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Comparative chemical compositions of the leaves of some selected antihypertensive medicinal plants in Nigeria

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Abstract

Leaves of Four different types of antihypertensive medicinal plants: Vernonia amygdalina, Carica papaya, Persea americana and Cnidosculous aconitifolius use in Nigeria were analysed for proximate composition, mineral profile, phytochemical screening and amino acids. The results from the study revealed that the leaves of all the plants are good sources of proteins, fibre, minerals and amino acids. However, the fat contents of the plants were very low and there were presence of some phytochemicals which accounts for their therapeutic uses. It can concluded that that the leaves of these plants contain nutrients and mineral elements that may be useful in nutrition with Persea americana and Vernonia amygdalina having nutritional superiority over Carica papaya and Cnidosculous aconitifolius.

Key words: proximate, nutrients, antihypertensive, phytochemicals, therapeutic.

INTRODUCTION

Hypertension, otherwise known as High Blood Pressure is a widely prevalent health problem in the developing countries and the most common of cardiovascular diseases which is the leading cause of morbidity and mortality in the world [1]. To overcome this alarming problem, researchers are veering round to folk medicine looking for new leads to develop better drugs against High Blood Pressure.

Over 90% of Nigerians in rural areas and 40% in the urban areas depend partly or wholly on traditional medicine for health care [2]. Therefore, the evaluation of the chemical compositions of these medicinal plants is a matter of importance. Thus the objective of this study is to assess the chemical compositions of different types of plants: *Vernonia amygdalina*, *Carica papaya*, *Persea americana* and *Cnidosculous aconitifolius* use in Nigeria for the treatment of hypertension.

RESULTS AND DISCUSSION

Table 1: Proximate composition (%) of plants studied

Plant	Moisture content	Total Carbohydrate content	Fat content	Proteins content	Fibre content	Ash content
Vernonia amygdalina	3.00 ± 1.22	17.73 ± 2.00	5.37 ± 1.80	22.99 ± 5.18	28.41 ± 3.11	22.50 ± 3.49
Carica papaya	5.61 ± 1.92	15.69 ± 2.80	6.35 ± 2.39	28.48 ± 5.91	27.00 ± 9.50	16.87 ± 3.90
Cnidosculous aconitifolius	5.81 ± 2.11	32.70 ± 8.90	12.41 ± 2.88	32.90 ± 5.00	9.48 ± 3.21	12.51 ± 4.11
Persea americana	5.00 ± 2.00	13.87 ± 6.38	4.30 ± 1.95	26.38 ± 5.22	40.11 ± 5.52	20±.34 3.44

Table 2: Mineral compositions (Mg/100g) of the leaves of Plants studied

Minerals	*Vernonia amygdalina*	*Carica papaya*	*Cnidosculous aconitifolius*	*Persea americana*
Na	89.43 ± 10.22	93.23 ± 10.11	90.50 ± 10.33	75.35 ± 10.39
Ca	58.43 ± 5.33	180.72± 21.00	178.00 ± 20.44	15.89± 3.11
Mg	70.22 ± 12.11	44.82 ± 13.48	68.22 ± 12.34	80.45± 5.29
Zn	9.08 ± 2.50	2.05 ± 1.31	2.93 ± 1.03	0.95 ± 0.05
Fe	10.86 ± 1.59	2.89± 0.89	10.12 ± 2.10	9.30 ± 4.88
Mn	6.66± 2.09	0.48± 0.07	1.32 ± 0.19	0.74± 0.03
Cu	7.80 ± 1.99	0.56 0.01	ND	10.50 3.21
Pb	ND	ND	ND	ND
Cd	ND	ND	ND	ND
K	168.30 ± 5.11	209.33 ± 21.65	280.35 ± 40.22	480.32 ± 24.99
P	58.30 ± 3.55	130.50 ± 16.88	40.28 ± 8.99	160.41± 34.54

