

Vitamin and Mineral content of *Ageratum conyzoides* (goat weed)

¹Nwankpa, M. E., ¹Agbor R.B., ²Amadi B. A and ¹Ikpeme E.V

¹Department of Genetics and Biotechnology, University of Calabar, P.M.B 1115 Calabar, Cross River State, Nigeria

²Department Of Biochemistry, Imo State University, Owerri, Imo State.

agborreagan@yahoo.com

Abstract: The leaf extract of *Ageratum conyzoides* (goat weed) was analyzed for its Vitamins and Mineral content. The result revealed that the plant contains the vitamins: ascorbic acid (33.36mg/100g), thiamin (0.22mg/100g), riboflavin (0.16mg/100g), niacin (0.07mg/100g) and tocopherol (0.61mg/100g). The mineral concentrations were measured at 5.75mg/100g Zinc, 2.52mg/100g Iron, 0.51mg/100g Calcium, 0.23mg/100g Phosphorus, and 0.11mg/100g Magnesium. The heavy metal Cadmium (Cd) and lead (Pb) were not detected in the sample. The concentration of these vitamins and minerals in *A. conyzoides* can be attributed to some of its identified properties such as anti-inflammatory, analgesic, anti-oxidant, anti-allergic, and therapeutic activities that supports its use in herbal medicine.

[Nwankpa, M. E., Agbor R.B., Amadi B. A and Ikpeme E.V. **Vitamin and Mineral content of *Ageratum conyzoides* (goat weed)**. *Nat Sci* 2015;13(4):1-5]. (ISSN: 1545-0740). <http://www.sciencepub.net/nature>. 1

Keyword: Vitamins, Inerals, Concentrations, *Ageratum conyzoides*, Herbal Medicine, Therapeutic, Anti-Inflammatory, Anti-Allergic, Antioxidant

Introduction

The active components in most plants which contribute to its protective effects are the phytochemicals, vitamins and minerals (Okwu and Ekeke, 2003). In recent years, reports on the role of elements present in medicinal plants in traditional medicine has been on the increase in Nigeria (Agbor *et al.*, 2012). Throughout the World, the interest on the importance of dietary minerals in the prevention of several diseases is also on the increase. This is because of the enhanced awareness of their importance on health. Most of the study pertains to their organic contents, such as: essential oils, glycosides, vitamins, alkaloids and other active components and their pharmacological/therapeutic effects. Besides several organic compounds, it is now well established that many trace elements play a vital role in general well-being, as well as in the cure of diseases (Prasad, 1993). Vitamins have diverse biochemical functions while some have hormone-like functions as regulators of mineral metabolism (vitamin D), or regulators of cell and tissue growth and differentiation (some forms of vitamin A). Others function as antioxidants (vitamin E and sometimes vitamin C) (Bender, 2003). The largest number of vitamins (B complex vitamins) functions as precursors for enzyme cofactors. A number of minerals essential to human nutrition accumulate in different parts of plants. Plants accumulate minerals essential for growth from the environment, including metals such as cadmium (Cd), cobalt (Co) and silver (Ag) which are of unknown direct benefit to the plant (Dshenkov *et al.*, 1995). The major minerals (Ca, P, Mg, S, K, Cl, Na) serve as structural components of tissues and function in cells and basal metabolism and

water and acid-base balance (Smith, 1988). Trace metals (Zn, Fe, Si, Mn, Cu, F, I, Cr) constitute significant health hazards for man and have become an area of particular concern and highest priority in environmental research (Venugopal and Luckey, 1988). Trace elements can be directly taken up by the leaves of plants or they accumulate in the soil and reach the plant through their roots (Quin *et al.*, 1996). Trace elements also have curative and preventive roles in combating diseases (Perma *et al.*, 1994). The past decade has seen a significant increase in the use of herbal medicine due to their minimal side effects, availability, and acceptability to the majority of the population, so medicinal plants play an important and vital role in traditional medicine and are widely consumed as home remedies. The study was undertaken to investigate the basis of the use of *A. conyzoides* by quantifying the percentage of essential vitamins and minerals present in the leave extract of the plant, and also as a benchmark for potential evaluation on its nutritional benefits.

Materials And Methods

Sample Collection and Preparation

The leaves of *Ageratum conyzoides* were collected from Umunchi village in Isiala Mbano Local government area of Imo state. The collected sample was properly air dried, crushed into fine powder, put in a sterilized bottle and taken to the laboratory for analysis.

