



Nutritional Composition of ‘Aju Mbaise’ Herbal Cocktail

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Authors' contributions

This work was carried out in collaboration among all authors. Authors TAN and CCMI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author TAN managed the analyses of the study. Authors TAN and LCC managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRB/2020/v7i230136

Editor(s):

(1) Dr. Mohamed Fawzy Ramadan Hassanien, Zagazig University, Egypt.

Reviewers:

(1) Tiziana Maria Sirangelo, Council for Agricultural Research and Agricultural Economy Analysis, Italy.

(2) Berrak Delikanlı Kiyak, Bursa Uludag University, Turkey.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/60470>

Original Research Article

Received 14 June 2020
Accepted 19 August 2020
Published 31 August 2020

ABSTRACT

This study was carried out to evaluate the nutritional content of ‘Aju Mbaise’ herbal mixture. The experiment involves the collection of fresh plant samples that make up ‘Aju Mbaise’ cocktail. The study was done in the Research Laboratory of the Department of Biochemistry, Faculty of Science, University of Port Harcourt, Nigeria. The plants samples were collected from Mbaise locality in Imo State, Nigeria, and were identified as *Cnestis ferruginea*, *Xylopiya aethiopica*, *Uvaria chamae*, *Palisota hirsuta*, *Scleria sp.*, *Napoleona imperialis*, *Dialium guineense*, *Combretum racemosum*, and *Heterotis rotundifolia* respectively. The dietary, mineral, and vitamin compositions were determined accordingly. The proximate, vitamin, and mineral composition of the herbal cocktail were investigated in line with their standard methods of analysis. The proximate analysis revealed that the cocktail extract contains carbohydrate (69.51%), crude protein (10.05%), moisture (8.89%), crude fat (5.17%), fibre (3.745), and ash content (2.65%). The vitamin analysis revealed reasonable concentration of vitamins A, B₁, B₂, B₃, B₆, B₁₂, C, D, and K. The mineral evaluation showed high concentration of calcium, magnesium, potassium, sodium, zinc, and iron. This study revealed high nutritional value of ‘Aju Mbaise’ herbal cocktail which is responsible for the plant’s usefulness in the management, treatment, as well as maintenance of good health.

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Keywords: Aju mbaise; minerals; extraction; vitamins and cocktail.

1. INTRODUCTION

'Aju Mbaise' is a herbal therapy composed of combination of leaves, roots and trunk of different medicinal plants wrapped together. This herbal cocktail has its origin from 'Mbaise', a sub-tribe of Igbo in Imo State, Nigeria. According to [1], the cocktail effectively detoxifies, and sanitizes the womb, as well as reduces stomach to its original size and shape in good time when administered to women after childbirth. According to [2], the cocktail is made up of *Sphenocentrum jollynum*, *Cnestis ferruginea*, *Xylopi aethiopica*, *Uvaria chamae*, *Palisota hirsuta*, *Scleria sp.*, *Napoleona sp.*, *Dialium guineense*, *Combretum racemosum*, and *Heterotis rotundifolia*. These plants have shown their individual therapeutic effects against so many diseases. According to [3], the root extract of *S. jollynum* is generally used by men as aphrodisiac (Spanish fly). Its capability in stimulating the central nervous system (CNS), management of mental and inflammatory disorders, pain and depression was reported by [4]. Other restorative activities of *S. jollynum* includes anti-diabetic [5], antioxidant [6], anti-inflammatory [7], anti-allergic [8], anti-bacterial [9], and anti-malaria [6]. According to [5], *S. jollynum* extract stimulates haematopoietic stem cells. In this manner, improves haematological indices. *C. ferruginea*, according to [10], showed in vivo hypoglycaemic activity in STZ-induced diabetic rodents. Hypoglycemic and hypocholesterolemic activities of *C. ferruginea* leaves have also been reported by [11]. The antimicrobial activities of water and organic extracts of *C. racemosum* leaves have been reported by [12]. Other therapeutic benefits such as, anti-inflammatory, vasorelaxant, and trypanocidal properties of *C. racemosum* extract has been confirmed by [13] and [14]. According to [15], *D. guineense* bark is used for oral hygiene and treatment of stomach ache, fever, prenatal pains and edema. [16], also reported the use of the fruits to improve lactation and check genital infection in women. [17], reported the use of the leaves and stem bark for the treatment of diarrhea, severe cough, bronchitis, wound, stomach ache, malaria fever, jaundice, anti-ulcer and hemorrhoids. According to [18], the fruit pulp contains over 13% of dietary fiber which increases its bulk and augments bowel movement, thereby prevent constipation. [19], reported the utilization of *H. rotundifolia* for treating rheumatism and diarrhea. [20], also

