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Proximate Composition and Vitamin Levels of Seven Medicinal Plants

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ABSTRACT: *The curative effects of some plants for curing various human diseases could be as a result of the presence of bioactive constituents in them. The proximate composition and vitamin level of dried leaves of Bambusa vulgaris, Euphorbia hirta, Lawsonia inarmic, Mimosa pudica, Bidens pilosa, Croton zambesicus and Persia americana used in the management and treatment of various human diseases were studied. Mimosa pudica and Euphorbia hirta had the highest moisture content (9.70%), Bidens pilosa was found to be more proteinous than the others (13.8%), Mimosa pudica and Lawsonia inarmic had the highest fat level (1.40%), Bambusa vulgaris had the highest percentage ash (3.10%); all the plants had high carbohydrate value with Persia americana having the highest value. Ascorbic acid was found to be very high in Bambusa vulgaris (26.1%), Persia americana showed thiamin level of 0.70 mg/100g, riboflavin was very high in Croton zambesicus (1.50mg/100g). Pearson correlation revealed significant correlation. These antioxidants property of plants can help prevent damage that is associated with cancer, heart disease and other related human diseases. In rural areas where access to modern health facilities is limited by the level of development, plants/herbs remain the main stay of the health care system.*

Keywords: *Correlation, diseases, plants, proximate analysis, vitamins.*

I. INTRODUCTION

The contribution of different species of plant parts to health status of human cannot be over emphasized. Various plants in Nigeria have served as source of vitamins, protein, fat and carbohydrates. They become important when their functions are considered in human body [1]. The absence of some vitamins in the body can lead to primary and secondary deficiency diseases. Most of these plants are used to cure some diseases [2]. The ability of these plants to cure human and animal diseases is as a result of the ethnopharmacological activities carried out by these plant-containing bioactive constituents.

So many medicinal plants have been used by traditional medicine practitioners in Nigeria for the treatment of different diseases. Among the various evidence revealing that medicinal and culinary herbs have some endemic species, a diet rich in fruits and vegetables and phytochemical which decrease the risk of cardiovascular diseases and some forms of cancer are of particular interest [3].

Many of these plants are underutilized. Bioactive chemical compounds found naturally in plants work with nutrients and dietary fibre to protect against diseases [4, 5].

Some sources state that sixteen chemical elements are required to support human biochemical processes by serving, structural and functional role as well as electrolyte. Most dietary elements are of relatively low atomic weight. Vitamins are organic substances necessary for metabolism. Deficiency of vitamins can cause serious human health diseases and sometimes, small concentrations are required for maintenance of good human health [6].

Some medicinal plants in Nigeria such as *Bambusa vulgaris (Poaceae), Euphorbia hirta (Euphorbiaceae), Lawsonia inarmic (Lyhracene), Mimosa pudica (Fabaceae), Bidens pilosa (Asteraceae), Croton zambesicus (Euphorbiaceae) and Persia americana (Lauraceae)* are underutilized for effective treatments of serious human ailments. This research looks into the quantitative determination of the proximate composition and vitamin levels of these plants that makes them usable for curing some diseases.

II. MATERIALS AND METHODS

2.1 Sampling

Samples of seven different medicinal plants such *Bambusa vulgaris (Poaceae), Euphorbia hirta (Euphorbiaceae), Lawsonia inarmic (Lyhracene), Mimosa pudica (Fabaceae), Bidens pilosa (Asteraceae),*

Croton zambesicus (Euphorbiaceae) and Persia americana (Lauraceae) were collected from an uncultivated farmland at Iddo-Osun in Osun State, Southwestern Nigeria. The samples were identified at the Forestry Research Institute of Nigeria in Ibadan. Three plant samples were collected randomly for each species at three different spots and mixed to form composite samples, kept in a labeled polythene bag and taken to the laboratory. It was air dried, crushed into powdered form and kept for chemical analysis.

2.2 Determination of proximate analysis:

Proximate analyses were carried out according to the procedure of [7]. This constitutes the class of food present in samples such as carbohydrate, protein, fat, fiber, ash content and moisture content. Briefly, ash content was determined by dry ashing method *i.e.*, placing the sample in furnace. Fats were extracted from powdered samples in soxhlet extractor. The extract obtained was left overnight drying at 80 °C and contents of fat were determined gravimetrically. Fiber content was determined by titrimetric method of analysis. Kjeldhal apparatus was used for the estimation of nitrogen content and protein content was calculated as $N \times 6.25$.

