrosine (0.68±0.03 g/100protein), glycine (0.24±0.02 g/100protein), serine (0.83±0.03 g/100protein) and proline (1.94 ± 0.02 g/100protein). The vitamin analysis showed the presence of thiamine (0.15±0.1 µg/100g, riboflavin (0.08±0.01 µg/100g), niacin (0.14±0.01 µg/100g), cyanocobalamin (0.07±0.02 µg/100g), ascorbic acid (2.63 ± 0.01 mg/100g) and tocopherol (0.64 ± 0.010 µg/100g). The presence of these nutritional constituents justified the traditional use of the plant for the treatment of various ailments hence Plukenetia conophora is of pharmacological importance.

Keywords: *Plukenetia, conophora, anti-asthmatic, anti-diabetics, anti-nflammatory*

1. Introduction

Medicinal plants often exhibit a wide range of biological and pharmacological activities such as anti-inflammatory, anti-bacteria and anti-fungal properties (Okwu and Okeke, 2003). Extracts from the roots, barks, seeds and fruits of these plants are used in the preparation of syrups and infusion in traditional medicine as cough suppressant and in the treatment of liver cirrhosis and hepatitis (Iwu, 1986; Ogu and Agu, 1995).

A number of medicinal plants are of common use in the African traditional medicine. Medicinal plants are therefore crude drugs of plant origin utilised for the treatment of diseases (Kolawole, 2006). One of them is *Plukenetia conophora (*African walnut*).* It is generally assumed that the active constituents contributing to these protective effects are the phytochemicals, vitamins and minerals (Okwu and Okeke, 2003).

The nutritional evaluation of some Nigerian wild seeds, Ganiyu and Mofoluso, (2004) reported the proximate, mineral, anti-nutrient composition and zinc bioavailability of some Nigerian wild seeds including *Tetracarpidium conophorum*. Walnuts are considered to be an herb in Traditional Chinese medicine. The bark is used in tea as laxative and chewed for toothache. It helps to prevent and control high blood pressure. Much work has not been reported on the minerals, vitamins, amino acids, phytochemical compositions, fatty acids and the chemical components in the root within the locality and state covered in this report. Therefore, the objective of this work is to evaluate the mineral, vitamin and amino acids properties of *Plukenetia conophora* root in order to ascertain its possible usefulness in the management of some diseases in Nigeria.

2. Materials and Methods

Fresh root sample of this plant (Plate 1) was collected from a cocoa farmland in Alagbayun farm Osu town, Surulere Local Government Area of Ogbomoso, Oyo State, Nigeria. The root (Plate 2) was thoroughly washed, cut into small pieces to facilitate

dryness, and air-dried under shade for thirty days. The dry sample was crushed into fine powder using wooden mortar and pestle and stored in an air tight bottle prior to analysis.

2.1. Mineral Analysis

The AOAC, (1984) method was used for the determination of minerals in the test sample. Calcium, sodium, potassium, magnesium were determined by flame photometric method while iron, zinc, manganese, copper and chromium were determined by atomic absorption spectrophotometric method.

2.2. Vitamin Analysis

The composition of the water-soluble vitamins such as thiamine (B1), riboflavin (B2), niacin (B3), cyanocobalamin (B12) were determined by the method of Okwu and Josiah (2006) While ascorbic acid (vitamin C) content was determined by the method of AOAC(1984).

2.3. Amino Acids

Spectrophotometric method was used using ninhydrin Chemical Reaction. Ninhydrin combines with amino acids to form coloured complexes, the intensity of whose colours depend on the amount of amino acid present according to the method of AOAC (1984).

Plate 1: A Plukenetia conophora plant (Climber tree)

Plate 2: Root of Plukenetia conophora plant

3. Results and Discussion

The concentration of mineral elements in the root sample is reported in Table 1. The root contained appreciable amount of calcium, magnesium, sodium, potassium, iron, manganese, zinc and copper. Calcium helps in regulation of muscle concentrations, transmit nerve impulses and help in bone formation (Cataldo *et al.*, 1999).

It is also necessary for the coagulation of blood, proper functioning of the heart and nervous system (Gbolahan, 2001). Magnesium plays a major role in relaxing muscles along the airway to the lung thus allowing asthma patients to breathe easier (Appel, 1999).