Minerals Extraction

Two grams of the sample was weighed in a crucible and ashed in a muffle furnace at 550°C for 5 hours until a white ash was obtained. The minerals

were extracted from the ashed sample. The digest found was filtered into a 100ml standard bottle and used for flame photometric and Atomic and absorption spectrophotometric (AAS) analysis.

Using Flame Photometric Method: The extract of the sample was aspirated into the digital flame photometer (PFPP Model) using the filter corresponding to each mineral element. The meter readings were for two elements, 766.5nm wavelength for potassium and 589.0nm wavelength for sodium.

Using the atomic absorption spectrophotometer (AAS), Ten milliliters of the extract was pipetted into 50ml standard flask and 10ml of vanadate yellow solution was added, and the flask was made up to mark with distilled water, stoppered and left for some minutes for full colour (Yellow) development.

The concentration of phosphorus was obtained by taking the absorbance of the solution on a spectrum, 20 spectrophotometer at a wavelength of 470nm.

The sample extract was aspirated into the Buck 211gp atomic absorption spectrophotometer (AAS) through the suction tube. Other Mineral contents were read at different wavelength with hollow cathode lamp using appropriate fuel and oxidant combination, different slit width, working range, sensitivity and flame type (air - C₂H₂).

Calcium content of the sample was read at 422.7nm wavelength; Magnesium content of the extract read at 25.2nm wavelength; Zinc element in the sample was read at 213.9nm wavelength; The copper content of the sample was read at 324.7nm wavelength; The chromium content of the sample was read at 425.4nm wavelength; The cobalt content of the sample was taken at 240.7nm wavelength; Cadmium content of the sample was taken at 228.8nm; The mercury content of the sample was read at 253.7nm with Flame type = Mercury Hydride System (MHS); Lead content was determined at 283.3nm wavelength; The aluminum content of the sample was taken at 396.2nm wavelength.

Vitamin Extraction

Vitamin A (Retinol) Determination: Three different test tubes were prepared into which 0.2ml of alcoholic potassium hydroxide was added to sample, standard, and blank test tubes. Distilled water of 0.2ml volume was added to blank test tube alone. The mixture formed was mixed on the vortex for 10-20 sec with the tubes stoppered. The test tubes were then placed on a water bath at approximately 55-60°C for 20min. A prepared 0.2ml 1:1 mixture of xylene: kerosene was added after 20min of cooling the samples to room temperature and mixed. Retinol was extracted by vigorous mixing of each tube on the vortex for at least 30 sec, and the tubes were centrifuged for 5 min at 600-1000rpm. The xylene-kerosene supernatant

formed was carefully withdrawn from the test tubes by a means of Pasteur's pipette, and the extracted samples read at 328nm with the aid of a spectrophotometer.

Vitamin B₁ (Thiamine) Determination: Two grams of the powdered sample was weighed into a reagent bottle. This was homogenized with 50ml ethanoic sodium hydroxide. The mixture was shaken properly and filtered into a 100ml flask where 10ml of the filtrate was pipetted followed by 10ml of 1% potassium dichromate (this brought about development in colour of the solution). With the aid of a spectrophotometer, the absorbance of the analyzed solution was taken at 560nm against a blank and standard thiamine solution prepared.

Vitamin B₂ (Riboflavin) Determination: Two grams of the sample was weighed and extracted with 50% ethanol solution and was shaken for about an hour. The mixture was filtered and 100ml of the extract was pipette into a 250ml beaker where 10ml of 5% potassium permanganate and 10ml of 30% hydrogen peroxide were added. The mixture was allowed to stand over a hot water bath for about 30 min. Two milliliters of 4% sodium sulphate was added to the cooled mixture and the whole mixture filtered with a 50ml volumetric flask to remove precipitate. This was made up to mark with distilled water and the absorbance was measured at 510nm using a spectrophotometer. A blank and standard riboflavin solution was prepared alongside the solution and was read at the same wavelength.

Vitamin B₃ (Niacin) Determination: Two grams of the sample was weighed into a reagent bottle. It was treated with 50ml of 1N sulphuric acid and shaken for about 30min. The mixture was filtered after the addition of 3 drops of ammonia solution, and then 10ml of the filtrate was pipetted into a 50ml volumetric flask where 5ml of 1% potassium cyanide was added. This was acidified with 5ml of 0.02N sulphuric acid, and the absorbance of the mixture, blank and standard niacin solution prepared was taken at 470nm in the spectrophotometer.

Vitamin C (Ascorbic Acid) Determination: Two grams of the powdered sample was dissolved in 100ml of distilled water. The mixture was taken and shaken vigorously for about 30min and was filtered into a 250ml beaker where it was titrated with iodine solution using 10drops of starch indicator. The reading from the burette was noted for both the sample and standard solutions prepared as their end points developed.

