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Chemical Composition of Asystasia Gangetica: A Wild Vegetable Considered in Cross River and Akwa Ibom States-Nigeria

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Abstract

Wild edible vegetables are often highly nutritious but under-utilized and at the same time is gradually going extinct because of lack of information. This study investigated the chemical composition of Asystasia gangetica (Mmeme, Chinese violet), a wild vegetable that is consumed in Cross-River and Akwa-Ibom States. Standard methods were used chemical composition of wild vegetable. The result of the proximate analysis revealed that Asystasia gangetica have moisture content of 84.50±0.06 and fat content of 5.50 ± 0.06, ash content was 4.80±0.06 while the crude fibre content was 10.83±0.01. The percentage crude protein determination was done by macro kjeldahl method and which gave a value of 15.64 ± .01. The carbohydrate content was shown to be 62.96±0.10. The high carbohydrate content accounts for the use as a primary energy source and the high energy value 365.68 ± 0.32kcal. Vitamin A content was 182.84 ± 0.01, vitamin C, total Vitamin C was 278.30 ± 0.06 which was the highest and soluble vitamin C was 98.04 ± 0.01, vitamin E content was 2.58 ± 0.01, folic acid, Thiamine, Riboflavin, Niacin and Pyridoxine were 0.28 ± 0.01, 0.30 ± 0.01, 0.18 ± 0.01, 2.02 ± 0.01 and 1.78 ± 0.01 respectively. Reducing sugar content was 3.28±0.01. The mineral elements analysis indicated that Asystasia gangetica contains 48.47±0.01. 201.40 ± 0.06, 53.20 ± 0.06, 47.40 ± 0.011, 125.24±0.01 for calcium, Magnesium, Phosphorus, Iron, Zinc, Copper, Manganese and Selenium respectively. The result indicates that the wild vegetable contain an appreciable amount of nutrients and should be included in our meals for health benefits. This study has established the rich nutritional value of Asystasia gangetica (Mmeme, Chinese Violet) and that the consumption could combat malnutrition and prevent some of the common nutritionally-related ailments.

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Introduction

Vegetables are edible parts of plants that are consumed wholly or parts, raw or cooked as part of main dish. They are valued mainly for their carbohydrate, vitamin, protein, fats and mineral contents which may be edible roots, stems, leaves, fruits, shots, or seed. Leafy vegetables are important items of diet in many Nigerian homes and are valuable sources of nutrients especially in rural areas where they constitute substantially to protein, mineral, vitamins, fibre and other nutrients which are usually in short supply in daily diets.

However, there other vegetables in the wild/forest that are nutrient dense, and are unadvertised. They are cheap because they are wild crafted (gathered) in the forest. A large number of wild food plants (WFFs) are used around the world for food in the form of vegetables. Wild food plants constitute those plants that grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently of direct human action. They include all vegetables that are gathered (not cultivated), whether they are harvested in agricultural areas uncultivated areas or forest land. These vegetables make important contributions to culinary baskets and livelihoods in the small holder and subsistence farming communities.

The consumption of wild plants persists in many communities especial among indigenous peoples to whom wild food plants are part of their traditional food systems. Indigenous people often experience food insecurity and malnutrition, but local communities often possess traditional knowledge that can help them to alleviate these problems though harvesting, hunting and gathering of wild plants. Wild plants may not only play important roles in diets, but some of them also provide important health benefits with documented biological and haematological effects.

Green leafy vegetables are good sources of micronutrients. They are the cheapest and most accessible source of protein, vitamins, minerals and amino acids. Leafy vegetable are highly essential for maintenance of health and prevention of disease. They also contain valuable source of food ingredients that can be utilized to build and improve the body. Vegetables are relatively inexpensive, easily and quickly cooked and rich with several nutrients especially in beta-carotere and vitamins which are essential in human health.

Wild edible green leafy vegetables grow in unattended or uncultivated places all over the world in many different climate sores. They are actually leafy foods that are nutritious to incorroborate into meals and salads from time to time. They are different from the conventional vegetables that are found in the local market.

Some of these edible wild vegetables are nutrient dense but some of them are gradually going extinct because of lack of information.