Mineral	Root (mg/kg)
Calcium	19625±0.10
Magnesium	1760.00±0.30
Manganese	51.00±0.22
Copper	15.01±0.01
Zinc	29.40±0.82
Iron	3275.00±0.02
Sodium	6300.00±0.02
Potassium	13437.00±0.3

Table 1: Mineral Compositions of the Root of Plukenetia conophora Plant
Values are means (±SD) of triplicate determinations

The value of manganese in the root was in agreement with the value reported (52.21 mg/g) by Effiong and Udo (2010) in the *conophor* nut. Mangenese supports the immune system, regulates blood sugar levels and is involved in the production of energy and cell reproduction. It works with vitamin K to support blood clothing. Working with the B-complex vitamins, manganese helps to control the effects of stress. Birth defects can possibly result when an expectant mother does not get enough of this important element. Manganese is also used in the management of diabetes (Ayoola *et al.*, 2010). Deficiences of copper have been reported to cause cardiovascular disorders as well as anaemia and disorders of the bone and nervous systems (Mielcarz *et al*., 1997). According to Reddy and Love (1999), these essential elements are needed for growth, production of bones, teeth, hair, blood, nerves, skin, vitamins, enzymes and hormones. The healthy function of nervous transmission, blood circulation, fluid regulation, cellular integrity, energy production and muscle contraction are influenced by essential elements and too little of any essential element can lead to deficiency disease and too much of any can be toxic (Schauss, 1995). Zinc play a valuable role in the management of diabetes, which results from insulin malfunctioning (Okwu and Morah, 2004). The root contained 3275 mg/kg of iron which was higher than the value reported in the seed by Tidjani *et al* (2010). Iron is said to be an important element in the diet of pregnant women, nursing mothers, infants, convalescing patients and elderly to prevent anaemia and other related diseases (Oluyemi *et a*l., 2006). Therefore, the root is a good source of iron.

The vitamin composition of the root sample is as shown in Table 2. The root contained thiamine (B_1), riboflavin (B_2), niacin (B_3) and cyanocobalamin (Vitamin B_{12}). The vitamins, though in trace amount are very essential for the body metabolism. Niacin is active in preventing the disease called pellagra.

Vitamin	Root
B1(Thiamine) µg/100g	0.15 ± 0.1
B2 (Riboflavin) µg/100g	0.08 ± 0.01
B3(Niacin) µg/100g	0.14 ± 0.01
B12(Cyanocobalamin) µg/100g	0.07± 0.02
C(Ascorbic acid) mg/100g	2.63± 0.01
E(Tocopherol) µg/100g	0.64 ±0.01

Table 2: Vitamin Compositions of the Root of Plukenetia conophora Plant
Values are means (±SD) of triplicate

The presence of Ascorbic acid (Vitamin C) in the root makes it useful in herbal medicine for the treatment of skin conditions, including eczema, pruritus, psoriasis and parasitic skin conditions (D' Amelio, 1999). Ascorbic acid can also be used for the treatment of common cold and other diseases like prostate cancer (Okwu and Okeke, 2003; Okwu and Okwu, 2004). The presence of vitamin E in the root may also supports its relevance in southern Nigeria ethnomedicine as a male fertility agent (Ajaiyeoba and Fadare, 2006).

The concentrations of essential amino acids can be seen in Table 3. The root contained all the essential amino acids that the body needed except tryptophan and valine. While Table 4 shows **t**he concentrations of non-essential amino acids.

Parameter	Root (g/100protein)
Hisidine	0.13±0.02
Trytophan	0.00
Leucine	1.08±0.01
Isoleucine	0.67±0.02
Lysine	1.65±0.05
Methionine	0.18±0.01
Enylalanine	0.15±0.03
Threonine	0.86±0.01
Valine	0.00

Table 3: Essential Amino Acids of the Root of Plukenetia conophora Plant
Values are means (±SD) of triplicate determinations

Parameter	Root (g/100protein)
Glutamic acid	1.89±0.08
Cysteine	2.06±0.02
Tyrosine	0.68±0.03
Glycine	0.24±0.02
Serine	0.83±0.03
Proline	1.94±0.02
Asparagine	0.00
Pyrrolysine	0.00

Table 4: Non-Essential Amino Acids Compositions of the Root of Plukenetia conophora Plant
Values are means (±SD) of triplicate determinations.

The root contained most of the non essential amino acids except alanine, aspartic acid, omithine, asparagines and pyrrolysine.