2.3 Determination of mineral composition:

The plant samples were dry ashed at 550°C.The ash was boiled with 10mL of 20% hydrochloric acid in a beaker and then filtered into a 100mL standard flask . It was made up to the mark with deionised water. The minerals were determined from the resulting solution using Atomic Absorption Spectroscopy.

III. RESULTS AND DISCUSSION

The results obtained are as shown in Tables 1and 2.

Table 1. Proximate analysis of selected medicinal plants (%)

Plant type	Moisture content	Protein	Fat	Ash	Crude fibre	Carbohydrate
B. vulgaris	**9.20**	**13.5±0.15**	**1.13±0.06**	**3.13±0.06**	**3.57±0.06**	**69.5±0.20**
E. hirta	**9.70**	**12.0±0.06**	**0.83±0.15**	**3.00**	**2.37**	**72.1±0.15**
L. inarmic	**9.17±0.12**	**10.2±0.06**	**1.40**	**3.43±0.06**	**2.63±0.58**	**73.1±0.17**
M. pudica	**9.67±0.15**	**8.37±0.15**	**1.43±0.01**	**3.57±0.06**	**3.30**	**73.7**
B. pilosa	**9.60**	**13.8**	**1.03±0.06**	**2.47±0.12**	**3.27±0.06**	**69.8±0.21**
C. zambesicus	**8.87±0.06**	**11.2±0.15**	**0.90**	**2.67±0.06**	**3.13±0.06**	**73.2±0.15**
P. americana	**9.07±0.06**	**9.83±0.06**	**1.27±0.06**	**2.90**	**2.87±0.06**	**74.2±0.37**

Table 2. Vitamin contents of selected medicinal plants (mg/100g)

Plant type	Ascorbic acid	Thiamin	Riboflavin	Niacin
B. vulgaris	**26.1±0.31**	**0.60**	**1.20**	**0.70**
E. hirta	**9.13±0.06**	**0.20**	**0.80**	**0.40**
L. inarmic	**18.3±0.29**	**0.50**	**0.97**	**0.30**
M. pudica	**13.5**	**0.60**	**1.10**	**0.40**
B. pilosa	**16.0**	**0.30**	**1.10**	**0.30**
C. zambesicus	**14.3**	**0.40**	**1.50**	**0.30**
P. americana	**22.1±0.02**	**0.70**	**0.90**	**0.50**

Table 1 illustrates, the proximate analysis results of all the plants investigated with *E. hirta* having highest moisture content (9.70%), *B. pilosa* highest protein content (13.8%), *M. pudica* highest ash content (3.57%), *B. vulgaris* with highest crude fibre (3.57%) and *P.americana* with highest carbohydrate level (74.2%). Table 2 explains the level of vitamin C and B. vitamins in these plants with *B. vulgaris* having the highest vitamin C (26.1 mg/100g) and highest niacin level (0.70 mg/100g), *P. americana* with highest thiamin content (0.70 mg/100g), *C. zambesicus* with highest riboflavin level (1.50 mg/100g).

IV. DISCUSSION

The quantitative estimation of the percentage yields of chemical constituents of the plants studied showed that they are rich in protein with *B.pilosa* having the highest protein content. *M. pudica* had the lowest protein level in all the plants investigated and could be administered to patients that does not need much protein. *M. pudica* showed a high fat level out of the plants studied and explains why it may not be useful for those having high fat content already. Epidemological evidences have shown that consumption of reasonable amount of dietary fibre (20 – 35g/day) lower risk of a number of chronic diet related diseases such as diverticular disease, coronary heart disease, obesity, type 2 diabetes mellitus, irritable bowel syndrome, etc., [8]. *E. hirta* and *C. zambesicus* are best prescribed for diabetic patients because of their low fat level. *L inarmic,*

M. pudica and *B. vulgaris* had high ash content and makes them suitable as source of minerals and agrees with the findings of [9]. *B. vulgaris* had the highest crude fibre with *E.hirta* having the lowest crude fibre among the plants investigated. *P. americana* had the highest carbohydrate content and *B. vulgaris* with the lowest carbohydrate this makes the its extract of this plant good energy source.