Table 3: Amino acids compositions of the leaves of plants studied

Amino acids	*Vernonia amygdalina*	*Carica papaya*	*Cnidosculous aconitifolius*	*Persea americana*
Alanine	10.51 ± 3.45	7.67 ± 2.88	9.22 ± 3.33	12.00 ± 5.98
Arginine	11.51 ± 1.87	8.66 ± 2.01	8.65 ± 3.78	13.53 ± 6.71
Methionine	12.95 ± 4.07	8.98 ± 2.76	7.77 ± 3.29	13.70 ± 3.44
Cystine	1.50 ± 0.80	2.98 ± 0.67	3.45 ± 0.87	3.90 ± 1.11
Isoleucine	11.96 ± 1.10	7.54 ± 2.12	8.54 ± 3.75	12.55 ± 4.98
Glycine	9.12 ± 1.50	4.44 ± 1.09	6.76 ± 2.11	11.11 ± 3.94
Leucine	10.57 ± 0.99	8.34 ± 3.52	7.23 ± 2.65	12.66 ± 6.23
Lysine	8.21 ± 1.41	6.21 ± 1.89	7.65 ± 1.98	10.65 ± 3.00
Serine	3.00 ± 1.11	1.98 ± 0.06	3.10 ± 0.84	2.99 ± 0.70
Threonine	14.00 ± 0.91	9.65 ± 2.86	10.34 ± 4.97	15.43 ± 5.78
Phenylalainine	17.21 ± 2.33	11.34 ± 4.65	12.78 ± 5.84	17.89 ± 5.34
Tryptophan	10.92 ± 0.07	8.88 ± 2.74	11.44 ± 3.21	10.87 ± 4.23
Tyrosine	2.91 ± 0.59	2.77 ± 0.54	2.45 ± 0.67	1.90± 0.09
Histidine	9.99 ± 1.70	8.64 ± 2.76	9.87 ± 3.90	11.98 ± 4.88
Asparagine	15.11 ± 3.50	11.90 ± 5.98	12.22 ± 5.33	16.00 ± 6.90
Valine	12.87 ± 4.76	10.55 ± 3.87	11.56 ± 3.90	12.78 ± 3.53
Glutamine	12.21 ± 3.81	9.73 ± 2.60	9.76 ± 4.77	13.01 ± 6.54

Table 4: Phytochemical screening of the leaves of the plants studied

Phytochemicals	*Vernonia amygdalina*	*Carica papaya*	*Cnidosculous aconitifolius*	*Persea americana*
Saponins	+++	++	+++	++
Tannins	+	+	+	+
Flavonoids	+	+	++	++
Glycosides	ND	ND	ND	ND
Alkaloids	++	++	+++	+++
Phenolics	++	+	++	+++
Anthraquinones	++	+	++	+++
Triterpenes	++	+	+	++
Steroids	ND	ND	ND	ND
Phlobatannins	++	+	+	++
Cardenolides	ND	ND	ND	ND

Table 1 presented proximate composition of the leaves of the plants: *Vernonia mygdalina, Carica papaya, Persea americana* and *Cnidosculous aconitifolius.*

The lower moisture contents in all the samples investigated suggests that the plants can be stored for a long period without spoilage. A low level of moisture content has been reported to inhibit microbial action thereby preventing spoilage [7]. Quantitative analysis of protein in the plants studied varies from 22.99 ± 5.22% to 32.90 ± 5.00% with *Cnidosculous aconitifolius* having the highest protein content followed by *Carica papaya, Persea americana* and *Vernonia amygdalina*. Similar results has been reported [8]. This indicates that the leaves of these plants are not negligible sources of protein. The high ash contents that were observed in the leaves of the plants is an indication that the plants are good sources of minerals suggesting that mineral elements have been deposited in the leaves of the plants [9]. The highest ash contents for *Vernonia amygdalina* and *Persea americana* (22.50 ± 3.49% and 20.34 ± 3.44%) suggests that *Vernonia amygdalina* and *Persea Americana* contain more minerals than *Carica papaya* and *Cnidosculous aconitifolius.*

The plants have high levels of dietary fibre except for *Cnidosculous aconitifolius*(9.48 ± 3.21). The fibre content was greatest for *Persea americana* followed by *Vernonia amygdalina* and then *Carica papaya.* This was in agreement with [10] who reported that leafy vegetables are important sources of dietary fibre. These plants most especially *Persea americana* and *Vernonia amygdalina* might be useful in the regulation of intestinal transit. Dietary fibres are known to increase dietary bulk and faeces consistency due to their ability to absorb water [11] and therefore might decrease the risk of colon cancer [12].

