COMPARATIVE STUDY OF PHYTOCHEMICAL COMPOSITIONS OF *Persea americana* seed (African pear) and *Dacryodes edulis* seed (Local pear)

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ABSTRACT

The comparative study of phytochemical composition in Dacryodes edulis *and* Persea americana *seeds obtained from Ikot Osurua, Ikot Ekpene Local Government Area of Akwa Ibom State was carried out using standard analytical procedure. The result revealed the presence of the following phytochemicals in* D. edulis *and* P. americana *respectively: Alkaloids % (18.215±0.276) and (21.511±0.157), saponins % (14.120±0.170) and (19.622±0.120), flavonoids (3.690±0.270) and (3.590±0.014), tannins (3.315±0.134) and 0.947±0.025) and hydrogen cyanide (1.660±0.100) and (14.225±0.110). Some of these phytochemicals were below, higher and within the FAO/WHO standard. The various concentrations of these phytochemicals serve as defence mechanisms against pathogens and*

should be utilized by pharmaceutical industries to manufacture supplements.

Keywords: Phytochemicals, Comparative Study, *Dacryodes edulis, Persea americana.*

Introduction

Persea americana otherwise known as avocado pear and *Dacryodes edulis*, known as African pear, are usually consumed in different parts of Nigeria as food/snacks. The plants are generally planted as fencers or wild bush, but their production and commercialization have been on the increase for the last few years (Whiley and Schaffer, 2002).

Persea americana is a tropical fruit containing a high level of lipids and minerals (Maitera *et al.,* 2014). The plant is reported to be rich in several phytochemicals and is used in traditional medicine for the treatment of various ailments, such as hypertension, stomach ache, diarrhoea, etc. *Dacryodes edulis* is a rich source of nutrients such as lipids, proteins and vitamins (Ajibesin *et al.,* 2011). It is characterized by its high content of fixed and volatile oils and is highly consumed locally and internationally which gives the plant a high economic value (Ajibesin *et al.,* 2011).

Persea americana and *D. edulis* are one of those plants currently used by indigenous persons for their nutritional value and to manage health problems. The seeds of these plants are underutilized as a non-edible part of the fruit and discarded as waste (Owusu et al., 2015). These seeds have a range of useful chemicals. Thus, these seeds may potentially be extracted and produce valuable income for different pharmaceutical industries (Sommaruya and Eldridge, 2020). The seeds are sources of phytochemicals and have higher total phenolic content and antioxidant capacities.

Phytochemicals are bioactive non-nutrient compounds produced by plants, fruits, vegetables and grains, to help them resist fungi, bacteria and plant virus infections, and also consumption by insects and other animals (Gruter, et al., 2022). Some phytochemicals have been used as poisons and others as traditional medicine. Phytochemicals generally, are used to describe plant compounds that are under research with unestablished effects on health and are not scientifically defined as essential nutrients (Roberts, 2018).

Phytochemicals are present in all the plant parts, at different concentrations. The main two antioxidant phytochemicals are polyphenols and carotenoids. These

phytochemicals are concentrated in colourful parts of plants like fruits, vegetables, nuts, legumes whole grains, etc.

Materials and Methods

The materials used in the phytochemical analysis include; a funnel, beaker, water bath, measuring cylinder, distilled water, test tube, rack, weighing balance, mortar and pistol, conical flask, aluminum foil, Whatman no1 filter paper, oven, heating mantle. The reagents used include Methanol, ethanol, NH4OH, Acetic acid, picrate acid, ferric chloride, distilled water, potassium ferro, and Cyanide.

Sample Collection and Preparation

The samples were both obtained from a market at Ikot Osurua, Ikot Ekpene Local Government Area and were then conveyed to the laboratory in a nylon where they were authenticated by a botanist as *Persea Americana* and *Dacryodes edulis*. The seeds were then removed from the fruits and were washed and sliced into smaller pieces. The samples were then sundried for some days until it was completely dried. The samples were then grounded using mortar and pistol into powdered form and then stored in an airtight container for further phytochemical analysis.