Inspite of evidences conforming the nutritional contribution of these wild vegetables to local diets and their health maintenance and protective properties. There have been very little concerted efforts toward explaining this bioactive nutritional and health resources to address the complex food, nutrition and health problems prevalent in Africa and Nigeria especially. Hence this research becomes important at this period of economic recession where people cannot afford to buy products of annual proteins for health sustenance. It is therefore important to investigate the nutrient profile of some of the edible wild vegetables in order to encourage their consumption.

Purpose of study

The general objective of the study was to determine the nutrient composition of Aystasia gangetica (mmene, Chinese violet) a wild vegetable that is consumed in Cross River and Akwa Ibom states

The specific objectives of the study were to:

I. Identify the wild vegetable

II. Determine the proximate composition of the vegetable

III. Assess the levels of mineral content of the vegetable (Fe Zn, ca, Na, Se, Cu Mg, K and P)

IV. Determine the vitamin content of the wild vegetable (A,C,E,B,B_2, B_3 B_6 and folic acid,)

Materials and Methods

Design of study: The design of the study is experimental. This is because the research used standard procedures to determine the nutrient and mineral composition of the hold vegetable.

Materials

Mature fresh *Asystasia gangetical* (Mmeme, Chinese violet) leaves were bought from Marian market, Calabar, Cross River State.

Identification

The mature fresh Asystasia gangetica leaves were taken to Department of Botany. it was also identified by the indigenes of some selected Efik and Ugep people with the local name (mmeme).

Methods

The proximate analsysis of Asystasia gangetica of the sample for crude fat, carbohydrate, Ash, crude fibre, crude protein and moisture content were determined using standard methods of Association of official Analytical chemists (AOAC, 2010).

The carbohydrate content of the sample has determined by difference. The sum of the percentages of protein, fat, ash, fibre and moisture was determined and the value deducted from 100% to obtain the value for carbohydrate.

Minerals such as fe, zn, ca, Na, se cu, mg, k and p were determined by methods of mineral analysis, atomic absorption spectrophotometer of IITA, International Institute of Tropical Agriculture (2002).

Vitamins A. C and E were determined by the method of AOAC, (2010). B_1, (Thiamin)B. (Ribflavin), B_3 (Nacin) and B_6 (Pyrodoxine) and folic acid were determined by methods of mineral analysis, atomic absorption spectrophotometer of IITA (2002).

Findings of Results and Discussion of Results

Table 1: Proximate composition of asystasia gangetica.

Constituent	Mean SEM%
Moisture	84.50 ± 0.06
Ash	4.80 ± 0.06
Crude protein	15.54 ± 0.01
Crude fat Crude fibre	5.50 ± 0.06 10.83 ± 0.10
Carbohydrate	62.98 ± 0.10
Energy (kcal/100g)	365.68 ± 0.32

Table 1 showed that *Asystasia gangetica* contained high moisture (84.50%). The leaves contained, high crude protein (15.64%), high, carbohydrate (62.78%), and high crude fibre (10.83%) and carbohydrate (62.98%) respectively.

Table 2: VITAMINS COMPOSITION OF *ASYSTASIA GAGETICA* (MG/100G).

CONSTITUENT	MEAN (mg/100g)	SEM
Vitamin A (µg/dl)	182.84	±0.01
Total vitamin C	278.3	±0.06
Soluble vitamin C	98.04	±0.01
Vitamin E	2.58	±0.01
Folic acid	0.28	±0.01
Vitamin B1	0.3	±0.01
Vitamin B2	0.18	±0.01
VitaminB3	2.04	±0.01
Vitamin B6	1.78	±0.01
Reducing sugar	3.28	±0.01

Values are expressed as mean ± SEM,n=3

Table w showed that total vitamin had the highest mean value (278.30mg), follow by vitamin A with a mean value of 182.84 mg. vitamin A mean value was 2.58mg, vitamin B3 (2.04mg) and the Reducing sugar 3.28mg. vitamin B6 had the mean value of 1.78mg while B2 and B1 had low mean values (0.18, 0.30mg) respectively Folic mean value also low (0.28mg).

