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NUTRITIONAL POTENTIAL AND SOME ELEMENTAL COMPONENTS OF SOME TROPICAL LEAFY VEGETABLES CONSUMED IN MUBI REGION OF ADAMAWA STATE, NIGERIA

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***Abstract*—** The present research was carried out to determine the Nutritional and chemical analysis of nine selected leafy vegetables mostly consumed in Mubi region of Adamawa State, Nigeria. These vegetables were as follows, Balanites aegyptiaca, Adansonia digitata, Phaseolus vulgaris, Corchurus olitorius, Abelmoscus esculentum, Allium cepa, Cassia tora, Cerathuceca sesemoides, Gynandropsis gynandra. All the samples were randomly collected from three different local Governments Areas; Mubi North, Mubi-South and Uba area. The elemental analysis was carried out using Atomic Absorption Spectroscopy (AAS), to analyze the levels of essential minerals (Cu, Fe, Ca, Zn, Mg, Mn and Na). The Nutritional components of the studied vegetables revealed that all the samples contain moisture (35.50-65.30%), ash (11.00-1.25%), crude fibre (12.70-27.50%), crude lipid (1.90-13.40%), crude protein (6.20-30.20%) and carbohydrate (1.65-10.80%). The result showed the presence of mineral elements in all samples. Iron, was not detected in all the samples, except in Gynandropsis gynandra (0.31±0.014mg/kg) and cassia tora (8.00±0.035mg/kg) respectively. The result for vitamins showed that ceratotheca sesemoides has a higher concentration of vitamin A and C. Hence, on comparison with the recommended dietary allowance (RDA) and the World Health Organization (WHO), these vegetables contain an appreciable amount of nutrients, minerals and vitamins.

Index Terms— Nutritional Potential, Elemental Components, Mubi Region and Tropical Leafy Vegetables

I. INTRODUCTION

Nigeria has rich genetic resources of cultivated, semi-wild and wild species of plants used as traditional vegetables and different types are consumed by various ethnic groups for different reasons such as supporting food and main dishes that contributes a great deal to diet [1]. These vegetables may be aromatic, tasteless or bitter but are the cheapest and most accessible source of protein, vitamins, minerals, essential amino acids and possess certain hormone precursors in addition to energy.

Vegetables are important protective foods that are highly beneficial for the maintenance of health and prevention of disease. Studies have repeatedly shown that increasing colon and stomach cancer may be prevented by the regular consumption of vegetable meals [2; 3]. They are valuable in maintaining alkaline reserve in the body and are valued mainly for their high vitamin, dietary fiber and mineral contents. The wide variation in colour, shape, tastes and textures of various vegetables have added an interesting touch to meals [4].

There is increasing epidemiological evidence in favour of an association between nutrition and susceptibility to infection. Health disorders such as appendicitis, hemorrhoids, gallstones, heart diseases, obesity and constipation can be either corrected, or treated by copious consumption of vegetables [5].

The awareness of the populace on the significance of nutrition in health has resulted to an increasing quest for biochemical knowledge of the composition of foods. Vegetables play an important role in human nutrition, apart from the fact that we derive most of our recommended daily needs of minerals and vitamins from them, they also supply certain constituents in which other food materials are deficient.

Most African Leafy Vegetables (ALVs) are rich in nutrients which are the building blocks of the human body. These nutrients may be affected by food processing and cooking since the African Leafy Vegetables (ALVs) are highly perishable and have a very short shelf life, lasting at best for only 3 days [6]. Proper handling and techniques as well as proper processing, need to be developed to minimize these problems and maintain a supply of wholesome, nutritious food during the year and preservation.

The major aim of this research is to analyze the nutritional potential and chemical components of some tropical leafy vegetables consumed in Adamawa state, Nigeria. The specific objectives of this research are to determine the nutritional potential such as moisture, crude protein, crude fiber, ash content, carbohydrates and crude lipid using physical methods and also to determine essential elements such as Na, Ca, Mg, Fe, Zn and Cu using Atomic Absorption Spectrophotometer (AAS) and Flame Spectrophotometer.

This report is limited to nine selected tropical leafy vegetables that are mostly consumed in Adamawa State, Nigeria as shown in the table below.

Table 1: Local and Botanical Names of the Selected Leafy Vegetables

Botanical name	English name	Local name (Hausa)
Balanites aegyptiaca	Desert date	Ganyen adu'a/ baha
Adansonia digitata	Baubau	Ganyen kukka/ kuri
Phaseolus vulgaris	Beans leaf	Ganyen wake/ dugu
Corchurus olitorius	Jute plant	Laloo
Abelmoscus esculentum	Okro leaf	Ganyen kubewa
Allium cepa	Spring onions	Lawashi
Cassia tora	Senna tora	Tapasa
Cerathuceca sesemoides	Limpopo Foxglove	Karkashi
Gynandropsis gynandra	Spider Flower	Gasiya/ kinasi

[7]

Study area

Mubi region is located in the northeastern part of Adamawa State, in the northern Nigeria, geographically co-ordinated $10^0$12N and $13^0$17' East of the Greenwich Meridian [7].