reported the antimicrobial effects of *H. rotundifolia* leaves and stems extracts. The leaves extract of *N. imperialis* has shown antibacterial and wound healing properties in rats [21]. [22], demonstrated that a herbal ointment made of methanolic extract of *N. imperialis* showed a better wound healing property. According to [23], the leaves extracts of *P. hirsuta* possess anxiolytic and antidepressant effect. The anti-inflammatory, antipyretic, and anti-oxidant effects of this plant have been reported by [24]. The use of this plant alone or as combination therapy with orthodox medicine in the treatment of various painful inflammatory conditions has also been reported by [25]. According to [26], ethanolic extract of *P. hirsuta* leaves showed to be a potent anti-arthritis therapy in rat adjuvant-induced arthritis when administered prophylactically, curatively or in combination with standard anti-rheumatic drugs. The use of leaf juice of *U. chamae* in the treatment of injuries, swellings, ulcers, iritis and conjunctivitis has been reported by [27]. According to [28], its root bark is a powerful anti-inflammatory, astringent, febrifuge, galactagogue and styptic agent. Its root was also prescribed to be a "lady's prescription" by [28], as it effectively averted amenorrhoea, miscarriage; and quelled labour torments. Also [29], reported that the plant extracts are powerful solutions for gastroenteritis, intestinal sickness, fever, vomiting, diarrhea, wounds, sore throat and inflamed gums. [30], further expressed the hypoglycemic, antifungal, bacteriostatic and antimalaria properties of *U. chamae*. According to [31], *X. aethiopica* is a potential ethno-medication against rheumatism, arthritis, cough, stomach ache, bronchitis, biliousness and dysentery. [32], reported an increased steroid hormone by ethanolic extract of *X. aethiopica*, while its aqueous extract showed diminished amylase and lipase activity [33]. According to [34], *X. aethiopica* can be ingested as remedy for diarrhoea, bronchitis, ulceration, skin disease and female sterility. Other medicinal activities of *X. aethiopica* include antibacterial [35], anti-parasitic [36] and anti-plasmodial [37]. The medicinal abilities of these plants are as a result of the bioactive compounds present in them. Previous study by [2], revealed that the herbal cocktail of 'Aju Mbaise' contains various phytochemicals such as alkaloids, flavonoids, glycosides, hydrogen cyanide, phenols, saponins, steroids, tannins, and terpenoids. And so, there is need to further ascertain the nutritive value of the herbal cocktail. Therefore, the

present study was designed to investigate the nutritional composition, vitamins and mineral content of 'Aju Mbaise' herbal cocktail as dietary supplement for preservation of good health and promoting better life.

2. METHODOLOGY

2.1 Collection of Plant Materials

Fresh samples of the plants that make up Aju Mbaise were collected at Obodo Ujichi, Ahiazu and Amuzi, Ahiaza Towns, both in Ahiazu Mbaise L.G.A, of Imo State, Nigeria. The plants were identified as *Cnestis ferruginea*, *Xylopia aethiopica*, *Uvaria chamae*, *Palisota hirsuta*, *Scleria sp.*, *Napoleona imperialis*, *Dialium guineense*, *Combretum racemosum*, and *Heterotis rotundifolia*, respectively by Dr. Chimezie Ekeke of the Department of Plant Science and Biotechnology, University of Port Harcourt, Nigeria. The fresh plants after collection were dried. The dried samples were pulverized with a mechanical grinder. The powdered sample was used to determine the proximate analysis, vitamins and mineral content.

