

Qualitative Studies on Proximate Analysis and Characterization of

Oil From *Persea Americana* (Avocado Pear)

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ABSTRACT

Studies were carried out on the proximate analysis and extraction and characterization of ripe and unripe *P.americana*. The result reveals that ripe and unripe *P.americana* contains iodine value ranging from 165.11gI₂/100g to 252.41gI₂/100g and 152.41gI₂/100g to 288.59gI₂/100g respectively. The range of the saponification values in the ripe and unripe *P.americana* are 58.85mgKOH/g to 168.61mgKOH/g and 62.8mgKOH/g -142.65mgKOH/g respectively. Acid value of both ripe and unripe *P.americana* ranged between 17.82mgKOH/g to 25.31mgKOH/g and 11.44mgKOH/g to 28.60mgKOH/g respectively. The proximate analysis shows that both ripe and unripe *P.americana* has moisture which ranged between 67.62% to 73.63% and 29.05% to 51.17% respectively. This signifies that unripe *P.americana* can be kept for a long period of time without rotting. The ripe pulp contains 4.82% of crude fibre and it also has the highest energy value of 162.58%. Ripe pulp of *P.americana* contains 2.38% of protein, 13.38% of fat and 8.16% of carbohydrate. It is observed that ripe *P.americana* contains substantial nutrients that could meet the needs and requirements of the body, thus it is good for human and animal consumption. It can be recommended for inclusion in animal feeds.

Keywords: *P.americana*, Iodine value, Saponification values, Acid value, Proximate analysis

1. INTRODUCTION

The Avocado pear *Persea americana* is a nutritious and valuable fruit tree found in the tropics. (*Persea americana*) is well known in many parts of the tropical world including Nigeria. The species belongs to the family *Lauraceae*. The fruit tree can attain a height up to 20m, with large spreading and flat topped crown. It has a deeply fissured brown corky bole. The leaves are ovate-elliptic to *ovate-lanceolate*, 5-20cm long and about 15cm broad, *cuneate* to *truncate* at the base and gradually *acuminate* with 6-10 pairs of lateral nerves. The leaves are crowded towards the ends of the twigs. Flowers are pale yellow in compact inflorescences at the ends of the twigs. Calyxes are densely covered with grey hairs, deeply divided into 6 parts. Stamens are 12 of which only 9 are developed. Fruits are large, 5-15cm long, *ovate* to spherical, shining green and fleshy (Keay, 1989). In addition, the fruit is a large fleshy berry with a single seed. It is *pyriform*, green, with a high oil content rich in vitamins A, B and E (Hill and Waller, 1994). The pulp of mature avocado fruit has a sweet pleasant taste that is consumed as human food. The first major problem of Avocado is the threat of extinction brought about by the high rate of deforestation of the tropical rainforest, and the Niger Delta region of Nigeria is not an exception. Many authors have reported on the ecological consequences of deforestation (Adedire, 1991; Akachukwu, 1999, 2006). A second problem of avocado is the paucity of adequate information on its fruiting efficiency for biodiversity conservation and breeding studies in the Niger Delta region of Nigeria. Existing stands are mainly in compound farms and traditional agro forestry system.

Persea americana variously known as the avocado pear, alligator pear, ahuacatl or agvacate, is a highly nutritional fruit rich in proteins, fats and oils and low in sugar. *P. americana* are well known plants in West Africa. The fruits are edible and the bark; leaves, stem and roots are used as local medicine against diseases (Neuwinger, 2000; Jirovetz et al., 2003; Annabelle1 et al., 2004).

