Assessment of Mineral Nutrient and Proximate Contents of *Gongronema Latifolia* Benth from Derived Savanna And Rainforest Zones of Nigeria

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Abstract- Assessment of mineral nutrient and proximate contents of Gongronema latifolia Benth was conducted in the derived savanna and rainforest zones of Nigeria. Ogoja, in Cross River State, and Abak, in Akwa Ibom State were choosen to represent the derived savanna and rainforest zones, respectively. Five (5) sampling units were choosen for collection of samples in each experimental site. Soil and leaf (G. latifolia) samples were collected from the study area. The contents of N, Na, Mg, and K in soils of rainforest zone were significantly ($P < 0.05$) higher than those of the derived savanna zone. The contents of K, Mg, Na, P, Cu, and Zn in leaf samples of the test crop in rainforest zone were significantly ($P < 0.05$) higher than those in the derived savanna zone. Similarly, the moisture, crude fat, ash and carbohydrate content in leaf of the test crop were comparatively ($P < 0.05$) higher than those of the derived savanna zones. This study suggests that the nutritional potentials of this species is influenced by ecological factors, hence, can be enhanced by using appropriate cultural practices and environmental conditions for its growth and development.

Index Terms- Mineral nutrient, proximate, Gongronema latifolia, derived savanna, rainforest

I. INTRODUCTION

Gongronema latifolia Benth belongs to the family Asclepiadaceae and is regarded as a non- wood forest product of west African origin [9]. It is a forest leafy vegetable that grows in the forests of South- Eastern Nigeria [10]. Its protein contents compares favourably with percent content reported for cowpea, green pea and fluted pumpkin leaves [17;18]. Chemical analysis of aqueous and ethanolic extracts of the species have been reported to contain hypoglycemic, hypolipidemic and antioxidative properties [17;26;27],. *G. latifolium* is commonly grown and utilized as leafy vegetables for soup preparation and for medicinal used in various parts of Nigeria, and even in Africa [10;17]. Medicinally, its extract have been used in the treatment of diabetes, hypertension and malaria [10;19;25]. Nutritionally, it is widely used as a spice for sauces, soups, and salads due to its sharp-bitter and sweet taste [18]. The nutritional compositions of dry leaves have been shown to be riched in both proximate and mineral nutrients. It grows in rainforest, deciduous and secondary forests and also in Mangrove and disturbed road side forest, at 900m altitude above sea level [17;18]. Considering the importance of this species, it is sometimes cultivated for the purpose of availability and sustainability. Ogoja is characterized by areas of derived savanna, which occur in lowland parts with intensive forest degradation, while Abak is characterized by secondary forest vegetation. The major source of livelihood in the two areas is subsistence agriculture. Therefore, the evaluation of eco-physiological parameters of this species using two ecotypes becomes increasingly important in order to provide a baseline information for continuous domestication of the species.

II. MATERIALS AND METHODS

Study area: This research was conducted in Ogoja and Abak, in Cross River and Akwa Ibom States, respectively. Ogoja and Abak represent the derived savanna and rainforest zones, respectively. Abak is located at coordinates of 4°33′N and 7°33′E. Akwa Ibom State has an Altitude of 106m AMSL (Above Mean Sea Level) with a mean annual minimum and maximum temperature of 23°C and 31.7°C, respectively [2;11]. The coordinates of Ogoja are 6 °30′N and 8°40′E. Average precipitation of 3000mm occurs annually along the coastal areas areas of Cross River State with an ambient minimum and maximum temperature of 22.4°C and 33.2°C, respectively [12], and Altitude of 32m (105ft) [3].

Collection of samples

Leaf samples of *Gongronema latifolium* were collected from the two (2) experimental sites (Ogoja and Abak). Five (5) sampling units were randomly choosen for collection of samples in each experimental site using completely randomized design. Similarly, soil samples were collected for assessment of soil chemical properties. The mean values of the five replicates reading were presented.

Analysis of soil samples

Soil samples (0.15cm depth) were dried, crushed and sieved using 0.2mm sieve. The chemical properties were analysed using standard procedures [4].

Analysis of plant materials

Leaf samples of the test crop were harvested, rinsed with distilled water and dried. The leaf material of each sample was crushed into powdered form using pestle and mortar. Fine powdered sample was obtained by sieving the powder through a

0.002mm wire mesh. The samples were kept in small bottles for analysis. Standard methods of [4;20] were used for the analysis. Phosphorus was assayed spectrophotometrically by ammonium-Vanadate-molybdate method, potassium by using a frame photometer and other elements by atomic absorbtion spectrophotometer.

Statistical analysis

Standard errors of the mean values were calculated and data were subjected to Analysis of variance (ANOVA) at 0.05% probability level [13].

