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PHYTOCHEMICAL AND NUTRITIONAL COMPOSITION OF PIPER METHYSTICUM LEAEVES

***Uzomba N. I., Ajah Obinna and Amaralam E.C.**

Department of Microbiology/Biochemistry, Federal Polytechnic Nekede, Owerri Nigeria.

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***Corresponding Author**
Uzomba N. I.
Department of Microbiology/ Biochemistry, Federal Polytechnic Nekede, Owerri Nigeria.

ABSTRACT

This study was designed to determine the proximate, phytochemical and mineral values of *piper methysticum* grown in Enugu state. Standard methods of analysis were used. The result of the proximate composition showed the following: moisture (36.80%), protein (0.03%), crude ash (30.05%), crude fibre (28.60%), crude fat (3.35%) and crude carbohydrate (1.27%). The result of the phytochemical screening (qualitative) revealed the presence of terpenoid, flavonoid, tannin, cardiac glycoside and alkaloid, with the exception of saponin. The mineral content were phosphorus (0.541%), potassium (2.755%), sodium (0.103%), magnesium (0.486%), calcium (1.455%), Iron (58.375mg/100g), Zinc (10.025mg/100g). The findings in this study indicate that *piper methysticum* could serve as a source of nutrients for human consumption.

KEYWORDS: Phytochemicals, Nutritional Composition, *Piper methysticum.*

INTRODUCTION

Vegetables are generally succulent parts of plants grown in gardens and consumed as a side dish with starchy staples. Green leafy vegetables constitute an indispensable constituent of human diet in Africa generally and West Africa in particular. In addition, green leafy vegetables are used in the diets of post partum women during which time it is claimed that they aid the contraction of the uterus (Adepoju *et al.,* 2006).

Piper methysticum (Awa) also known as kava is a green leafy vegetable that belongs to the Piperaceae family, but it can also be regarded as an herb (Sarris *et al.,* 2011).

An herb is a plant that is valued for flavor, scent, medicinal or other qualities other than

its food value. They are used in cooking, as medicines and for spiritual purposes. Herbs are generally recognized as "safe" by the Food & Drug Administration (FDA), at least at concentrations commonly found in foods (Kaefer *et al*, 2008). Medicinal plants continue to provide valuable therapeutic agents, both in modern and traditional system.

Today, the two most effective and widely accepted drugs for the treatment of malaria today emerged through the herbal traditional medicine viz: Quinine from the bark of the Peruvian cinchona tree and artemisinin from the Chinese antipyretic Artemisia annua L. hence, throughout history, the medicinal benefits of herbs are quoted.

Phytochemicals from plant species are of current interest due to their potential effects on different ailments (Omodamiro and Obinna, 2017). However, many herbs and their bioactive components are being investigated for potential disease prevention and treatment at concentrations which may exceed those commonly used in food preparation herbs (Milner et al, 2008). It is therefore imperative to evaluate the phytochemical and nutritional composition of *Piper methystcum* leaves.

MATERIALS AND METHODS

Collection and identification of plant materials

The leaves of *Piper methysticum* were collected from a local far mland in Afor Garriki, Enugu State, Nigeria. The plant was identified and authenticated by Mr. Duru at the Department of Evironmental Biology, Federal Polytechnic Nekede, Nigeria. The leaves were air dried for 4 days and pulverized into fine powder using an electric blender. Two hundred grams (200g) of the powdered sample was used for the phytochemical, proximate and mineral analysis.

Phytochemical screening

The qualitative screening of phytochemical constituents of the *Piper methysticum* leaves was carried out using the method of Parekh and Chanda (2009), phenolics, saponins, alkaloids, flavonoids and tannins, terpenoid and cardiac glycoside were screened.