Vitamin E (Tocopherol) Determination: Two grams of the powdered sample was weighed and transferred into a 250ml round bottomed flask where 50ml of 20% ethanol solution was added. The mixture was kept under reflux for about 30min and was filtered into a 250ml conical flask. Two test tubes were prepared, in

each, 2.5ml of the filtrate was placed, and 0.5ml of concentrated nitric acid (HNO₂) was added to each. The mixtures were allowed to stand over a hot water bath for 3min after which the test tubes were cooled and allowed to stand in dark for 15min. The volume of the solution was brought to 5ml with absolute ethanol, shaken and the absorbance measured at 470nm wavelength with the aid of a spectrophotometer. A standard and blank solution was also prepared and read off at the same wavelength.

Results And Discussion

The results are shown in Table 1 and 2. Table 1 shows the Vitamins composition and concentration level in *A. conyzoides* and Table 2 shows the Mineral constituent of *A. conyzoides*.

Table 1: Vitamins composition of *A. conyzoides*

Vitamin	Concentration (mg/100g)
Vitamin A (Retinol)	ND
Vitamin B1 (Thiamin)	0.22 ± 0.083
Vitamin B2 (Riboflavin)	0.16 ± 0.039
Vitamin B3 (Niacin)	0.07 ± 0.036
Vitamin C (Ascorbic acid)	33.36 ± 7.66
Vitamin E (Tocopherol)	0.61 ± 0.71

ND Not detected

Table 2: The Mineral Composition Of *A. Conyzoides*

Minerals	Concentration (Mg/100g)
<u>Macro Minerals</u>	
Calcium (Ca)	0.51 ± 0.37
Phosphorus (P)	0.23 ± 0.062
Magnesium (Mg)	0.11 ± 0.0082
Potassium (K)	0.057 ± 0.031
Sodium (Na)	0.047 ± 0.038
<u>Micro Minerals</u>	
Zinc (Zn)	5.75 ± 0.33
Iron (Fe)	2.52 ± 0.89
Manganese (Mn)	0.077 ± 0.05
Copper (Cu)	0.016 ± 0.0097
Cadmium (Cd)	ND
Chromium (Cr)	ND
Mercury (Hg)	ND
Cobalt (Co)	ND
Aluminum (Al)	ND
Lead (Pb)	ND

Values are Mean ± standard deviation of triplicate determination on a dry weight basis.

ND Not detected

Discussion

Vitamins composition of *A. conyzoides*

Leaves are generally considered to have appreciable amount of vitamin levels, although their vitamin content may vary from place to place due to geographical factors. Vitamins are important in the body as their deficiencies adversely affect the metabolism of the body. Lack of ascorbic acid impairs the normal formation of intracellular substances throughout the body, including collagen, bone matrix and tooth dentin. A striking pathological change resulting from this defect is the weakening of the endothelial wall of the capillaries due to a reduction in the amount of intracellular substance (Hunt, 1980). The clinical manifestation of scurvy hemorrhage from mucous membranes of the mouth and gastrointestinal tract, anaemia, pains in the joints and defects in skeletal calcification can be related to the association of ascorbic acid and normal connective tissue metabolism (Okwu, 2004; Hunt, 1980). The function of ascorbic also accounts for its requirement for normal wound healing (Okwu, 2004). The efficacy of using vitamin C to improve wound healing in non-deficient individuals remains uncertain. It should be noted, however, that even the highest dose in this study (33.36mg/100g) is below the RDA for vitamin C. Higher doses and larger differences between doses might have significant differences. There has also been interest in the ascorbate ability, as an antioxidant, to prevent or at least minimize the formation or carcinogenic substances from dietary material (Hunt, 1980). Nitroso compounds which are known to be carcinogenic can be formed from the reaction of nitrites with certain amino compounds in vivo. The nitrite is formed from the oxidation of nitrate, which is commonly incorporated into food stuffs used in human nutrition. In this sequence, ascorbate can therefore prevent the oxidation of nitrite. As a result, the availability of ascorbic acid in *A. conyzoides* leaves; make it to be used in herbal medicine for the treatment of the common cold (Okwu 2004; Okwu 2003 and Ekpo *et al.*, 2012). The vitamins, though in trace amount are very essential for the body metabolism. Niacin is active in preventing the disease pellagra while a deficiency of thiamin in the diet is the cause of the disease beriberi (Hunt, 1980). A deficiency in riboflavin does not result to any specific and identifiable disease and one is apt therefore to underestimate its importance. The symptoms are inflammation of the tongue, lesions in the eyes and lips, congestion of conjunctiva blood vessels and desquamation of the skin (Taylor, 1972; Okwu, 2003). The vitamin C content of *A. conyzoides* leaf in this study (33.36±7.66mg/100g) is higher than those in *Garcinia kola* Heckel (bitter kola) and *Aframomum melegueta* (alligator pepper) on evaluation of the