2.2 Proximate Analysis

The proximate composition of 'Aju Mbaise' herbal cocktail was investigated with the standard methodology according to Association of Analytical Chemist [38].

2.2.1 Estimation of ash content

Sample weighing 2g was placed in an empty dried platinum crucible of weight (W_1). The weight of the sample and the weight of the platinum crucible were noted (W_2). The crucible containing the sample was subjected to ashing for 3 hours in a muffle furnace at a temperature of 500°C. The crucible was removed and cooled in a desiccator and the final weight (W_3) was determined as follows;

$$\text{Ash content (\%)} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

2.2.2 Estimation of carbohydrate content

Differential method of AOAC [38] was adopted for the estimation of carbohydrate content. The carbohydrate content was calculated thus;

$$\% \text{ Carbohydrate content} = 100 - (\% \text{ Protein} + \% \text{ Moisture} + \% \text{ Ash} + \% \text{ Fat} + \% \text{ Fibre})$$

2.2.3 Estimation of crude fibre content

A sample of weight 2g was defatted with petroleum ether, boiled under reflux for 30mins with 200ml of 0.25M sulphuric acid (H_2SO_4) solution. It was filtered through a linen fabric and the insoluble matter was washed severally with hot water until it was free of acid. The residue was then transferred to a beaker and boiled for 30mins with 100ml of hot 0.31M sodium hydroxide (NaOH) solution. This process was done repeatedly and the final residue filtered through a thin but close pad of washed and ignited asbestos in a Gooch crucible. The sample was then dried in an electric oven, weighed, incinerated, cooled and reweighed. The crude fibre content was determined as;

$$\% \text{ Crude fibre} = \frac{\text{weight of fibre} \times 100}{\text{weight of sample}}$$

2.2.4 Estimation of crude protein content

Sample of weight 0.5g was gently placed in a 30ml Kjeldahl flask. The content of the flask was digested by heating cautiously in the presence of sulphuric acid, anhydrous sodium sulphate and 0.5g of the Kjeldahl catalyst (copper) until a clear solution (ammonia) appears. The clear solution was allowed to stand and cool. After cooling, it was made up to 100ml with distilled water which was added to avoid caking and then 5ml was transferred to the Kjeldahl distillation apparatus, followed by 5ml of 40% NaOH. A receiving flask containing 5ml of 2% boric acid and mixture of 5 drops of bromocresol blue and 1 drop of methylene blue indicators was subjected to the distillation apparatus such that the tap was about 20cm inside the solution. The distillation was initiated immediately, and was titrated with 0.01M HCl to an end product. The percentage protein content was calculated as;

$$\% \text{ Protein content} = \% \text{ Nitrogen} \times 6.25$$

$$\text{While \% Nitrogen} = \text{titre value} \times 0.01 \times 14 \times 4$$

2.2.5 Estimation of crude fat

A clean dried 500ml round bottom flask containing anti-knocking granules, was loaded up with 300ml petroleum ether of boiling point 40 - 60°C, and stopped neatly with cotton wool. The soxhlet extraction apparatus was set up and allowed to reflux for about 6 hours. It was gently expelled and the oil ether gathered in the top compartment of the set up was condensed into a flask for re-use. At the point when the

compartment was practically free of oil ether, the oil was expelled and dried. It was allowed to cool and afterward measured as;

$$\% \text{ Crude fat} = \frac{(\text{weight of flask + oil}) - (\text{weight of flask}) \times 100}{\text{weight of sample}}$$

2.2.6 Estimation of moisture content

With a dried clean crucible of weight (W_1), a sample weighing 2g was placed in it to make up W_2 (weight of crucible + weight of sample). The crucible containing the sample was placed in an oven for drying at temperature of 105°C for about 24 hours. After the drying process, the weight (W_3), of the crucible containing the dried sample was noted. Thus, moisture content was determined as;

$$\text{Moisture content (\%)} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

2.3 Determination of Vitamin Composition

The amount of vitamin A, C, D, B₆, and B₁₂ in the sample was determined according to the method described by [38,39]. Vitamins B₁ and B₃ were determined according to the method described by [40] while Vitamins B₂ and K were determined using the method described by [41].

