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NUTRITIONAL EVAUATION OF *LEPTADENIA HASTATA* LEAVES

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ABSTRACT: Fresh leaves of *Leptadenia hastata* were obtained from different locations at Baram village along Dass road in Bauchi State, Nigeria and analyzed for their proximate and mineral composition using standard analytical techniques. The results obtained indicated that all the parameters (carbohydrate, crude lipid, crude protein, ash content, crude fibre, moisture content and minerals) determined were present at varying concentrations. The results indicated high moisture content of 78.85 ± 0.32 %, ash content of 8.73 ± 0.14 %, crude protein content of 4.65 ± 0.09 %, available carbohydrate of 6.50 ± 0.43 %, energy content of 49.79 ± 1.89 kcal/100 g, but low in crude fibre and crude lipid contents of 0.18 ± 0.02 % and 1.10 ± 0.03 % respectively. The results of the mineral analyses showed higher levels of calcium (43, 086.67 ± 270.00 mg/kg), magnesium (94,325.00 ± 330.00 mg/kg), potassium (1,160.00 ± 165.13 mg/kg) and iron (1,322.50 ± 28.40 mg/kg). Low levels of zinc (53.00 ± 5.35 mg/kg), manganese (29.50 ± 1.91 mg/kg), copper (12.80 ± 1.89 mg/kg) and phosphorus (3.59 ± 0.56 mg/kg) were determined in the leaves of *Leptadenia hastata.* This therefore suggests that the leaves of *Leptadenia hastata* is a potential source of iron for anaemics as well as a source of calcium for the development and maintenance of strong bones and teeth in both children and adults.

Keywords**:** *Leptadenia hastata*, fresh leaves, proximate and mineral compositions.

1 INTRODUCTION

Leptadenia hastata, commonly known as "Yadiya" in Hausa language is an edible non-domesticated herbaceous vegetable that is widely distributed in Tropical Africa; from Mauritania and Senegal eastwards to Cameroun, Ethiopia, Northern Kenya and to Uganda. It is however cultivated in Ethiopia [1]. The leaves, young shoots and flowers are eaten; cooked as vegetable and in soups. In Uganda, the chopped and boiled leaves are mixed with beans, pigeon peas or cowpea and eaten. It is however a famine food in most parts of Africa, but poor people eats it in normal times. It is also an important plant for goat and cattle fodder.

Vegetables constitute an important part of human diet since they contain carbohydrates, protein, vitamins, and macro minerals and trace minerals that are essential for the nutritional balances of living organisms. Recently, there has been an increased awareness in Nigeria on the nutritional contents of most of these leafy vegetables. This has therefore led to the domestication of most of these wild plants [2].

Nigeria is blessed with abundant domestic trees, fruits, tubers, vegetables and other plant foods which are of great

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economic importance and are excellent sources of essential nutrients required by the body for growth and prevention of diseases. Their values cannot be compared with processed or imported items which are said to contain essential body nutrients. Nutritional supplements which fill our markets at exorbitant rates are often a waste of resources and may cause a short or long term health effects instead of playing supplementary role. The human body cannot function properly unless its diet can provide the necessary nutrients required for the provision of sufficient energy for its needs, growth and maintenance of the chemical reactions involved in the body [3]. This paper is aimed at determining the nutritive and mineral composition of *Leptadenia hastata* leaves.

2 MATERIALS AND METHODS

Analytical reagent (AnalaR) grade chemicals and distilled deionized water were used in the study. All the apparatus used were washed with detergent solution, 20 % (v/v) nitric acid, rinsed with tap water and finally with distilled deionized water. The apparatus were then allowed to dry [4].

2.1 Sampling and Sample Treatment

The leaves of the plant were collected from different locations at Baram village along Dass road, Bauchi State, Nigeria. The plant was identified in the Department of Biological Science, Abubakar Tafawa Balewa University, Bauchi as *Leptadenia hastata*. The leaves were then washed with water, homogenized, air dried under shade and ground to powder using porcelain pestle and mortar. This was kept in screw capped plastic containers and labeled accordingly prior to the analysis.