P.americana is one of the 150 varieties of avocado pear. The tree is widely cultivated in tropical and subtropical areas (Lu et al., 2005). The seed of *P.americana* has diverse application in ethno-medicine, ranging from treatment for diarrhea, dysentery, toothache, intestinal parasites, skin treatment and beautification. The avocado seed oil has several health benefit e.g. for controlling human weight (especially used for obese for weight loss) (Roger, 1999). *P.americana* leaves have been reported to have or possess anti inflammatory and analgesic activities (Adeyemi et al.,

2002). Antioxidant activity and phenolic content of seeds of avocado pear was found to be greater than 70% (Soong and Barlow, 2004). The edible part (fruit) is very popular in vegetarian cuisine, making a substitute for meat in sandwiches and salads, because of its high fat content and high in valuable, health-promoting fats (Lu et al., 2005). The fruit is not sweet but fatty, almost distinctly, yet subtly flavored, and of smooth, almost creamy texture. Avocado fruits in many countries such as Mexico, Brazil, South Africa and India are frequently used for milkshakes and occasionally added to ice-cream.

In addition to the nutritional values of its fruits, the leaves and other parts of *P.americana* possess medicinal properties, and widely used in traditional medicines of many African countries. It is recommended for gastritis, gastroduodenal ulcer, hypercholesterolemia, hypertension, anaemia and exhaustion (Roger, 1999). Various products of the plant have been effectively used for the management, control and treatment of peptic ulcers, gastritis, dysentery, diabetes mellitus, diarrhoea, insomnia, amenorrhoea, bronchitis, cough and hepatitis. Previous studies in Nigeria have shown that leaf extracts of *P.americana* possess a catalogue of pharmacological activities, including anti-tussive (reduces cough), anti-convulsant, vasorelaxant, analgesic, anti-inflammatory, antidiabetic, hypoglycaemic, hypotensive and antihypertensive properties (Adeboye et al., 1999; Adeyemi et al., 2002; John and George, 2006; Gomez-Flores et al., 2008)

The avocado pear fruit must be mature to ripen properly. Fruits that fall off the tree ripen on the ground, depending on the amount of oil they contain, their taste and texture may vary greatly. Generally, the fruit is picked once it reaches maturity. Once picked, the fruit ripens in few days at room temperature (faster, if stored with other fruits such as apples or bananas, because of the influence of ethylene gas). In some cases, avocados can be left on the tree for several months, which is an advantage to commercial growers who seek the greatest return for their crop; if the fruit remains unpicked for too long, however, it will fall to the ground

When ripe the colour of the skin is purplish black, the edible flesh of the fruit constitutes 65%, seed is 20% and the skin is 15% which makes up the total weight of the fruits. Although they are fruits, avocados have a high fat content of between 71 to 88% of their total calories - about 20 times the average for other fruits. High *P.americana* intake has been shown to have a beneficial effect on blood serum cholesterol levels (USDA, 2009). About 75% of an avocado's calories come from fat, most of which is monounsaturated fat. They are rich in Vitamin B, as well as Vitamin E and Vitamin K. They have high fiber content among other fruits - including 75% insoluble and 25% soluble fiber. The nutritional value of *P.americana* makes it a good raw material for cosmetics industries, the oil serve as a high source of nutrients in the production of cosmetics to enhance the skin's good looking condition (Le poole, 1995)

This research work is carried out in order to determine proximate analysis of ripe and unripe *P.americana*. the extraction and characterization of oil from ripe and unripe *P.americana*. Also to compare between ripe and unripe *P.americana*

2.0 MATERIALS AND METHODS

P.americana (Avocado Pear) was obtained from Mushin market, Lagos State, Nigeria. All the samples were washed clean to remove all dirt.

They were divided into six parts; Ripe Pulp, Ripe seed, Ripe skin; Unripe pulp, Unripe seed and Unripe skin, all the six samples were put into the oven for 8hours at the temperature of 60°C. After drying, the samples were pulverized. The various samples were authenticated in the Department of Botany of Lagos State University Ojo.

