

CHEMICAL COMPOSITION OF *PERSEA AMERICANA* LEAF, FRUIT AND SEED

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ABSTRACT

The chemical composition of *P. americana* leaf, fruit and seed was investigated. The results obtained showed that the investigated samples contain phytochemicals such as phenols, saponins, and flavonoids in appreciable quantities. Proximate content revealed that the fruit of *P. americana* contains more of fat and energy; seed, more of fat, protein and energy and the leaf, more of protein, fibre, and ash. Mineral contents of the investigated samples followed the order of leaf > fruit > seed in terms of concentration. These chemical compositions of the investigated samples may be behind their medicinal values in phytomedicine.

Keywords: *P. americana*, phytomedicine, chemical composition, mineral elements.

1. INTRODUCTION

The World Health Organisation (WHO) Alma Ata (1978) declaration in primary Health care paved way for the official recognition of traditional medicine as a source of primary healthcare [32]. Since then, healthcare delivery has tremendously improved with the combination of phytomedicine and orthodox medicine in most part of the world, especially in Africa, Asia, Middle East, etc., [4]. Recent research studies [12, 17, 18, 19, 20, 2] have shown that plants are embodiment of important chemicals, which are bioactive in nature and are mostly essential to health. Among such groups of chemicals are carotenoids, flavonoids, vitamins, dietary fibre, minerals, amino acids, prebiotics, phytoestrogens, etc [13, 24]. [16, 17] noted that plants derive their medicinal property from these bioactive chemical compounds. Presently, there is a general assumption that different part of plants contributing to health improvement may contain some of these important chemicals [29].

Persea americana (*Lauraceae*), the plant that bears avocado pear as fruit, is among such plants contributing to health improvement and may contain some of these important chemicals. *P. americana* has been reported to be effective against hepato-toxicity, inflammation, cancer, hypertension, etc [1, 3, 9, 14]. Due to the importance of this plant in traditional medicine, there is need to ascertain the plant chemicals that may be responsible for these health benefits.

The present study investigated the presence of phytochemicals, proximate and mineral composition of *P. americana* leaf, fruit and seed.

2. MATERIALS AND METHODS

Sample collection and preparation: The *P. americana* fruit, and leaves used in the present study were collected from Imo State University school farm, Owerri, Imo State, Nigeria. The Plant materials (Leaf, fruit, and seed) were identified and authenticated by Dr. F. N. Mbagwu of Plant Science and Biotechnology Department, Imo State University, Owerri, Imo State, Nigeria. The identified leaves were separated and fresh ones obtained. The fruits at the onset of ripening were cut open to obtain their edible portion and seeds. The required plant materials (leaf, edible portion of the fruit and seed) were air dried for one week. After air drying, the samples were ground to fine powder using Thomas-Wiley milling machine. The ground samples were stored in airtight bottles till required for analysis.

Phytochemical analysis: Quantitative analysis for the presence of saponins, tannins, flavonoids, cyanogenic glycosides, alkaloids, phenols and steroids were carried out using the methods of [23].

Proximate composition analysis: The methods of [5] were used for proximate composition analysis.

Mineral analysis: Sodium and potassium were determined using flame photometer. Phosphorus was determined by vanado-molybdate yellow method. Calcium and magnesium was carried out using Versanate EDTA complexometric titration method while iron, zinc, copper, lead and cadmium were estimated using a unicam atomic absorption spectrophotometer based on [23].

3. RESULTS AND DISCUSSIONS

Table 1: Phytochemical constituents of *P. americana* leaf, fruit and seed (mg/100g)

Constituents	Leaf	Fruit	Seed
Saponins	1.29±0.08	0.14±0.01	19.21±2.81
Tannins	0.68±0.06	0.12±0.03	0.24±0.12
Flavonoids	8.11±0.14	4.25±0.16	1.90±0.07
Cyanogenic glycosides	ND	ND	0.06±0.02
Alkaloids	0.51± 0.21	0.14±0.00	0.72±0.12
Phenols	3.41± 0.64	2.94±0.13	6.14±1.28
Steroids	1.21±0.14	1.88±0.19	0.09±0.00

Values are means ± standard deviations of triplicate determinations ND= Not Detected.

Phytochemicals are important chemicals found virtually in plants and their different parts and at different concentrations [10]. Table 1 above shows the presence of saponins in *P. americana* leaf, fruit and seed. Some of the general characteristics of saponins include formation of foams in aqueous solution, haemolytic activity, cholesterol binding properties, etc [28]. Saponins were highest in *P. americana* seed while the fruit produced the least. Tannins noted for astringency and bitter taste, hasten the healing of wounds and inflamed mucus membrane [21]. The low content of tannins in *P. americana* leaf and fruit in this study may be responsible for their free astringency and bitter taste. Flavonoids are potent water-soluble super antioxidants and free radical scavengers. They prevent oxidative cell damage, have strong anticancer activity and protect against all stages of carcinogenesis [27]. Flavonoids in intestinal tract lower the risk of heart disease, inflammation and represent the most common and widely distributed groups of plant phenolic compounds. Flavonoids in leaves and fruits of *P. americana* in present study are high and could be behind anti-inflammatory, anti-cancer and anti-hypertensive property of the plant and its parts as earlier reported by [1, 3, 9, 14,]. Alkaloids are important therapeutically significant plant secondary metabolites. Isolated pure form of alkaloids and their synthetic derivatives are used as basic medicinal agents for their analgesic and bactericidal effects [29]. Phenols have been extensively researched as disease preventives [10]. Phenols detected in parts of *P. americana* investigated in this study could further indicate their ability to act as anti-inflammatory, anti-clotting, anti-oxidants, immune enhancers, etc. The knowledge of cyanogenic glycosides is important due to their hydrogen cyanic acid (HCN) poison in the body [23] but should not pose a problem, since the frequently used parts (leaf and fruit) in phytomedicine are free of this toxic compound. For many years now, it has been known that plant steroids are antioxidants *in vitro*, and have link with reproduction in humans [25]. Their values in the investigated samples are appreciable and could add to their medicinal properties.