2.2 Elemental Analyses

The sample solution was prepared by digesting 1.00 g of the ground sample with a mixture of concentrated HNO_3 (4.30 cm^3), H_2SO_4 (4.30 cm^3) and $HClO_4$ (4.30 cm^3) in a beaker [5]. The mixture was then filtered using Whatmann number 1 filter paper into a 100 cm^3 volumetric flask and made to volume with water. The solution was used for the determination of sodium and potassium at their respective wavelengths using a Jenway Digital Flame Photometer Model PFP7/6108. The same solution was also used to determine calcium, magnesium, manganese, iron, copper and zinc at their respective wavelengths using Buck Scientific Atomic Absorption Spectrophotometer Model 2010 VGP [5]. Phosphorus was determined using standard colorimetric technique [6] at 470 nm using UV/Visible Spectrophotometer Model 91743 cecil.

2.3 Proximate Analyses

The sample was analyzed for its proximate composition (moisture content, ash content, crude protein, crude lipid, crude fibre and available carbohydrate). The methods of analyses were those of AOAC, 1999 [7]. The energy value of the sample was calculated in kcal/100 g according to the formula: Energy = (% protein x 3 kcal) + (% lipid x 9 kcal) + (% available carbohydrate x 4 kcal) [8].

3 RESULTS AND DISCUSSION

The result of the proximate composition of *Leptadenia hastata* leaves is given in Table 1. The moisture content (78.85 %) is very high compared to reported literature values of 10.02 and 11.05 % for the leaves of *Veronica amygadalina* and *Gongronema latifolium* respectively [9]. The determined moisture value compares fairly well with the reported literature range of 61.95 to 72.07 % in some browse leaves and tuber peels [10]. High moisture content is responsible for the

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greater activity of water soluble enzymes and co-enzymes needed for metabolic activities in leafy vegetables [11].

The crude fibre content was found to be 0.18 %. This value is very low compared to 12.08 % and 4.02 % report for *Veronica amyygdalina* and *Gongronema latifolium* respectively [9].

Dietary fibre helps to prevent constipation, bowel problems and piles. It also promotes the movement of food through the intestine and high fibre food expands the walls of the colon, thereby easing the passage of waste.

Leptadenia hastata leaves sample have a low ash content of 8.73 %. The value is much lower than 15.55 % determined in *Amaranthus hybridus*, but higher than 5.02 % found in *Basella alba L.* [11]. Ash contains essential mineral components necessary to nourish the blood and tissues.

The crude protein content of the plant was found to be 4.65 % which compares favourably well with the 4.70 % crude protein content of the same plant leaves determined [12]. This in turn is far less than 11.29, 20.72 and 13.10-14.90 % reported for *Momordica balsamina*, *Moringa oleifera* and *Lesianthera africana* leaves respectively [13]. Proteins are needed in the body for growth and maintenance. They are also components of hair, skin and enzymes.

The crude lipid content was low (1.01 %) compared to 3.51 and 14.02 % found in *Gongronema latifolium* and *Amaranthus hybridus* [9]. The value is however higher than 0.92 % found in baobab leaves [14]. Fats are high energy nutrients and are usually referred to as the store house of energy because it contains more than twice, as much energy as does carbohydrate or protein. The fat/protein ratio of 0.24 of the leaves point to the fact that when consumed more protein will be taken into the body system than fat [15].

Leptadenia hastata leaves had an available carbohydrate content of 6.50 %. The value is higher than 1.22 and 1.16 % for scent leaves and Telfaira occidental respectively [9]. The value is however lower than 11.30 % for *Leptadenia hastata* leaves [12]. The role of carbohydrate in the body includes providing energy for working muscles, providing fuel for central nervous system, enabling fat metabolism and preventing protein from being used as energy [16].

Table 2: Mineral composition of *Leptadenia hastata* leaves (mg/kg dry matter).