2.1.1 Determination of Acid Value (British Standard method, 1988)

Into 25cm³ of carbon tetrachloride (CCl₄) in 100ml conical flask, 1g of the avocado pear oil was added, 2 drops of phenolphthalin indicator were also added to the mixtures. Titration was done with 0.1M alcoholic potassium hydroxide (KOH) until a colour change was obtained. Blank determination was also carried out. Similar method was repeated for the native pear oil. This was calculated using the formula:

$$\text{Acid Value (AV)} = \frac{\text{Sample titre} - \text{Blank}}{\text{weight of sample}} \times 0.1 \times 56.1$$

Where 0.1= concentration of alcoholic potassium hydroxide (KOH)
 56.1= constant

2.1.2 Peroxide, iodine, peroxide value and saponification values:

Acid, peroxide, iodine and saponification values were determined following the AOAC (1997). Percentage yield = (actual yield ÷ theoretical yield) × 100

2.2 Determination of moisture, Ash, Fat, Protein, and carbohydrate contents

These were determined by the method of AOAC, 1997.

3.0 RESULTS

Table 1: Comparison of extraction and characterization analysis of unripe seed, unripe pulp, unripe skin, ripe seed, ripe pulp and ripe skin.

Parameter(%)	Unripe seed	Unripe pulp	Unripe skin	Ripe seed	Ripe pulp	Ripe skin
Iodine value(gI ₂ /100g)	288.59±3.23*	180.96±3.18*	152.41±3.18	252.41±4.778	165.11±3.18*	173.06±1.51*
Acid value(mgKOH/g)	11.44±0.44*	28.60±0.55*	22.66±0.66*	17.82±0.22*	25.31±1.10*	20.67±0.88*
Saponification(mgKOH/g)	62.81±0.64*	131.45±0.40*	142.65±0.56*	58.85±0.83*	154.08±0.21*	168.61±0.31*
% Yield	9.27±0.02*	28.51±0.00*	41.60±0.00*	9.47±0.00*	34.23±0.00*	84.43±0.00*
Peroxide value(mg/kg)	0.19±0.01*	0.33±0.04*	0.32±0.03*	0.37±0.03*	0.50±0.00*	0.39±0.01*

The results are represented as Mean ± SEM of triplicate determinants,* P<0.05 is significant when compared between groups

Table 2: Comparism of proximate analysis of unripe seed, unripe pulp, unripe skin, ripe seed, ripe pulp and ripe skin.

The results are represented as Mean SEM of triplicate determinants *P<0.05 is significant when compared between group

Parameter	Unripe seed	Unripe skin	Unripe pulp	Ripe seed	Ripe pulp	Ripe skin
Moisture (%)	29.05±0.43*	32.59±0.09*	51.17±0.47*	65.62±0.79*	70.65±0.05*	73.63±0.15*
Ash (%)	1.25±0.02*	1.90±0.02*	0.96±0.02*	1.15±0.03*	0.38±0.03*	1.46±0.03*
Protein (%)	3.36±0.16*	0.72±0.07*	2.14±0.05*	4.44±0.06*	2.38±0.07*	0.83±0.09*
Fat (%)	21.41±0.18*	16.62±0.20*	7.96±0.08*	12.24±0.07*	13.38±0.34*	8.88±6.14*
Carbohydrate (%)	15.74±0.41*	15.71±0.57*	17.05±0.30*	4.67±0.16*	8.16±0.05*	13.81±0.07*
Crude fibre (%)	29.12±0.83*	27.98±0.59*	20.72±5.38*	12.83±0.72*	4.82±0.78*	1.38±0.07*
Energy K(CAL)	140.54±2.76*	152.86±3.79*	131.84±2.70*	133.67±0.10*	162.58±3.49*	138.31±0.85*

4.0 DISCUSSION

The comparison of the three samples (skin, pulp and seed) was shown in Table 1, Unripe seed of *P.americana* had the highest iodine value 288.59(gI₂/100g), the ripe seed contains 252.41(gI₂/100g) of iodine. However, iodine is necessary in the body for thyroid glands proper performance of its work. Iodine also calms the body and relieves nervous tension.