Table 2: Proximate composition of *Persea americana* leaf, fruit and seed (g/100g)

Parameters	Leaf	Fruit	Seed
Moisture	5.33±0.62	8.12±0.12	9.92±0.01
Fat	4.01±0.16	29.94±1.24	16.54±2.10
Protein	25.54±2.52	1.60±0.09	17.94±1.40
Fibre	38.40±5.12	2.06±0.33	3.10±0.18
Ash	19.38±4.34	4.54±1.28	2.40±0.19
Carbohydrate	7.34±0.41	53.74±3.41	48.11±4.13

Values are means ± standard deviations of triplicate determinations

Table 2 above reveals the proximate composition of the leaf, fruit and seed of *P. americana*. Their moisture contents are relatively low and could imply long shelf life [5, 23]. The importance of moisture in the body of organisms cannot be overstated. It acts as a dissolving medium for substrates, transport materials; regulate temperature, etc [30]. The fruit of *P. americana* produced the highest fat than the seed and leaves. This may be an indication that it could be an oil fruit. Generally, fats have many functions. Aside insulation and conservation of body temperature in organisms, their fatty acid components such as lauric acid, etc, have been reported to improve health [8]. The protein contents of the investigated samples ranged from 1.60± 0.09g/100g in fruit to 25.54±2.52 g/100g. Aside contributing to diets, the relative impact of proteins in body system should not be overlooked. As chemical compounds, they repair and replace worn out cells, form structural and globular materials that holds the body, form blood proteins, boost immune system, etc [22]. Dietary fibres alter the colonic environment in such a way as to protect against colorectal diseases. It provides protection by increasing faecal bulk, which dilutes the increased colonic bile acid concentrations that occur with a high fat diet [7]. Evidence from epidemiological studies

suggest that increased fibre content in the body of organisms could reduce incidence of diseases like diabetes, high blood pressure, piles, digestive disorders, etc [26,31]. So herein rests a likely health benefits derivable from the consumption of leaves of *P. americana*, due to high fibre content. Ash constituents of the investigated samples could be related to their mineral contents and these minerals, which are mostly in forms of chemical compounds, play numerous functions towards the improvement of health in the body of organisms [22, 23]. Carbohydrates are related to energy generation [22]. Observed carbohydrates in the investigated samples may be an indication that the samples could produce energy to power the cells and tissues of the body on consumption.

Table 3: Mineral composition of leaf, fruit and seed of *P.americana*(mg/100g).

Minerals	Leaf	Fruit	Seed
Sodium	80.42±9.12	12.61±1.19	0.30±0.02
Calcium	56.13±3.31	210.08±0.17	14.15±3.01
Magnesium	75.60±13.31	26.89±4.01	26.16±5.90
Phosphorus	48.98±5.50	51.00±6.12	31.33±6.11
Potassium	148.92±0.12	385.14±12.01	100.83±5.64
Zinc	7.21±2.62	0.64±0.03	0.09±0.01
Iron	14.61±4.18	0.49±0.01	0.31±0.03
Magnesium	4.84±0.13	0.16±0.11	1.28±0.14
Copper	5.71±1.26	0.68±0.12	0.98±0.13
Lead	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	ND	ND	ND

Values are means ± standard deviations of triplicate determinations ND= Not Detected.

Mineral elements in plants become important when their health benefits are considered in the body of organism. Most of these minerals occur as chemical compounds in solution form hence, they are able to diffuse to different part of plants. Table 2, above shows the presence of sodium in all the samples investigated. High sodium content in the body has been associated with high blood pressure in the body [6, 22] but this may not be possible in a situation of higher potassium content. Potassium was the highest to other minerals investigated in the present study. Potassium is necessary for electrolyte balance, controls high pressure, etc. This could also be behind the use of *P. americana* plant to cure high blood pressure in traditional medicine. The leaf, fruit and seed studied contained appreciable amounts of calcium, magnesium, and phosphorus. These are very important to health of humans. They are required for formation of bones and teeth, formation of blood clot, formation of cyclic AMP and other second messengers, for body mechanisms, etc [22,36]. Trace elements were highest in the studied leaves. Zinc plays role in wound healing, iron is known for haem formation, manganese and copper aid iron absorption in the body [22]. The absence of lead, cadmium, and chromium could be an indication that the investigated samples are free of toxic metals.

4. CONCLUSION

The present study has revealed the chemical contents of the leaf, fruit and seed of *P. americana*. There is no doubt that these constituents may be behind their medicinal values in phytotherapy.

5. REFERENCES

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