Proximate analysis

The proximate analysis of the dried leaves was carried out using a modified method of Antia et al. (2006). The crude fat was determined by exhaustive extraction of 5 g of the powdered leaves with 100 ml of diethyl ether twice. The solvent was removed from the sample by

filtration and the residue was taken as the lipid free sample. The ash content was determined by the incineration of 5 g of the sample in a muffle furnace (Naber Industrieofenbau, Bremen, Germany) at 550°C for 12 h. Determination of crude fiber involved the digestion of the sample with 100 ml of 1.25% (v/v) sulphuric acid and 100 ml of 1.25% (w/v) sodium hydroxide. This was followed by incineration in muffle furnace. The fiber content was calculated from the loss of weight on ignition. The digestion of the sample for the determination of protein content was done using the micro Kjeldahl method of AOAC (1990). The total nitrogen content in the leaves was determined according to the colorimetric method described by Okalebo et al. (2002). The value of nitrogen was multiplied by a conversion factor (6.25) to give the amount of protein present in the leaves. The carbohydrate content was calculated by subtracting the sum of the ash, fiber, fat and protein from 100. The values for all parameters were reported in g/kg of the whole sample. Each experiment was triplicate determination.

Mineral analysis

A method described by Aluko *et al*., (2012) was used. The powdered *Piper methysticum* leaves (0.5 g) was digested in a reaction mixture of 9 ml of 55% (v/v) nitric acid and 3 ml of 32% (v/v) hydrochloric acid for 60 min in a microwave digester. The mixture was allowed to cool and was made up to 50 ml with distilled water in a volumetric flask. The digested sample was analyzed for macro and micro elements using the Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-OES, Varian 710 –ES series). The instrument was set at the following working conditions: power 1.00 KW, plasma flow 15.0 L/min, auxiliary flow 1.50 L/min, nebulizer flow 200 KPa, sample uptake delay 30 s, rinse rate 10 s, pump rate 15 rpm, replicate read time 5.00 s, instrument stabilizing delay 15 s. The phosphorus content was analyzed on the flow analyzer. The experiment was done in triplicates.

RESULTS AND DISCUSSION

Table 1: Proximate composition of Piper methysicum leave.

Nutrients	Composition (%)
Carbohydrate	1.27±0.01
Crude fat	3.35±0.09
Crude protein	0.03±0.0001
Crude fibre	28.60±0.06
Crude ash	30.05±0.20
Moisture content	36.80±0.50

Values are mean±SD of triplicate determination

Table 2: Proximate composition of Piper methysicum leave.

Minerals	*Composition (%)*
Iron	***58.375±0.9(mg/100g)***
Zinc	***10.025±0.2(mg/100g)***
Sodium	***0.103±0.01***
Potassium	***2.755±0.05***
Phosphorus	***0.541±0.01***
Calcium	***1.455±0.01***

Values are mean±SD of triplicate determination

Table 3: Phytochemical screening of Piper methysicum leave.

Compound	*Result*
Terpenoid	+
Flavonoid	+
Cardiac glycoside	++
Tannin	++
Saponin	_
Alkaloid	+

The proximate composition of *Piper methysticum* leaves was shown in table 1. These components are crucial to the assessment of the nutritive qualities of the plant being analyzed.

The moisture content of the sample was the highest (36.80%). The moisture content of plants or its processed products give an indication of its freshness and shelf life and high moisture content subjects food items to increased microbial spoilage, deterioration and short shelf life (Adepoju and Oyewole, 2008).

The protein content was low (0.03%). Protein is an essential component of diet needed for survival of animals and human beings, their basic function in nutrition is to supply adequate amount of required amino acids. Protein deficiency causes growth retardation, muscle wasting, oedema, abnormal swelling of the belly and collection of fluids in the body.

The ash content which is a measure of mineral matter was found to be (30.05%) which is an indicative of high mineral especially the macro mineral which the body needs for normal product of metabolism. Ash contains essential mineral especially mineral components which are necessary for blood and tissue. They are necessary for blood coagulation, treating wounds and stopping bleeding. High ash content also affects the mineral content which the body needs for normal process of metabolism.