Table 3: Mineral Composition of *Asystasia gangetica* (mg/100g).

Constituent	Mean SEM (mg/100g)
Iron (fe)	3.42 ±0.01
Zinc (Zn)	2.70 ±0.06
Calcium (Ca)	53.20±0.06
Sodium (Na)	45.47±0.01
Selenium (Se)	0.03±0.01
Copper (cu)	0.19±0.01
Magnesium (mg)	47.40±0.01
Potassium (k)	201.40±0.06
Phosphrous (p)	125.24±0.01
Manganess (Mm)	0.03±0.01

Values are expressed ± SEM. n=3

Table 3 revealed that the leaves of *Aystasia gangetica* contained high (201.40mg) mean value of potassium. This was followed by phosphrous (125.24mg), calcum (53.20mg) sodium (48.47mg) and magresum (47.40mg) iron, zinc, selenium, copper and managanese had low (3.42, 2.70, 0.02, 0.19 and 0.03) values respectively.

Table 3 showed that the leaf sample of A. gangetica contained high vitamin (182.54mg) mean value, so as the total vitamin C (98.04mg) each. The vitamin E and reducing sugar values were 2.58 and 3.28 mg respectively.

Vitamins B_1, B_2, B_3, and B_6 had mean values of (0.30, 0.18, 2.04 and 1.78mg) each.

Discussion of Findings

Proximate analysis of *Asystasia gangetica* (mmeme, Chinese violet)

The proximate analysis showed that the wild vegetable contains a high amount of moisture (84.50±0.06%). The moisture value is similar with that of other workers (83.38 ± 0.40vs93.38 ± 0.67%)[1]. Although high moisture content is necessary to maintain the turgidity of the vegetable cells and thus their freshness, it could adversely affect their shelf like. That notwithstanding. The high moisture content si a welcome phenomenon as this would be able to provide the 20% of the total water consumption needed to come from food [2].

The ash content of the wild vegetable is lower (4.80 ± 0.06%) compared to the ash content of different wild vegetables reported (7.06 ± 12.77 ± 0.01%)[1]. This may be due to plant specificity which indicates that the vegetables could be a good source of mineral elements in the diets of consumers.

The crude protein content observed in this study was higher (15.64 ± 0.01) than the crude protein values recorded for similar studies. [1], the had protein values that ranged from (0.28 ± 0.39 -1.53 ± 0.01%). [3] also reported higher protein values that ranges from (27.05 ± 0.97 -45.34 ± 0.83%) for some of the wild vegetables. This showed that this vegetale is a rich source of protein and their consumption could be encouraged to avert protein energy malnutrition common in traditional communities. Protein is an essential component of human diet needed for the replacement of tissues and for the supply of energy and adequate amount of required amino acids. Protein deficiency causes growth retardation, muscle wasting, oedema, abnormal swelling of the belly and collection of fluids in the body of children [4].

The crude fibre content (10.83 ± 0.01) was high. Other workers reported higher fibre values (10.5±0.00 – 36.86±0.99), [1]. Fibre may aid digestion, absorption of water to form the bulk stool. Fibre softens stool and prevents constipation. The vegetable may therefore be useful in the control of body weight, blood cholesterol and protection against cancer.

Fat content in the vegetable occurred in moderate amount. (5.50 ± 0.06). The fat content was not a surprise. Vegetables have low fat to maintain cellular integrity. The fat value is slightly above what other workers reported. [1] reported values that ranged from 0.57 ± 0.47 – 3.43±0.03%. The low fat confirmed that vegetables are poor sources of fat. The nutrition and health implication of this is that the vegetable could be used for dietary regime for the obese, hypertensive and diabetic patients.

The carbohydrate value (62.96 ± 0.01) of the vegetable was high which shows that the vegetable can serve as food. It is high compared to the value of other workers reported. Simon, et al., reported values that ranged from (33.11 ± 0.81 – 62.11 ± 0.72), [3] reported values that ranged from (7.02 ± 0.03 – 55.64

± 0.32). The calculated energy value to be 365.68 ± 0.32kcal.

This disagreed with expert observation that vegetables are poor sources carbohydrate. This may be due to soil and plant specify.