phytochemicals, vitamin and mineral content of two Nigerian medicinal plants (Okwu, 2005). This may imply that the leaf of *A. conyzoides* can fight the chemical manifestation of scurvy hemorrhage from mucous membranes of the mouth and gastrointestinal tract, anaemia, and pains in the joints. Vitamin B1, vitamin B2, and Vitamin B3 are B complex vitamins with high water solubility. Their appreciable value in plants confers such plant with ability to remedy pellagra, beriberi, etc (Okwu, 2005). The low levels of these vitamins ($0.22\pm 0.083\text{mg}/100\text{g}$ for B1, $0.16\pm 0.039\text{mg}/100\text{g}$ for B2, $0.07\pm 0.036\text{mg}/100\text{g}$ for B3) in the present study may not be an added advantage when it comes to what these vitamins do in the body system of consumption. The observed values in the present study are lower than those observed in *G. kola* (Okwu, 2005). Vitamin A, not detected in the present study may imply that *A. conyzoides* leaf may not provide enough vitamin A to the body system and hence, the ability to remedy eye defect associated with deficiency of vitamin A may not be there. Vitamin E has been suggested to play significant role in reproduction. Spermatogenesis was found to be drastically inhibited in rats with vitamin E deficiency. The observed value ($0.61\pm 0.71\text{mg}/100\text{g}$) of vitamin E in the present study may be very low to activate spermatogenesis in the testes of vitamin E deficient animals on consumption of *A. conyzoides* as a recipe for feeding.

Mineral composition of *A. conyzoides*

Elemental study of the plant showed that it contains rich sources of mineral elements. This becomes important when the usefulness of such minerals like phosphorus, calcium, magnesium, potassium, Iron and zinc in the body is considered. The zinc observed in the study ($5.75\pm 0.33\text{mg}/100\text{g}$) was the most abundant micro element, and was greater than the detected value in *G. kola* (Okwu, 2005) could mean that the plant can play a role in the management of diabetes, which results from insulin malfunctioning. Thus, Zinc is essential for the production of insulin, a hormone in the body (Okwu and Morah, 2004). Zinc is not considered to be highly toxic, but high contents of zinc in plants may cause the loss of leaf production, whereas low contents may cause deformation of leave. Zn has been quoted by various authors, as a critical indicator of whether the environment is polluted with Zn. The lower sodium content of the plant studied ($0.047\pm 0.038\text{mg}/100\text{g}$) might be an added advantage due to the direct relationship of sodium intake with hypertension in human (Dahl, 1972). The concentrations of lead in medicinal plants are generally low. Some type of metals such as copper, manganese and zinc are natural essential micronutrients, others such as lead, cadmium and

mercury have no biochemical or physiological importance and are considered as toxic pollutants. The absence of lead, mercury, aluminum, cobalt, manganese and chromium in the present study may signify that the leaf is free of toxic element and does not indicate a potential health hazard to users. The extent of contamination with these depends on the environmental pollution (Nasralla and Ali, 1985; Sovlajanski *et al*, 1990) and the different rates at which the elements are taken up from the soil and subsequently incorporated into different parts (Ibanga and Okon, 2009). The present study has verified the usefulness of *A. conyzoides* leaves for nutritional and medicinal purposes. A rich source of phytochemicals coupled with the presence of essential vitamins and mineral, *A. conyzoides*, can be seen as a potential source of drugs.

Conclusion

This work attempts to enrich knowledge of the nutritional properties of this plant as well as highlighting the importance of its vitamin and mineral contents. The composition of the plant is mainly dependent on the composition of the soil, which is influenced primarily by the nature of the rocks from which the soil is derived. The special flow, temperature, and humidity conditions of the air layer right above the ground entail extreme fluctuations of element concentration as well as contamination problems which are not easy to assess. This study indicates that this plant accumulates certain elements, and this property is exploited by the use of the plant for medicinal purposes in addition to its bioactive secondary metabolites constituents. The mode of application in the nature of this medicinal plant as a source of mineral supplements in the body has been traced to insufficient data on the mineral element accumulation in the plant (Curan, 1954; Schruedel 1965). The need to screen medicinal plants, used in traditional medicine for their elemental composition is highly desirable, and the elucidation of element specification in such plant helps interpret the therapeutic actions and may also help in designing chemically pure medication. There are some small pharmaceutical companies in Brazil using *A. conyzoides* as a raw material for phytochemicals. The demand is increasing year by year and this situation warrants further scientific research to develop both agricultural and medical uses. Research on medicinal plants should be focused primarily on species whose pharmaceutical activities have already been demonstrated. Positive preliminary clinical assays of *A. conyzoides* clearly demonstrate that this species may be an important economic resource in several tropical countries. The use of this species as a natural biocide or agent for pest management particularly