III. RESULTS AND DISCUSSION

The chemical properties of experimental soil are presented in Table 1. The pH of the secondary forest and derived savanna soils were slightly acidic with a pH value of 5.40 and 5.01, respectively. Higher contents of phosphorus, nitrogen, magnesium, sodium and potassium were recorded in soils of rainforest zone than those of derived savanna zone. These values showed statistical ($P < 0.05$) significance. The variation in the chemical properties of the two experimental soils may be attributed to differences in prevailing ecological conditions together with the cultural practices of a given site [5;14]. The soil is a medium for plant growth, hence its physico-chemical properties affect the nutrients availability, absorption as well as plant growth and development [21;24].

Table 2 shows the mineral element in leaf samples of *G. latifolia* from the two experimental locations. The contents of potassium, magnesium, sodium, phosphorus, copper and zinc in leaf samples of the test crop in the rainforest zone were significantly ($P < 0.05$) higher than those in the derived savanna zone. The disparity in contents of mineral elements between the two ecotypes examined in this study (Ca, K, Mg, Na, P, Pb, Cu, Zn and Fe) may be due to the overriding factor of pH which regulate the acidity and alkalinity of the soil medium, hence, affects the absorption of specific nutrients [6;14]. Variability in soil pH may be attributed to the ecological variation between the derived savanna and secondary forest habitat, respectively. Soil pH directly affects the solubility of many nutrients in soils for proper plant growth and development [15;23]. Therefore, the rate of accumulation of an ion in root cells and the entire plant is proportional to the external concentration of such ions, which ultimately affect the rate of synthesis of products and metabolic processes in plant [1;7].

Table 3 shows the proximate composition of leaf samples of *G. latifolia* from the two experimental locations. The moisture, crude fat, ash and carbohydrate contents in leaf of the test crop were comparatively ($P < 0.05$) higher than those of the derived savanna zone. The plant- soil –water interaction plays a major role in absorption of nutrients by plants [1;16]. The formation of nutritional components as well as biochemical attributes in plants is regulated by these physiological reactions [22]. The molecular basis of the cell play some crucial role in the formation of complex molecules such as carbohydrate, proteins, fat, etc. [8;16].

Table 1: Chemical properties of experimental soil

Sampling Site / Parameters	Rainforest	Derived Savanna
pH	5.40 ± 0.21	5.01 ± 0.34
Available–P (mg/100g)	7.29 ± 0.36	4.42 ± 0.39
Total- N (%)	1.64 ± 0.16	0.17 ± 0.06
Organic C (%)	2.06 ± 0.12	3.02 ± 0.15
Ca (mg/100g)	2.63 ± 0.30	3.04 ± 0.46
Mg (mg/100g)	2.16 ± 0.14	1.27 ± 0.33
Na (mg/100g)	3.24 ± 0.20	0.16 ± 0.04
K (mg/100g)	1.22 ± 0.10	0.26 ± 0.02

Mean± standard error of 5 replicates

Table 2: Mineral element in leaf samples of *Gongronema latifolia* from the two experimental locations

Sampling Site / Parameters (mg/kg)	Rainforest	Derived Savanna
Calcium	79.25 ± 0.23	86.52 ± 0.42
Potassium	256.14 ± 0.19	248.36 ± 0.33
Magnesium	56.66 ± 1.18	47.21 ± 0.39
Sodium	121.35 ± 1.10	116.02 ± 1.10
Phosphorus	32.21 ± 0.34	27.07 ± 0.73
Lead	0.24 ± 0.03	0.30 ± 0.02
Copper	1.08 ± 0.10	1.02 ± 0.06
Zinc	11.21 ± 0.22	9.03 ± 0.28
Iron	0.20 ± 0.02	0.32 ± 0.02

Mean± standard error of 5 replicates

Table 3: Proximate composition in leaf samples of *Gongronema latifolia* from the two experimental locations

Sampling Site / Parameters (%)	Rainforest	Derived Savanna
Moisture	11.08 ± 0.27	11.02 ± 0.23
Crude protein	18.29 ± 0.30	20.46 ± 0.14
Crude fibre	9.02 ± 1.24	9.64 ± 0.22
Crude fat	6.17 ± 1.20	6.02 ± 1.07
Ash	11.36 ± 0.49	11.17 ± 0.34
Carbohydrate	126.21 ± 0.27	120.30 ± 0.63

Mean± standard error of 5 replicates

IV. CONCLUSION

This study shows that *G. latifolium* leaf has the nutritional potentials for use as a source of food nutrient for the teaming population. However, nutrient contents of the species is influenced by ecotype. Therefore, appropriate cultural practices and suitable environmental conditions are required for optimum nutritional composition of the species.

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