Minerals are important in the physiological processes of the human body. Of the minerals analysed in the wild vegetable, potassium was the most abundant (201.40 ± 0.06) element. [3] reported higher potassium value (367.48 ± 2.57). This is in agreement to many reports that potassium is the most abundant mineral in Nigerian agricultural products [5]. Potassium helps to maintain body weight and regulate water and electrolyte balance in the blood and tissues [6].

The phosphorus content of the vegetable was 125.24±0.01 and it was when higher compared to the values gotten from similar studies. [3] reported values that ranged from (0.19 ± 0.03 – 14.00 ± 0.09). Phosphorus plays a vital role in normal kidney functioning and transfer of nerve impulse.

The sodium content observed from this study was higher (48.47 ± 0.01) than the sodium content reported by similar studies. [3] reported values that ranged from (0.05 ± 0.02 – 5.59 ± 0.09). [7] reported lower sodium content (1.86 ± 0.02). Sodium is the main positively charge ion outside the body the body cells. It maintains osmotic equilibrium and body fluid volume, tissue formation, nerve transmission and muscle contraction. [2] recommended 500mg/day as a safe and adequate dietary intake of salt. Most of this amount is provided by a diet of plain foods without added salt. The world health organisation (WHO) emphasizes moderation in the use of salt. This is because high intake of salt may lead to cerebral haemorrhage and hypertension. The level of sodium reported in this work is high. Caution should be exercised during preparation because the vegetable already contains enough salt.

The calcium content was found to be (53.20±06) which is higher than the values reported by other workers [3]; 2.12 ± 0.04 – 32.00 ± 0.03). Calcium helps in the regulation of muscle contraction required by children, infants and foetuses for bones and teeth development. Adequate calcium is necessary for older women and men to reduce the rate of decalcification which occurs after menopause. Adequate calcium prevents rickets in children and osteoporosis in adults.

The magnesium content of the wild vegetable was found to be (47.40 ± 01). the value reported from this study was higher than those reported by some workers. [7] reported (17.80 ± 0.02), [8] reported values that ranged from (15.17 ± 0.01-38.22 ± 0.02). Magnesium is required for the release and use of energy and energy yielding nutrients. It directly affects the metabolism of potassium, calcium and vitamin D. it works with calcium in contracting and relaxing museles. Calcium promotes contraction and magnesium assists the muscles to relax. Magnesium promotes resistance to tooth decay by holding calcium in to the enamel. It helps in the reduction of hypertension by releasing insullin from the pancrease which causes dilation of the arteries reducing blood pressure especially during pregnancy.

The iron content was (3.42±0.01) and was higher when compared to those of other workers. and (0.73±0.02) and [9] had (0.01±0.02). Iron is said to be an important element in the diet of pregnant women, nursing mothers, infants, convalescing patients and the elderly to prevent anaemia and other related diseases [10].

The zinc value was higher (2.70 ± 0.06) than that reported by [3] which ranged from (0.26 ± 0.05 – 0.80 ± 0.10). Zinc assists enzymes in all cells genetic material and formation. In haemoglobin and the pancreas, it assists digestive function as well as in the metabolism of protein, fat and carbohydrate. It liberates Vitamin A from storage in the liver and disposes damaged free radicals. Zinc affects behavious, learning and immune function. It is also important in healing, sperm production, taste perception, fetal development and growth in children. It is needed to produce active form of vitamin A in visual pigments. When deficiency occurs, it impairs all these functions.

The level of manganese observed in this study was low (0.03 ± 0.01) compared to the level of managanese from other study but is slightly in the range [3]; 0.24 ± 0.04-0.80 ± 0.07). Manganese regulates blood sugar level, the production of energy and cell reproduction. Manganese functions as an essential consituent for bone structure. Deficiency of manganese may result in birth defects if an expectant mother does not get enough of this important element.