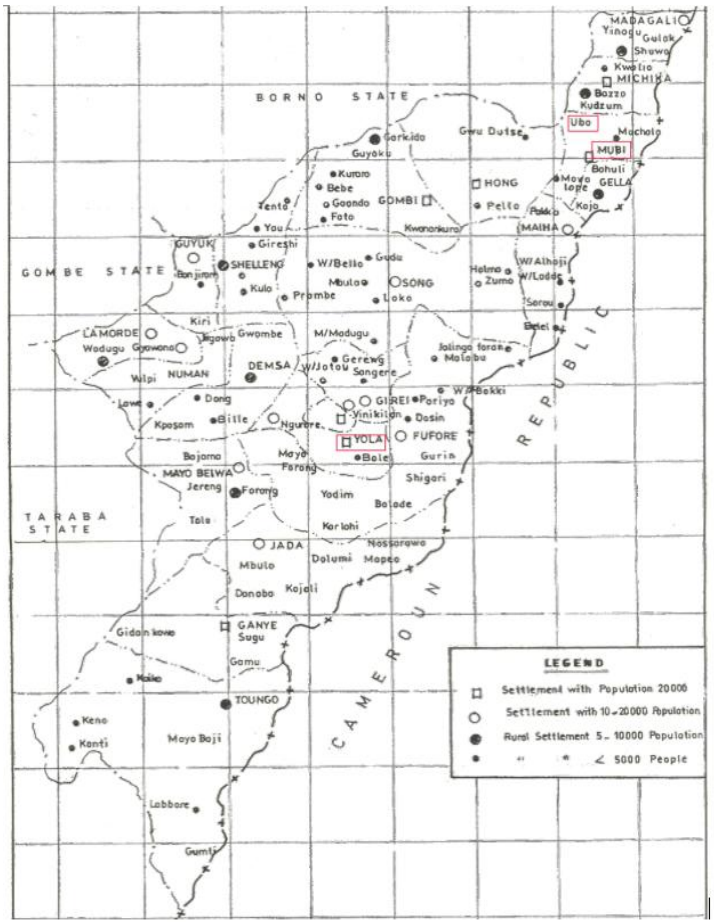

Figure 1: Map of Adamawa State showing the three Local Government Areas of sampling.

II. MATERIALS AND METHODS

Fresh leaves samples of Cerathuceca sesemoides, Corchurus olitorius, Allium cepa, Balanites aegyptiaca, Phaseolus vulgaris, Abelmoscus esculentum, Cassia tora, Adansonia digitata and Gynandropsis gynandra were randomly collected from different farms in Mubi North, Mubi South and Uba area in the month of June 2013.Vegetable collection techniques were carried out as described by [8]. The leaves samples were collected in an envelope to preserve the green colouration and moisture content, the samples were collected using a small knife and then were properly labeled and transported to the laboratory for subsequent analysis.

Vegetable samples were rinsed with distilled water to remove any attached soil particles. The water was allowed to drip out, it was then sorted out and sliced into smaller portions, and part of it was used for moisture content determination while the rest was placed in a clean crucible and dried at 100ºC for 8 hours. The dried leaves samples were then ground to fine powder using pestle and mortar, sieved and stored in an air-tight containers for other laboratory analysis, method as described by [9].

Sample Digestion

5g of each powdered sample was ash and dissolved in a 100cm^3 beaker and 2ml conc. HCl/HNO_3 in the ratio of

1:3, was added to it and digested on low heat by the use of a hot plate until it reduces to 2ml and was allowed to cool. After that it was filtered into 100cm^3 volumetric flask using No. 540 whatman filter paper and made to mark with more distilled water.

The method described by AOAC (2000) [10] was used for the proximate analysis while the method of Okunola *et al*.,(2008)[9]was used for mineral determination. All analyses were carried out in three replicates and the data were evaluated for significant differences in their means with Analysis of Variance (ANOVA) ($p<0.05$). Differences between the means were separated using turkey's test as packaged by SPSS 11.0 software.

