Studies on the Nutritional and Phytochemical Properties of *Persea americana* Seed

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Abstract

The phytochemical, nutrient, antinutrient and mineral element composition of seed extract of Persea americana were investigated. Phytochemical analyses of the seed extract revealed the presence of alkaloids, saponins, tannins, flavonoids, cyanogenic glycosides but no anthracine glycosides. Proximate analysis gave 12.90 ± 1.57% moisture; 18.53 ± 0.26% crude fat; 18.55±1.26% crude protein; 47.35±24% carbohydrate; 2.6±0.63% ash; 3.17±0.17% crude fibre. The seed also was a rich source of mineral elements; containing calcium 12.30±0.08 mg; iron 0.307± 0.13mg; magnesium 21. 12±3.86 mg; phosphorus 46.00±1.72 mg; potassium 103.8±0.22 mg; sodium 0.302± 0.02 mg; and zinc 0.087±0.01mg per 100gm dry weight respectively. Quantitative analyses of the anti nutritional components revealed oxalate, phytate, saponins, tannins, flavonoids and cyanogenic glycoside contents of 27.25±4.10, 5.44±0.03, 33.23±1.73, 56.11±0.21, 1.90 ± 0.08 and 24.01± 0.25 mg/100gm dry weight respectively.

Keywords: *Persea americana* seed, Phytochemical screening, Proximate analysis, Antinutritional components, Mineral content

Introduction

Persea americana otherwise known as avocado pear has not attracted much attention especially the seed, despite the several claims credited to the plant by herbalists who used the leaves and seed for herbal preparations. *P. americana* is an evergreen tree, up to 20 metres high with dense, compact and whorled branches. It has been used in ethnomedicinal preparations in some African countries. The fruit skin which "is antibiotic in nature is employed as a vermifuge and also as a remedy for dysentery. The leaves are chewed as a remedy for diarrhoea. Boiled leaves of *Persea americana* are applied on the fore-head to relieve neuralgia (Obioha, 1998). The seed when cut into pellets, roasted and ground are given to stop diarrhoea and dysentery. Oil extracted from the seed heals skin eruptions (Ezenwafor, 1992). Edible flesh of *Persea americana serves* as a very high energy source for diabetics due to its low sugar content. The seed could also be suitable for compounding poultry feed (Obioha, 1998).

Dietetically, the edible fleshy part of *Persea americana* is one of the most nutritious of all salad fruits with a fleshy, smooth, buttery pulp. In North America, it is primarily served as a salad vegetable and is merely halved and garnished with seasoning, lime juice, vinegar and other dressings. Often, the halves are stuffed with shrimps, crabs or other sea foods (Vermon, 1983).

Plants have been known to be useful in the formulation of feeds as feed supplements. The aim has been to improve the quality of some animal feeds. Soybean, maize and wheat for example are used in the formulation of standard poultry feed. This study is intended to assess the nutritional and toxicological compositions of *P. americana* seed with the view to evaluating its possible utilization in improving the quality of conventional commercial feeds. The importance of this effort is obvious considering the high cost of animal feeds and the abundance and apparent zero economic value of this plant resource.

Materials and Methods

Collection and preparation of plant materials: The seeds of *Persea americana* were bought from Ihiagwa Market in Owerri West LGA of Imo State, Nigeria. The seeds were identified at the Department of Plant Science and Biotechnology of the Imo State University, Owerri, Nigeria. Clean healthy seeds were cut into pellets and sun-dried to constant weight before powdering the dried pellets using a domestic blender. Portions of the powdered sample were then used for the various analyses.

Phytochemical analysis: Quantitative phytochemical screening for the presence of alkaloids, saponins, flavonoids, tannins, cyanogenic glycosides, oxalate and phytate were carried out according to the methods described by Harbome (1973) and Trease and Evans (1983).

Proximate analysis: The proximate analysis of the seed extract for crude protein, crude fibre and fat contents were determined using the methods described by Pearson (1976). Crude protein determination was done using Kjedhal's method, while crude fibre determination was done using Wende's method. Fat content was determined using continuous solvent extraction method. Total ash content was determined by furnace 'incineration using the method of James (1995). Moisture and carbohydrate contents were determined using the methods described by AOAC (2000).

Elemental analysis: The minerals: calcium, sodium, potassium, phosphorus. magnesium, iron

and zinc were performed using the Buck scientific atomic absorption/emission spectrophotometer 200A.

Determination of antinutrients: Phytate and oxalate contents were determined by the spectrophotometric method of Hang and Lantzsch (1983) while the cyanide content was estimated by the alkaline titration method (AOAC, 2000).