4. Conclusion

The presence of phytochemical, vitamins and minerals contribute to treatment and prevention of diseases (Okwu and Okeke, 2003). Especially, vitamins C, E, zinc and manganese that are used in fertility treatment. The study has provided some justification for the folklore use of the plant in several communities for conditions such as asthma, cough, eczema, pruritis, rheumatism and arthritis. This could also be used in the formulation of drugs (Pharmaceutical industries), cosmetics industries and herbal preparations.

5. References

1. Ajaiyeoba, E.O and Fadare, D.A. (2006). Antimicrobial potential of extracts and fractions of the African walnut-Tetracarpidium conophorum. African Journal of Biotechnology.5 (22): 2322-2325.
2. Association of Official Analytical Chemists (AOAC), (1984). Official Methods of Analysis 14th Edition. Arlington,V. A.
3. Appel, L. J. (1999). Non-pharmacologic therapies that reduce blood pressure: A fresh perspective. Clin.Cardiol,22:1111-1115
4. Ayoola, P.B, Adeyeye, A. and O. O. Onawumi. (2010). Trace Elements and Major minerals Evaluation of Spondias mombin, Vernonia amygdalina and Momordica charantia Leaves. Pakistan .J. Nutri. 9(8) pp: 755-758
5. Cataldo, C. B, DeBruyne, L. K. and Whiteny, E.N. (1999). Nutrition and Diet Therapy Principles and Practice. 5th Ed. Wadsworth Publishing Company an International Thomason Publishing Company U.S.A. pp: 35-204
6. D'Amelio, F. S. (1999). Botanical: A Phytocosmetic Desk Reference, Boca Raton, FL, CRC Press. Pp: 209-210.
7. Effiong, G. S and Udo, I. F. (2010). Nutritive values of four indigenous wild fruits in Southeastern Nigeria. EJEAFChe. 9 (7):1168-1176
8. Ganiyu, O and Mofoluso .E. (2004). Nutritional Evaluation of some Nigeria Wild Seeds. Wiley interscience, 48: 85-87.
9. Gbolahan, D., (2001). Lesson note on Medical Importance of trace elements. Centre for Natural Health Studies. Ejigbo, Lagos.
10. Iwu, M.M., (1986). Research finding on the possible applications of Nigeria`s raw materials on material. Proceedings Ed. J.K., Onoh. pp: 251-264
11. Kolawole, O.A., (2006). Phytoxic and antimicrobial activities of saponin extracts from lemon grass. M.sc Thesis Department of Biochemistry, Faculty of Basic Medical Sciences, University of Ibadan, Nigeria.
12. Mielcarz, G.W, Howard, A.N, Williams, N.R, Kinsman, G.D, Moriguchi, Y, Mizushima, S and
13. Ogu, E.O. and R.C.Agu. (1995). A comparison of some chemical properties of Garcina kola and Hops for assessment of Garcinia brewing value. Bioresource Technology. 54:1-4

14. Okwu, D.E and Josiah, C. (2006). Evaluation of the chemical composition of two Nigerian Medicinal Plants. African .J. of Biotechnology. 5(4): 357-361.
15. Okwu, D.E., and Okwu, M.E. (2004).Chemical composition of Spondias mombia linn plant parts. J. sustain Agric.Environ.6:140-147.
16. Okwu, D.E. and Morah, F.N. (2004). Mineral and Nutritive value of Dennittia tripetala fruits. Fruits, 59:437-442.
17. Okwu, D.E and Okeke, O., (2003). Phytochemical screening and mineral composition of chewing sticks in South-Eastern Nigeria. Global J. Pure and Applied Sc.,9 :235-238.
18. Oluyemi, E.A., Akinlua, A.A., Adenuga, A. A and Adebayo, M.B. (2006). Mineral contents of some commonly consumed Nigerian foods. Science Focus. 11(1) 153-157
19. Reddy, M.B and Love, M. (1999). The impacts of food processing on the nutritional quality of vitamins and minerals. Adv. Exp. Med. Biol. 459:99-106.
20. Schauss, A. (1995). Minerals: Trace Elements and Human health. Life Science Press. Tacoma W.A; 2-23
21. Tidjani, A.,Issoufou, A. Mohammed, T, Kamara, Kexue Zhu and Huiming, Zhou (2010). Chemical and Nutrient Analysis of Gingerbread Plum (Neocarya macrophylla) Seeds. Advance Journal of Food Science and Technology. 2(4) :191-195.