III. RESULTS AND DISCUSSION

The results of proximate composition of the vegetables are shown in Table 2. Moisture content ranged from 65.30 - 35.50%. *Gynandropsis gynandra* had higher moisture content (65.30%) and least in *Balanites aegytiaca* (35.50%) with no significant difference ($p<0.05$) from other samples. Higher moisture content of *Gynandropsis gynandra* makes the vegetable easily susceptibles to deterioration. Ash contents ranged from 11.00- 1.25%. *Phaseolus Vulgaris* recorded the highest (11.00%), and *Gynandropsis gynandra* (1.25%) the least, which is relatively higher than the values obtained in other vegetables samples. High values indicated that these vegetables are good sources of minerals when compared to values obtained from cereals and tubers [4]. The crude- fibre analyzed was higher in *Balanites Aegytiaca* (27.50%) and low in *Abelmoscus Esculentus* (12.70%), these vegetables have high level of dietary fibre which varied significantly in the different species. High level of dietary fibre in leafy vegetables are advantageous for their active role in the regulation of intestinal transits, increasing dietary bulk and increasing faeces consistency due to their ability to absorb water [11]. Carbohydrate content ranged from 10.80 -1.65%. *Abelmoscus esculent* had higher value while the least value was in *Gynandropsis* gynandra but there were significant differences with the other vegetables.

Crude lipid recorded 13.40 in *Balanites Aegypitiaca* as highest and the least in *Phaseolus vulgaris* (1.90), this result indicated that these vegetables are poor sources of crude lipids as compared to the reported values of some vegetables consumed in East Africa, [11]. However, their consumption in large amount is a good dietary habit and may be recommended to individuals suffering from obesity.

The results of the crude protein analysed ranged from 6.20 - 30.20% in *Phaseolus vulgaris* and *Allium cepa* respectively. The result of protein in these vegetables falls within the World Health Organizational Standard (WHO) (20.48% - 41.66%). The protein in leafy vegetables would require dietary supplementation with cereal protein and legume to alleviate kwashiorkor [11].

Table 2: Proximate composition in (%)

SAMPLES	MOISTURE/%	ASH/%	FIBER/%	LIPID/%	PROTEIN/%	CARBOHYDRATE/kcal
Ceratotheca sesemoides	40.60	8.60	22.60	11.30	14.50	2.40
Corchurus olitorius	65.00	6.20	11.50	9.70	5.90	1.70
Allium cepa	55.50	10.00	18.70	7.40	6.20	2.70
Balanites aegyptiaca	35.50	9.20	27.50	13.40	11.50	2.90
Phaseolus vulgaris	55.20	11.00	19.50	1.90	30.20	7.40
Abelmoscus esculentus	51.80	6.20	12.70	10.20	8.30	10.80
Cassia tora	60.00	3.50	17.60	3.50	6.80	8.30
Adansonia digitata	45.20	1.80	18.20	2.30	28.30	4.20
Gynandropsis gynandra	65.30	1.25	14.50	8.70	7.60	1.65
WHO	0.83 – 90.30			8.30 – 27.00	20.48 - 41.66	

Table 3: Mineral composition in (mg/kg)

Samples	Zinc	Iron	Copper	Calcium	Magnesium	Manganese	Sodium
Ceratotheca sesemoides	33±0.007	N.D	1.20±0.0098	36±0.02	8.46±0.0007	1.50±0.0134	2.00±0.009
Corchurus olitoriu	0.15±0.012	N.D	1.33±0.0007	1.60±0.007	10.53±0.0007	0.23±0.0053	8.00±0014
Allium cepa	0.40±0.0014	N.D	1.33±0.0007	23.67±0.0028	4.13±0.0014	16.00±0.007	38.00±0.014
Balanites aegyptiaca	0.30±0.0028	N.D	1.37±0.0014	23.67±0.028	4.06±0.0021	1.70±0.008	47.67±00014
Phaseolus vulgaris	3.40±0.003	N.D	1.30±0.0028	23.67±0.028	4.06±0.0014	1.46±0.015	47.33±0.0014
Abelmoscus esculentus	3.50±0.0007	N.D	1.33±0.0007	1.50±0.014	8.46±0.0007	1.03±0.039	46.00±0.0028
Cassia tora	32.60±0.0035	8.00±0.035	1.33±0.007	1.33±0.021	4.33±0.0018	1.73±0.002	47.33±0.0014
Adansonia digitata	0.03±0.0007	N.D	1.37±0.0014	1.33±0.021	0.06±0.039	N.D	47.67±0.0007
Gynandropsis gynandra	31.00±0.013	0.31±0.014	1.30±0.0028	1.50±0.014	0.3±0.011	12.66±0.814	81.00±0.182
FAO/WHO mg/kg	3-20	10-18	0.30 – 1.30	20 – 58	24 – 60	0.2 – 1.0	30 – 140

ND – Not Detected values are the standard deviation of triplicate analysis.