Elements	Concentration
Potassium	1,160.00 ± 165.13
Sodium	901.25 ± 128.48
Phosphorus	3.59 ± 0.56
Calcium	43,085.67 ± 270.00
Magnesium	94,325.00 ± 330.00
Manganese	29.50 ± 1.91
Iron	1,322.50 ± 28.40
Copper	12.80 ± 1.89
Zinc	53.00 ± 5.35

Values are mean ± standard deviation (n = 4).

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The levels of mineral elements determined in the leaves of *Leptadenia hastata* are presented in Table 2. The mean potassium level was found to be 1,160.00 mg/kg. This value is lower than the recommended dietary allowance (RDA) value of 2000.00 mg for adults, but much higher than 43.21 mg/100 g found in *Mucuna poggei* [17]. Potassium is an important intracellular and extracellular cation. The mean value of sodium (901.25 mg/kg) is higher than the RDA value of 500.00 mg for adults [18]. Sodium/ potassium ratio (Na/K) is important in controlling high blood pressure in the body. The value of phosphorus determined (3.59 mg/kg) in the present study was greater than the RDA value 1.50 to 3.00 mg [18]. Phosphorus is an essential component of bone mineral and a balanced proportion of calcium and phosphorus is needed in the body. The level of calcium (43, 085.67 mg/kg) is higher than the RDA of 2000.00 mg for adults. Calcium is an essential mineral for the development and maintenance of strong bones and teeth. Long term calcium deficiency can lead to rickets and poor blood clotting. A life-long deficiency can affect bone and teeth formation, while over–retention can cause hypercalcemia, impaired kidney function and decreased absorption of other minerals [19]. This value therefore suggests that the leaves of *Leptadenia hastata* are good source of calcium. A concentration of 94,325.00 mg/kg magnesium was found in the leaves of *Leptadenia hastata*. This value is higher than 56.05 mg/100 g found in *Mucuna poggei* leaves. The RDA of magnesium is 400 mg/day for men of 19-30 years old and 310 mg/day for women of the same age group. Magnesium is useful in the transmission of impulses between nerve cells and also in muscular activity. It also contributes to the make-up of teeth and bones as well as helps in regulating blood glucose levels [20]. A concentration of 29.50 mg/kg manganese was found in the leaves of *Leptadania hastata*. The RDA of manganese is 2.00-5.00 mg/100 g for a male adult [18]. Mangnese plays a role in fat, amino acid, carbohydrate metabolism, calcium absorption, blood sugar regulation, normal brain and nerve function as well as essential for the growth of bone [21]. The level of iron (1,322.50 mg/kg) found was higher than 135 mg/kg for *Vitex doniana* leaves [22], 10.58 mg/100g for *Mucuna paggei* [23] and 70.00 mg/100 g in *Cassia siamea* [24]. Considering the high level of iron determined, the consumption of the leaves need to be regulated in view of the fact that human body has no means of getting rid of excess iron. Excess dietary iron is a risk factor for cardiovascular disease, especially in men. It also increases the risk for bacterial infection and has been implicated as a cause of cancer [22]. Iron plays a vital role in haemoglobin formation, normal functioning of the central nervous system and oxidation of carbohydrates, protein and fats [25]. The high level of iron in the leaves of *Leptadenia hastata* shows that it could help in boosting blood level in anaemic conditions [18]. The value of copper determined (12.80 mg/kg) was found to be higher than the RDA value (1.50-3.00 mg) for male adults [26]. Copper is important in diet since it is a very powerful pre-oxidant and catalyses the oxidation of unsaturated fats and oils as well as ascorbic acid. The concentration of zinc concentration of zinc determined in the leaves of *Leptadenia hastata* was found to be 53.00 mg/kg. The value is higher than 12.00-15.00 mg RDA value of zinc for male adults [18]. This therefore suggests that the leaves of *Leptadenia hastata* are good source of zinc. It plays an essential role in polynucleotide transcription and translation as well as in the process of genetic expression [27].

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4 CONCLUSION

The leaves of *Leptadenia hastata* can be used to form part of regular human diet since the leaves contain significant amount of nutrients and minerals required for human nutrition. However, the consumption of the leaves should also be regulated as human body has no means of getting rid of excess iron, which is also a risk factor for cardiovascular diseases especially in men.

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