Results and Discussion

Table 1 shows the proximate composition of the powder seed which revealed the following: protein content 18.55 ± 1.26%, carbohydrate 47.35 ± 3.24%, fats 18.53 ± 0.26%, moisture content 12.90 ± 1.57%, ash content 2.67 ± 0.63% and crude fibre 3.17 ± 0.17% respectively. Results also showed a calorific value of 430.14+10.42 kilocalories per gram dried seed powered.

Table 1: Proximate composition of *Persea americana* seed extract

Nutrient composition	Mean Composition*
Crude' protein	18.55 ± 1.26
Carbohydrate	47.35 ± 3.24
Fats	18.53 ± 0.26
Ash	2.67 ± 0.63
Moisture	12.90 ± 1.57
Crude fibre	3.17 ± 0.17

**Values are means of three determinations ± S.D*

The seed powder although low in crude protein when compared to some leguminous seeds as reported by Boulter, (1997) could be a potential source of protein for livestock. The carbohydrate content of the seed powder is low compared to that reported by Ijeh *et al* (2004) from *Mucuna sloane* seed. The fat content of the seed powder is however higher than that determined from *Mucuna sloane* seed. The moisture content of the seed powder was found to be low indicating that the seed probably has a good keeping quality. This would agree with the reports of Ijeh *et al* (1998) and Ijeh *et al* (2004). The ash content of the powdered seed agrees with the report of Samson (1989). The crude fibre value from the results corroborates the results of Enechi (2001) who put the value as 4.01 ± 0.03%.

Table 2: Phytochemical composition of *Persea americana* seed extract

Phytochemical constituents	Composition (mg/l00g dry weight)*
Saponins	33.33 ± 1.73
Tannins	56.11 ±4.10
Oxalates	27.49±4.10
Phytates	5.44±0.05
Cyanogenic glycosides	24.01±0.25
Flavonoids	1.90±0.08

** Values are means of three Determinations ± S.D*

Quantitative phytochemical analyses (Table 2) revealed the presence of saponins, flavonoids and tannins. Saponins are known to have hypocholestrolemic activities (Price *et al,* 1989). This means that *Persea americana* seeds could have some protection against coronary heart disease. Also, flavonoids which have been associated with free radical scavenging property as well as an anticarcinogenic potential (Trease and Evans, 1983) had a fairly low concentration (1.9mg/l00gm dry weight) in the seed. This means that the powder can be useful in the management of physiological conditions associated with oxidative stress e.g. diabetes and hypertension.

The high concentration of the antinutritional factors phytate, oxalate and cyanogenic glycosides makes the seed to appear potentially toxic. The seed extract contains some micronutrients that are capable of complexing with these antinutritional factors and so make them unavailable. Calcium, for instance, complexes with oxalate to form calcium oxalate. Calcium also complexes with phytate and phosphorus to form calcium phytate and calcium phosphate (hydroxyapatite). Cyanogenic glycosides which are also known to be toxic are also found to be present in the extract. Although the levels of these antinutritional factors are fairly high, it is unlikely that they will pose any health problem as their values are drastically reduced by various processing methods including heating (Munro and Bassir, 1969; Enechi and Odonwodo, 2003).

Table 3 shows the mineral composition of the seed extract of *Persea americana* and reveals that it is a rich source of calcium, magnesium, potassium and phosphorus. It also contains small amounts of zinc, iron and sodium. These minerals play vital roles in diverse metabolic activities (Enechi, 2001). However, their bioavailability should be ascertained since a number of antinutritionals which are capable of complexing with these useful macro and micronutrients (Enechi *et al,* 1996) thus reducing their bioavailability have also been found in the seed.

Table 3: Mineral composition of *Persea americana* seed extract

Mineral Element	Composition (mg/l00gm dry weight)*
Calcium	12.30 ± 0.08
Magnesium	21.12 ± .86
Phosphorus	46.00 ± 7.20
Potassium	103.80 ± 0.22
Iron	0.31 ± 0.13
Sodium	0.30 ± 0.20
Zinc	0.087 ± 0.10

**Values are means of three determinations ± S.D.*

Conclusion: The study has shown that the seed extract of *Persea americana* is probably a good source of carbohydrate, protein and fat as well as some mineral elements including calcium, phosphorus, potassium and magnesium. It therefore means that if the seed if properly processed to reduce the antinutritive components, it can be incorpolated into livestock feeds. It could therefore be of nutritional benefit to livestock in addition to its potential medicinal benefits.

The fact that this seed is currently discarded after taking the pulp of the fruit further underscores the relevance of our work and emphasises the need for more interest by researchers in diverse disciplines in this potentially useful but wasted resource.

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