Copper content was (0.19+0.02- 7.09 ± 0.04). The level of copper in the vegetable is adequate. This is because; trace minerals at higher levels are toxic to the body. Copper is a component of several enzymes and proteins in the body. These enzymes and proteins have important functions in processes fundamental to human health. These include proper functioning of immune, nervous and cardio-vascular systems, for bone health, iron metabolism, formation of red blood cells and regulation of mitochondrial and other gene expression. Serum copper is known to be low in some cases of iron deficiency anaemia. This suggests that iron status has an effect on copper metabolism. The deficiency causes anaemia that does not respond to iron supplementation. The interaction between iron and copper is due to impaired utilization of one and the absence of the other.

Vitamin C was the most abundant element (Total vitamin C 278.30 ± 0.06mg/100g and soluble vitamin C 98.04 ± 0.01mg/100g) relative to other study. [9] reported (225.31 ± 0.02 -485.94 ± 0.01). Vitamin C promotes the health of teeth and gums, lungs, bronchia and joints. Vitamin C also aids in the purification of blood. Deficiency of vitamin C is associated with pains in the joints and defects in skeletal calcification, anaemia, manifestation of scurvy and hemorrhage from the mucous membrane of the mouth and gastrointestinal tract. The presence of ascorbic acid in the vegetable sample suggests that the consumption and use in herbal medicine can prevent against common cold and other disease like prostate cancer.

Vitamin A content was observed to be (182.84 ± 0.01). The value obtained from this work is in range with that of similar study. [9] reported (179.3 ± 03) (322.60 ± 0.06). Vitamin A promotes growth, resistance to disease and delays aging. It also promotes the health of the skin, eyes, nails and hair. Vitamin E content was observed to be (2.583 ± 0.01). Vitamin E acts as an anti-oxidant in cell membranes. It is especially important for maintaining the integrity of cells that are constantly exposed to high oxygen concentrations. Vitamin B_1 (Thiamin) content was (0.30±0.01). Thiamine plays a vital role in the growth and function of various cells.

Vitamin B_3 (Niacin) content was shown to be (2.04 (179.3±03) 0.01mg/100g). Vitamin B_3 is coenzyme which is involved in many biochemical processes including the detoxification of foreign compounds in the body.

Vitamin B_6 Pyridoxine) content was observed to be. Vitamin B_6 promotes the metabolism of proteins and non-saturated fatt acids (1.78±1.01). Vitamin B_2 (Riboflavin) content was shown to be (0.03±0.01). Vitamin B_2 carries oxygen to the cells, Vitamin B_2 is a key component of coenzymes involved with the growth of cells. Energy production and the breakdown of fats, steroids and medications. Folic acid was determined to be (0.28±0.01) and it is essential in preventing birth defects.

Conclusion

The result of this study has revealed that *Asystasia gangetica* (Mmeme, Chinese Violet) contains an appreciable amount of nutrients and minerals and vitamins needed for the maintenance of good nutritional status. They compete favourably with commonly consumed vegetables. Since it contains substantial amount of nutrients, it can therefore be concluded that *Asystasia gangetica* (Mmeme, Chinese Violet**)** can contribute significantly to the nutrient requirements and health management of man and should be recommended in our diets.

Recommendations

1. *Asystasia gangetica* (Mmeme, Chinese Violet) should be included as an important vegetable considering the high nutrient it possess and be used as a good alternative source of food to alleviate hunger and malnutrition.
2. Caution should be taken not to add too much salt when repairing the wild vegetable because the sodium content is high.
3. Intensive nutrition education is required to create awareness on the nutrient potentials and encourage the cultivation of the wild vegetable.
4. The information from this study could help policy makers to develop nutrition policies to promote the utilization of wild edible vegetables as part of a strategy to improve food security, nutrition and livelihoods especially of rural communities throughout the country
5. Policy developer should include the consumption of the wild edible vegetable into the Nigerian food composition table.
6. Wild edible vegetables are considered as food for poor families and it is going extinct inspite of its high nutritional constituent. Wild edible vegetables demand due consideration to fight food insecurity and improve rural livelihood.
7. Identification of more wild edible vegetables is imperative for regular consumption because of their rich nutrient potentials.
8. Nutrient content of many wild vegetables in food composition tables would be an important tool for nutritionists and dieticians nationwide.
9. Further research work should be done to confirm some of pharmacological claims on *Asystasia gangetica.*

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