Crude fibre measures the cellulose hemicelluloses and lignin content of food. Piper methysticum leaves was not too high in crude fibre (28.60%). High fibre content in diet have been reported to result in increased removal of carcinogens, potential mutagens, steroids, xenobiotics and bile acids by binding or absorbing to dietary fibre components and be rapidly excreted, hence these wastes will have health promoting benefits for the ruminants and non ruminants (Ayoola and Adeyeye, 2010).

Crude fat determines the free fatty lipids of a product. This property can be used as the basis of determining processing temperatures as well as auto oxidation which can lead to rancidity (affect flavor of food).

The carbohydrate content was found to be (1.27%) which is low. Dietary carbohydrates are primary sources of energy to the body. It spares fats and protein in the body.

Table 2 showed the mineral composition of the leaves of piper methysticum. The sample was found to be very high in iron, high in zinc but low in potassium, phosphorus, sodium and calcium.

Zinc (Zn) has an important biological role in enzyme systems; there are over twenty (20) Zn containing enzymes (Harrison and Demora, 1996). The metal plays an important role in biological structure e.g. in B.cells of pancreases where it appears to stabilize insulin structure and in position of choroids region of the eye. Calcium and Phosphorus are very important in the formation of strong bones and teeth, for growth, normal nerves and muscle contraction, blood allotting, heart function and cell metabolism (Roth and Townsend, 2003). Sodium ion (Na^+) is the major cation in extracellular fluid (ECF) where as potassium (K) is the main cation in intracellular fluid (ICF). Iron (Fe) level of piper methysticum was very high (58.375 mg/100g) than the FAO/WHO (1988) recommended dietary allowance for males (1.37 mg/day) and females (2.94 mg/day). Iron has been reported as an essential trace metal and plays numerous biochemical roles in the body, including oxygen binding in hemoglobin and acting as an important catalytic centre in many enzymes. Iron is also required for growth of the tissues and organs and for the expanding red bleed cell mass, thus the use of piper methysticum in diet can furnish the diet with iron sufficient enough to meet the daily requirement for the nutrient.

Table 3 shows the qualitative phytochemical content of piper methysticum leaves with the

presence of terpenoids, flavonoid, cardiac glycoside, tannin and alkaloid and the absence of saponin.

Tannins have been found to have healing effect and the findings show that its presence is high (++) in the sample. Alkaloids are known to have anti-inflammatory, antifungal, anti-hypertensive and antimicrobial effects.

Flavonoids are potent water soluble anti oxidant which prevents oxidative cell damage, suggesting anti-inflammatory properties. The availability of flavonoid in the leaves of piper methysticum inferred that it has the biological functions such as protection against allergies, free radical, platelet aggregation, microbes, ulcers, hepatoxins, viruses and have strong activity and protect against the different levels of carcinogenesis **(**Farguar, 1996; Okwu, 2004).

From clinical studies, it is shown that terpenoids strengthen the skin, increase the concentration of antioxidants in wounds and restores inflamed tissues by increasing blood supply. The terpenoids have also shown to decrease blood sugar levels in animal studies and in the study of *Piper methysticum*, terpenoids was found in minute/trace amount (+).

There was no presence of saponin indicated in the phytochemical study of piper methysticum and saponin is used as a mild detergent and in iotracellular histochemistry staining to allow antibody access to intracellular proteins. In medicine, antioxidant, anticancer, anti-inflammatory and weight loss etc. It is also known to have anti fungal proteins.

The presence of cardiac glycosides in *piper methysticum* leaves was found in a high amount (++) and cardiac glycosides are known to work by inhibiting the Na^{+}/K^{+} pump. This causes an increase in the level of sodium ions in the mycocytes, which then leads to a rise in the level of calcium ions. This inhibition increases the amount of Ca^{2+} ions available for contraction of the heart muscle, which improves cardiac output and reduces distention of the heart; thus, they are used in the treatment of congestive heart failure and cardiac arrhythmia. They are also used to strengthen a weakened heart and allow it to function more efficiently, though the dosage must be controlled carefully since the therapeutic dose is close to the toxic dose.

CONCLUSION

The findings in this study indicate that *Piper methysticum* could serve as a good source of nutrients and mineral for animal nutrition and human metabolism.

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