The vitamin C and B- vitamins in the plants studied are as shown in Table 2. Human diet does not always contain the required amount of vitamin for normal growth and as such cannot produce enough quantity for their body metabolism. Vitamin C content of these plants revealed very high level in *B. vulgaris* and lowest in *E. hirta*. Vitamin C is responsible for the prevention of scurvy and explains why the stem of *B. vulgaris* is sometimes used to cure tooth problems. The ascorbates have anti-oxidant ability to prevent the formation of carcinogenic substances. Carcinogenic compounds such as in nitroso compounds are formed from oxidation of nitrate which is oxidized to nitrite and the nitrites react with certain amino compounds to form nitroso compounds. Ascorbate can therefore prevent the oxidation of nitrate [10]. The level of vitamin C in these plants was higher than what was obtained by [11] but comparable to result for *E. ravens* and *C. lanatus* in that study. Thiamin (B_1) co-enzymes functions in the metabolism of carbohydrates and branched chain amino acids. Thiamin deficiency causes beri-beri, polyneuritis. Beri-beri occurs in adults with high carbohydrate. Table 1 revealed low thiamin when carbohydrate was very high in *P. americana*. This explains why *B. vulgaris* and *B. pilosa* can be used in curring beri-beri. Riboflavin is a coenzyme in numerous redox reactions. Results in Table 2 showed riboflavin to be very high in *C. zambesicus* and explains the health implication of taking the extract made from *C. zambesicus* which can help reduce deficiency as a result of growth, chelosis, angular stomatis and dermatitis. All the plants actually showed appreciable amount of riboflavin but higher than what was obtained by [11] but some values lower to what was obtained by [9]. Niacin is a co-enzyme or co substrate in many biological reduction and oxidation reactions thus required for energy metabolism. It showed highest level in *B. vulgaris* and explains why the plant is useful for curing pellagra with diarrhea, dermatitis and dementia. The lowest niacin level was obtained in *C. zambesicus, L. inarmic* and *B. pilosa* which agreed with findings by [9, 11].

These antioxidant properties of plants help prevent damage that is associated with cancer, heart disease and other related human diseases.

The medicinal values of plants and vegetables are dictated by their chemical constituents.

V. STATISTICAL ANALYSIS

Pearson correlation analysis using STATISTICA 7.0 revealed the association between the pairs as shown in Table 3.

Table 3: Pearson correlation between pairs for the plant samples

Correlation for proximate analysis (r)	Correlation for vitamins (r)
L.inarmic $_{\text{moisture}}$***/P.americana*** $_{\text{moisture}}$ **(+0.50)**	**B.*vulgaris*** $_{\text{ascorbic}}$**/ *L.inarmic*** $_{\text{ascorbic}}$ **(+0.95)**
P.americana $_{\text{moisture}}$***/P.americana*** $_{\text{protein}}$ **(+ 0.95)**	***B. vulgaris*** $_{\text{ascorbic}}$**/ *L. inarmic*** $_{\text{riboflavin}}$**(+0.95)**
P.americana $_{moisture}$**/ *P.americana*** $_{fat}$ **(+1.00)**	***P. americana*** $_{\text{ascorbic}}$**/ *B.pilosa*** $_{\text{ascorbic}}$ **(+0.50)**
M.pudica $_{\text{moisture}}$**/ *L. inarmic*** $_{\text{moisture}}$ **(+0.76)**	***P. americana*** $_{\text{ascorbic}}$***/L. inarmic*** $_{\text{riboflavin}}$ **(+0.76)**
E. hirta $_{\text{fat}}$***/M. pudica*** $_{\text{moisture}}$ **(+0.93)**	***L. inarmic*** $_{\text{ascorbic}}$**/ *P. americana*** $_{\text{ascorbic}}$ **(+0.76)**
M. pudica $_{\text{ash}}$***/M. pudica*** $_{\text{moisture}}$ **(+0.95)**	
C. zambesicus $_{\text{protein}}$***/P.americana*** $_{\text{ash}}$ **(+0.98)**	
B. vulgaris $_{\text{fat}}$***/P. americana*** $_{\text{ash}}$ **(+0.87)**	

Pearson correlation as shown in Table 3 revealed significant correlations in proximate analysis between *P. americana* $_{\text{moisture}}$/*P.americana* $_{\text{fat}}$ (r = +1.00) and *C. zambesicus* $_{\text{protein}}$/*P.americana* $_{\text{ash}}$ (+0.98). Highest correlation for vitamins reveals B.*vulgaris* $_{\text{ascorbic}}$/ *L.inarmic* $_{\text{ascorbic}}$ (r = +0.95) and *B. vulgaris* $_{\text{ascorbic}}$/ *L. inarmic* $_{\text{riboflavin}}$(r = +0.95).

VI. CONCLUSION

This study showed that the studied medicinal plants contained high carbohydrate, high protein and low moisture content. It contains high ascorbic acid for protection against scurvy and other ascorbic acid deficiency related ailments. This work has shown that all the plants have medicinal values for the management of certain health conditions.

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