The mineral compositions are shown in Table 3. The results of the analysis indicated the presence of Zinc, Iron, Copper, Calcium, Sodium Magnesium and Manganese. In all the mineral content analyzed the result showed the level of Zinc is high in *Ceratotheca sesemoides* (33±0.0007mg/kg) and *Adansonia digitata* (0.03±0.0007) recorded the least value. There are no significant differences in the values of copper, calcium and manganese of all the vegetable samples. While the values of sodium and magnesium falls within the World Health Organizational Standard (3 – 20mg/kg). However, the result showed the absence of Iron in all the studied vegetables except in *Gynanadropsis gynandra (*0.31±0.014mg/kg) and *cassia tora (*8.00±0.0035mg/kg) which had low values, as compared to the World Health Organizational Standard (10 – 18mg/kg). The low values of iron recorded in these vegetables shows they are not rich in iron.

The studied vegetables samples are very good sources of sodium, ranging 81.00±0.182mg/kg in Gynandrapsis gynandra

and 38.00±0.0014mg/kg in Allium cepa satisfying the dietary requirement of sodium, (30 – 140mg/kg) [13].

Table 4: Vitamin A and C Content

Samples	Vitamin A mg/100g	Vitamin C mg/100g
Ceratotheca Sesemoides	28.60	23.10
Corchurus Olitorius	28.20	19.70
Allium Cepa	19.30	20.00
Balanites aegytiaca	17.60	14.20
Phaseolus Vulgaris	18.70	20.01
Abelmoscus esculentus	14.20	15.60
Cassia Tora	27.20	21.60
Adansonia Digitata	16.20	18.70
Gynandropsis Gynandra	16.80	17.90s

The result for Vitamin A and Vitamin C is presented in Table 4. The results for vitamin A revealed that *Ceratotheca sesemoides* has the highest content 28.60mg/kg and 14.20mg/kg in *Abelmoscus esculentus* respectively.
The result for vitamin C ranged from 14.20 - 32.10 in *Balanites Aegypitiaca* and *Ceratotheca sesemoides* respectively. From the results, *Ceratotheca sesemoides* is reported to be richer in both vitamin A and C than the other vegetable samples.

IV. Conclusion

Vegetables are very important part of our diets. The data obtained from the analysis shows that these vegetables contain appreciable amount of protein, fat, fibre, carbohydrate, calorific value and sufficient amount of essential mineral elements needed for normal body function, maintenance of the body and reproduction. It can be concluded that these vegetables can contribute significantly to the diet of man as it should be used as a source of nutrients to supplement other major sources of nutrients. Advisable these vegetables should be consumed by both children and adults for a healthier living.

References

1. Ball, G.F.M (2006). Vitamin in Food Analysis, Bioavailability and Stability CRC Taylor and Francis, Bocaraton.
2. Whitney E.N Hamilton, E.M.N and Rolfes, S.R (1990). Understanding Nutrition (5th edition), West Publishing Company, St. Paul, USA Pg. 543.
3. Gropper, S.S, Smith, J.I and Groff, J.I (2005). The Antioxidant Nutrients, Reactive Oxygen Species and Disease in Advance Metabolism 4th Edition. Thompson Wards Worth Belmont, pg.368-377
4. Fasuyi, O.A (2006). Nutritional potentials of some tropical vegetable leaf meals: chemical Characterization and functional properties. African Journal Biotechnology. Pp 49-53.
5. Whitney, E.N, Hamilton, G, Cataldo, C.B and Rolfes S.R (2002). Antioxidant Nutrients and Phytochemicals in Disease Prevention, Understanding normal and Clinical Nutrition, (6th edition). Thompson Wadsworth, Belmont. Pp. 377-385.
6. Kirtan, T and Vaishali, A (2005). Antioxidant and Micronutrient Quality of Fruit and Root Vegetables from the Indian Subcontinent and their Comparative Performance with Green Leafy Vegetables and Fruits. J. Sci. Food Agric. 85:1469–1476.
7. www.googles search.com.
Thoyandon, south Africa. The Environmental soil and vegetation along major and minor road in Metropolitan city of Kaduna Nigeria Afr. J. Biotechno.6 (14)
9. Okunola O J, Uzam A, Ndukwe G I and Adewusi S G (2008). Assessment of Cd and Zn in Roadside Surface Soils and Vegetations along some Roads of Kaduna Metropolis, Nigeria. In: Research Journ. Of Environ. Science 2(4): 266-274.
10. Association of Official Analytical Chemistist (AOAC) (2000). (1st ed.), Washington D.C, 1: 600-792.
11. Ifon, E.T and Basir O, (1998). Nutritive value of some Nigerian Leafy Vegetables Part 3.
12. WHO/FAO, Dietary recommendations/Nutritional Requirement www.WHO.INT/../indexlitml