2.4 Estimation of Mineral Composition

The AOAC Official Method 985.01 [42] with little modification described by [43] were used for the analyses of the following metals: Ag, Ar, Al, Co, Mg, Mn, Mo, Hg, Zn, Fe, Cd, Cu, Pb, Ca, Ni, and Se, while the flame photometer was used in the analyses of K and Na. Using Atomic Absorption Spectrophotometer (Buck Scientific model 210 VGP), the ash solution of the plant sample was prepared by weighing 5g of the powdered herbal sample, this was ashed at 550°C in muffle furnace for 5 hours, and the residues dissolved in 100ml of deionized water. Suitable salts of the metals were used to make their standards, and suitable lamps were fixed. The standard minerals solutions were injected to calibrate the AAS using acetylene gas as the flame source. An aliquot of ash solutions were injected and the concentrations were extrapolated from the standard plots/curves of each metal.

2.5 Statistical Analysis

Data were analysed using SPSS Version 20.0. Results were expressed as Mean ± SD of three replicates determinations.

3. RESULTS AND DISCUSSION

The results of the analysis (proximate, vitamin, and mineral composition) carried out on the herbal cocktail were presented in Tables 1-3 respectively.

Table 1. Proximate composition of 'Aju Mbaise' herbal cocktail

Parameter	Concentration (g/100g)
Ash	2.65±0.10
Carbohydrate	69.51±1.66
Crude Fibre	3.74±0.12
Lipids	5.17±0.35
Moisture	8.89±1.01
Crude Protein	10.05±1.80

Values represent Mean ± Standard deviation and n = 3

Table 2. Vitamins composition of 'Aju Mbaise' herbal cocktail

Parameter	Concentration (mg/100g)
Vitamin A	0.27±0.02
Vitamin B ₁	0.54±0.06
Vitamin B ₂	0.34±0.02
Vitamin B ₃	0.13±0.03
Vitamin B ₆	0.32±0.02
Vitamin B ₁₂	0.23±0.05
Vitamin C	0.55±0.06
Vitamin D	0.27±0.04
Vitamin K	0.21±0.11

Values represent Mean ± Standard deviation and n = 3

3.1 Discussion

The utilization of natural products (herbs and vegetables) for medicinal purpose is a global practice aimed at achieving good health [44]. These plants are believed to contain many bioactive compounds which include phytochemicals, proximate nutrients, vitamins and minerals. Our research plant 'Aju Mbaise' is not an exemption, as its constituent plants possess such compounds. From the results presented above (see Table 1), the herbal extract possess high amount of carbohydrate, protein, moisture and fat, while the fibre and ash content are in little amount. Nutrients such as carbohydrate, proteins, lipids, fibre, minerals and vitamins are known to be required by the body in suitable proportion to improve and maintain good health. The proximate analysis of the herbal cocktail (Aju Mbaise) revealed carbohydrate, crude protein, lipids, crude fibre, moisture, and ash. According to [45], leaves extract of *S. jollyanum*, which is a constituent plant of 'Aju