requires further investigation. In view of the above facts, the medicinal plant studied is a source of biologically important elements, which may play a part in therapeutic use. It contains some important minerals and vitamins, and it is expected that plants containing such compounds, might play an important role in the maintenance of human health. Though, the detected values for some of the elements in the plant studied here are below the WHO permissible levels and may not constitute a health hazard to consumers, I recommend the toxicology study of the leaf to enable safe use of the plant.

References

1. Agbor R.B., Ekpo I.A and Ekanem, B.E (2012). Antimicrobial properties and Nutritional composition of *Aspilia africana* C.D Adams. *International Journal of Applied Science and Technology*. 2(7): 94-102.
2. Bender, David A. (2003). *Nutritional biochemistry of the vitamins*. Cambridge, U.K.: Cambridge University Press.
3. Curan, G. L. (1954). Effect of certain transition group elements on Hepatic synthesis of cholesterol. *J. of Biological Chemistry*, 210, 765-770.
4. Dahl, L. K. (1972). Salt and hypertension. *American J. clin. Nutr.*, 25: 231-238.
5. Ekpo I.A., Agbor R.B., Osuagwu, A.N., Ekanem B.E., Okpako E.C., and Urua I.S (2012). Phytochemical and comparative studies of the stem bark and root of *Xylopiya aethiopica* (dunal.) A. Rich. *World Journal of Biological Research*, 5(2): 41-44.
6. Hunt, S., Grott, J. L. and Holbrook, J. (1980). Nutrition principles and chemical practices. *John wiley and son New York*. Pp: 49-52, 459-462.
7. Ibanga O. Isaac and Okon D. Ekpa. (2009). Minerals and Anti-Nutrients in Two Varieties of African Pear (*Dacryodes edulis*). *Journal of Food Technology*, 7: 106-110.
8. Nasralla, M. M., Ali, E.A .(1985). Lead accumulation in edible portions of crops grown near Egyptian traffic roads. *Agr. Ecosyst. Environ.*, 13(1) 73-82.
9. Okwu, D.E. (2003). Investigation into the medicinal and nutritional potential of *Garcinia kola* (bitter kola) Heckel and *Dennettia tripetala* G. Baker, Ph.D Dissertation of Micheal okpara University of Agriculture, Umudike, Nigeria, pp: 5-10.
10. Okwu, D.E. (2004). Phytochemicals and vitamin content of indigenous spices of south Eastern Nigeria. *J. sustain Agric. Environ.*, 6: 30-34.
11. Okwu, D. E. (2005). Phytochemicals, vitamins and mineral contents of two Nigerian Medicinal plants, *Garcinia kola* (bitter kola) and *Aframomum melegueta* (alligator pepper). *International Journal of molecular medicine and advance sciences* 1 (4): 375-381.
12. Okwu, D. E. and Ekeke, O. (2003). Phytochemical screening and mineral composition of chewing sticks in south eastern Nigeria. *Global J. pure and applied sci.*, 9: 235-238
13. Okwu, D.E. and Morah, F.N, (2004). Mineral and nutritive values of *Dennrttia tripetala* fruits, 59: 437-442.
14. Okwute, S. K. and Yakubu, M. O. (1998). Anti-microbial and phytochemical screening of *Dallbergia saxatilis*. *ZUMA J. pure and Applied Sci.*, 1: 2124.
15. Prasad A. S.(1993). Essential and Toxic Elements in Human Health and Disease: an Update. Wiley-Liss. New York.
16. Smith, K. T. (1988). Trace minerals in foods. , *Marcel Dekker, New York*.
17. Taylor, O. J. (1972). Micronutrients. *A unilever educational booklet, unilever international company, London*. 9: 10-25.
18. *The wealth of India, a dictionary of Indian raw materials and industrial products*, New Delhi, *Raw Materials*, Vol.1, (1948).
19. Venugopal, B., Luckey, T.D.(1988). 'Metal Toxicity in Mammals', 'Chemical Toxicity of Metal and Metalloids' *Plenum Press, New York*. 2:101.