Acid value is low in the unripe seed with mean value of 11.44(mgKOH/g). It is however observed that unripe pulp has more than twice of the seed value with mean of 28.60(mgKOH/g). The high acid value in the oil in the unripe pulp and skin has a great advantage in soap making; the low acid value in unripe seed suggests that it may be useful in paint making. The lower the acid value of oil, the fewer free fatty acids it contains which makes it less exposed to the phenomenon of rancidification (Roger et al., 2010). The acid content is used to determine the suitability of oil as edible oil. The lower the acid content, the more appealing the oil is (Coenen 1976).

Saponification value is inversely proportional to the mean molecular weight of the glycerides in the oil. It also serves as an important parameter in determining the suitability of oil in soap making. The oil from ripe skin of *P.americana* had the highest value (168.61mg KOH/g) and ripe seed had the lowest value (58.85mg KOH/g). Both oils could be good for soap making but that of the ripe seed will give better and harder soap because of its lower unsaturation.

Percentage yield oil content of ripe skin of *P.americana* is the highest 84.43%, unripe has 41.60%, and this shows that (¾) three quarter of the skin is made up of oil. Thus *P.americana* can be classified as an oil fruit.

Peroxide value helps in determining which oil will be easily susceptible to oxidative rancidity. The highest peroxide value obtained was from ripe pulp of *P.americana* 0.50mg/kg. Peroxides are the primary reaction a product formed in the initial stages of oxidation of oil and therefore gives an indication of the process of lipid peroxidation (Onwuka, 2005)

Tables 2 showed the proximate analysis of ripe skin, ripe pulp, ripe seed, unripe skin, unripe pulp and unripe seed. The ripe skin and ripe pulp have the lowest crude fibre values. The ripe skin sample contains (1.38%) of crude fibre and the ripe pulp contains (4.82%) of crude fibre. The spongy mass of fibre helps to satisfy the appetite and it also assists moving food through the alimentary canal by aiding the muscular action of the intestine thus preventing constipation (Edem, et al, 2009).

The ash content though quite low in the ripe pulp sample (0.38%) is significantly important in foods as they account for the mineral constituents but must not be too much (Oluwole *et al.*, 2012; Edema and Oklemen, 2000). Unripe skin sample has the highest ash content (1.90%). It was observed that the fat content in the unripe seed (29.12%) is

higher than the other five samples. The significance of fats in foods cannot be over emphasized as they are used up by the cells of organs and glands to provide energy and in the synthesis of some of their secretions (Okpero, 2011). Fats are building blocks of hormones and they insulate nervous system tissue in the body. They fuel the body and help absorb some vitamins. As such the seed can be grounded and add to animal feeds. Proteins are complex nitrogenous substances that form an important part of living tissues. Functionary, proteins are important in food as they help in the growth and development of the body (Sundin, 2009). It was observed that the ripe seed sample is the richest in protein (4.44%) and unripe skin being the lowest (0.72%).

It was observed that unripe seed sample has the highest carbohydrate content (15.74%). This shows that the unripe skin of *P.americana* is a better source of carbohydrate. Carbohydrate gives ready source of energy to the body. The moisture content ranged between (29.05%) and (73.63%), it had the least value in the unripe seed sample and the highest in the ripe skin sample. It was observed that the ripe pulp sample had the highest energy value of 162.58Kcal. These comparative studies on the proximate analysis and extraction and characterization of ripe and unripe Avocado pear *P.americana* was carried out. The study revealed that both ripe and unripe *P.americana* has high iodine value, acid value, saponification value and percentage yield but low level of peroxide value. This indicates that ripe *P.americana* aids growth and development in the body. The ripe and unripe *P.americana* has high moisture, protein, fat, carbohydrate and crude fibre all necessary for the body but low ash. Since unripe *P.americana* cannot be eaten due to its hardness, ripe *P.americana* is the only one that man can consume. It is on this basis that the following recommendations can be made. Ripe Avocado pear is good for the body, good for making soaps, paint and cream. Also, unripe Avocado pear is good in making soaps, paint. The skin and seed can be used as animal feed. Public awareness should be carried out to enlighten the public on its importance, usefulness and nutritional benefits.

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