Mbaise' is rich in fat, moisture, protein, carbohydrate, ash, and fibre substances respectively, with a great energy value. *Dialium guineense*, another constituent plant of 'Aju Mbaise' contains high concentration of carbohydrate, proteins, and moisture [46]. Thus, gave the herbal cocktail its high nutrient content. Minerals and vitamins are essential nutrients, which the body needs its various forms in appropriate proportion to remain healthy. According to [47], they serve as fundamental cofactors and coenzymes for some physiological and metabolic actions and furthermore help essential reactions at cell level (which includes glycolysis, tricarboxylic acid cycle and lipid and amino acid digestion), important for energy generation, and maintenance of life. As indicated by [48], minerals remain an important daily necessity for appropriate tissue functioning. The minerals and vitamins analysis of the 'Aju Mbaise' herbal cocktail revealed significant amount of minerals and vitamins such as, vitamin A, vitamin B₁, vitamin B₂, vitamin B₃, vitamin B₆, vitamin B₁₂, vitamin C, vitamin D, vitamin K, arsenic, aluminum, cadmium, calcium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, and zinc (see Tables 2 and 3). This is consonant with the report of [49], that 'Aju Mbaise' contained appreciable concentration of minerals (potassium, calcium, magnesium, sodium, iron, zinc, phosphorus, copper, manganese and chromium). [50], revealed the presence of considerable amount of macro- and micro- elements such as calcium, magnesium, potassium, iron, manganese, zinc, and sodium in seeds and leaves of *S. jollyanum* (a component plant of the herbal cocktail), making the plant an important component in building solid bones, production of energy, and carrying out of some metabolic reactions in the body. According to [46], *Dialium guineense*, another constituent plant of 'Aju Mbaise' contains appreciable concentration of iron, magnesium, sodium, calcium, potassium, and reasonably amount of ascorbic acid. It can be scientifically expressed that utilization of this herbal cocktail can help fight against mineral and vitamin deficiencies since it contains a wide range of mineral elements and vitamins which are equivalent to those found in different foods necessary to improve health and growth in people. Minerals are crucial for normal growth, muscles activities and skeletal development, cellular activities and oxygen transport (iron and

copper), chemical reaction in the body and intestinal absorption (magnesium), fluid balance and nerve transmission (sodium and potassium). As indicated by [51], supplements are imperative to both grown-up and youngsters, as its insufficiency can be adverse to human health. The herbal cocktail extract contained reasonable amount of vitamin C, a powerful antioxidant that aids the transport and uptake of non-heme iron at the mucosa, and stimulates cortisol synthesis. [52], expressed its adequacy in diminishing sorbitol secondary diabetes and lipid peroxides generated by oxidative stress and free radicals. Its deficiency leads to fragility of blood vessels, gum rot and scurvy. According to [53], pyridoxine (Vit. B₆) is essential for protein digestion, growth, synthesis of phospholipids and sphingolipids, while cobalamin (Vit. B₁₂) is essential for blood formation, maintenance of healthy body, and normal functioning of the brain and nervous system. In another study by [2], it was observed that 'Aju Mbaise' herbal cocktail is rich in phytochemicals such as phenols, flavonoids, tannins, alkaloids, saponins, steroids, glycoside, and terpenoids. This is in consonant with the report of [49], that 'Aju Mbaise' herbal mixture contains appreciable amount of alkaloids, tannins, flavonoids, cyanogenic glycoside, and saponin.

Table 3. Mineral composition of 'Aju Mbaise' herbal cocktail

Mineral	Concentration (mg/kg)
Arsenic	0.10±0.00
Aluminium	0.11±0.01
Cadmium	0.39±0.02
Calcium	3580.00±98.00
Cobalt	0.13±0.01
Copper	0.25±0.01
Iron	27.84±0.96
Lead	0.12±0.00
Magnesium	6750.00±12.00
Manganese	0.24±0.00
Mercury	0.09±0.00
Molybdenum	0.06±0.00
Nickel	0.13±0.00
Potassium	2640.00±8.00
Selenium	2.61±0.06
Silver	0.11±0.02
Sodium	4270.00±13.00
Zinc	28.83±1.07

Values represent Mean ± Standard deviation and n = 3

4. CONCLUSION

This study has shown that 'Aju Mbaise' herbal cocktail contains numerous essential nutrients that play very important biological roles in the human system that aids in the maintenance of good health and promotion of quality healthy living.

ETHICAL APPROVAL

The Research work was approved by the Research Ethics Committee of the University of Port Harcourt with authorization number: UPH/CEREMAD/ REC/MM64/003.

ACKNOWLEDGEMENT

The authors are grateful to Messrs Ekeocha Akujobi, Cajethan Ugorji and Franklin Nwuda, for their assistance in the sample collection that led to the success of this work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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