The lowest fat content was recorded for *Persea americana* followed closely by *Vernonia amygdalina, Carica papaya* and *Cnidosculous aconitifolius.* This conforms with the reports of [13]. Total carbohydrate levels in these plants were relatively high suggesting that they can be ranked as carbohydrate rich leaves.

The amino acids compositions of the leaves of the plants were presented in Table 3. All the plants are rich in essential amino acids compared with FAO/WHO reference pattern [14]. However, *Persea americana* has the highest amount of amino acids followed by *Vernonia amygdalina*. High amino acids content has been reported for *Vernonia amygdalina* [5].

The phytochemical screening of the plants extracts revealed that alkaloids, flavonoids tannins, phlobatannins, anthraquinone, , saponins, phenolics and triterpenes are strongly present in all the

plants (Table 4). The presence of phytochemicals in plants has been reported [8, 15, 16]. The presence of phytochemicals which which are potent bioactive compounds in the leaves of *Vernonia amygdalina, Carica papaya, Persea americana* and *Cnidosculous aconitifolius* may accounts for the medicinal action of the leaves of the plants in the management of various ailments. It also accounts for the bitter taste of the leaves of the plants most importantly *Vernonia amygdalina* [16].

Table 2 presents the mineral composition of *Vernonia amygdalina, Carica papaya, Persea americana* and *Cnidosculous aconitifolius*. Results obtained from the present study indicate that the leaves of these plants are very rich in minerals as evident in the ash content. This is in conformity with earlier reports [17, 18]. The lower sodium content for the leaves of the plants most importantly *Persea americana* and *Vernonia amygdalina* have nutritional implication on the control of hypertension. Potassium is the most abundant mineral in all the plants with the highest value in *Persea americana* (480.32 ± 24.99mg/100g). The use of the leaves of these plants in the treatment of hypertension may be attributed to their high potassium and low sodium contents. Potassium has been shown to be an important mineral nutrient in the management of hypertension [19].

MATERIALS AND METHODS

Plant materials

The plants: *Vernonia amygdalina, Carica papaya, Persea americana* and *Cnidosculous aconitifolius* were purchased from a market in Akure, Ondo State, Nigeria. The plants were identified and authenticated by a Botanist in Plant Science Department, University of Ado-Ekiti, Nigeria. The leaves of the plants were washed under running water, air dried and ground into a powdery fine texture.

Proximate analysis

The moisture, ash, protein, crude fibre and totalcarbohydrate contents were determined according to the method described by [3].

Mineral analysis

The levels of sodium, potassium, calcium, manganese, zinc, iron, magnesium, phosphorous, copper, lead, and cadmium were estimated using Atomic Absorption Spectrophotometer [4].

Amino acids analysis

Determination of amino acids was done using the method described by [5].

Phytochemical screening

The phytochemical screening for the presence of alkaloids, flavonoids tannins, phlobatannins, anthraquinone, glycosides, saponins, phenolics, triterpenes, steroids and cardenolides were carried out by the method of [6].

CONCLUSION

The results from this study showed that the leaves of *Vernonia amygdalina, Carica papaya, Persea americana* and *Cnidosculous aconitifolius* are good sources of proteins, dietary fibre and amino acids most importantly essential amino acids while they are not potential sources of fat. They also have substantial amount of minerals like potassium, calcium, iron, magnesium, phosphorous and copper with values particularly higher in most cases in *Persea americana*. In

comparison, the average nutritive values of *Persea americana* and *Vernonia amygdalina* are found to be superior to those of *Carica* papaya and Cnidosculous *aconitifolius*. The leaves also contain some antinutrients. In spite of these interesting findings, efforts should be made to quantify the antinutrients in the leaves of these plants so as to actually determine their safety consumption as medicinal plants.

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