Phytochemical Analysis

Determination of Alkaloids

2g of samples were weighed into a 25ml beaker and 200ml of 10% acetic acids in ethanol was added and covered, it was then allowed to stand for 4 hours. This was filtered and the extract was heated to one-quarter of the original volume (I.e. 50ml) concentrated NH4OH was added dropwise to the extract until the precipitate was collected and washed with dilute ammonium hydroxides and then filtered. The residue is the alkaloid which was dried and weighed.

$$\% \text{ Alkaloid} = \frac{W_2 - W_1}{W_3} \times \frac{100}{1}$$

Determination of Saponins

2g of each sample was put into different conical flasks and 100 ml of 20% ethanol was added. The samples were heated over a hot water bath for 4 hours with continuous stirring at about 55OC, the mixture was filtered and the residues re-extracted with the combined extract were reduced to 4ml over a water bath at about 90OC, the concentration was transferred into a 5ml separatory funnel and 20ml of petroleum ether was added and shaken vigorously, the aqueous layer was recovered while the other was discarded.

$$\% \text{ saponins} = \frac{W_2 - W_1}{W_3} \times \frac{100}{1}$$

Determination of Tannins

1g of the samples were weighed into a 100ml plastic bottle. 50ml of distilled water was added and shaken for one hour in a mechanical shaker. This was filtered into a 50ml volumetric flask and made up to the mark. Then 1 ml of the filtrate was pipette into a test tube and mixed with 1 ml of 0.1m FeCl3 in 0.1m HCL and 0.008m potassium ferrocyanide. The absorbance was measured in a spectrophotometer at 720nm wavelength within 10 minutes.

$$\frac{\text{(Absorbance Test –Blank) concentrated standard}}{\text{Absorbance standard x Weight of sample}} \times \frac{100}{1}$$

Determination of Flavonoids

2g of the samples were extracted repeatedly in 100ml of 80% aqueous methanol at room temperature. The whole solution was filtered through Whatman filter paper. The filtrate was later transferred into a crucible and evaporated into dryness over water and weighed to a constant weight.

$$\% \text{ Flavonoids} = \frac{W_2\text{-}W_1}{W_3} \times \frac{100}{1}$$

Determination of Cyanide glycosides

1g of the sample was dissolved in 50 ml of distilled water in a corked flask and was allowed to stay overnight. The solution was filtered and the extract was used for cyanide determination. 1ml of the filtrate was corked in a test tube and 4ml of alkaline was added and incubated in a water bath for 5 minutes. After colour development, the absorbance was red in the spectrophotometer at 490nm with the blank.

$$\frac{\text{(Absorbance Test –Blank) concentrated standard}}{\text{Absorbance standard x Weight of sample}} \times \frac{100}{1}$$

Results and Discussion

Table 4.1 shows the result of the comparative study of phytochemical composition in *Dacryodes edulis* seed and *Persea amricana* seed. The result was obtained using standard analytical procedures and is summarized as shown in Table 4.1 below.

Table 4.1: Photochemical Composition of *D. edulis* seed and *P. americana* seed

Parameters	*D. edulis*	*P. americana*	FAO/WHO Standard
Alkaloids %	18.215 ± 0.276	21.511 ± 0.157	20 – 50 %
Saponins %	14.120 ± 0170	19.622 ± 0.120	10 – 50 %
Flavonoids %	3.690 ± 0.270	3.590 ± 0.14	15 – 60 %
Tannins (mg/100g)	3.315 ± 0.134	0.947 ± 0.025	1.8mg/100g
Hydrogen Cyanide (mg/100g)	1.660 ± 0.100	14. 225 ± 0.110	0.5 – 3.5mg/kg

Mean ± Standard deviation of two determinations

Discussion

The above results revealed that alkaloids, Saponnins and hydrogen cyanide were most abundant in *P. Americana* and least in *D. edulis.*Whereas, flavonoids and tannins were most abundant in *D. edulis* and least in *P.americana.*

The concentration of alkaloids found in *D. edulis* was (18.215 ± 0.276) and (21.511 ± 0.157) in *P. Americana.* When compared with the FAO/WHO standard (20-50% it reveals that *D. edulis* was below the standard and *P. Americana* was within the standard. Oluwaniyi *et al.,* (2017) also reported the concentrations of alkaloids in *D. edulis* seed to be (15.80 ± 0.001) and (5.40 ± 0.001) in *P. Americana* seeds, which are below the results of the present study. Alkaloids have a wide range of pharmacological activities including antimalarial, antiasthma, and anticancer (Manske, 2015). Many have found use in traditional or modern medicine or as starting points for drug discovery.

The concentration of saponins in *D. edulis* seed was found to be (14.120 ± 0.170) and in *P. Americana* it was found to be (19.622 ±0.120). The result reveals that the samples were within the FAO/WHO standard for saponins which is (10 – 50%).

Oluwaniyi *et al.,* (2017) also reported the concentration of saponins in *D. edulis* seed to be (0.58 ±0.02) and (0.52 ± 0.42) in *P. Americana* seed. When compared with the result of the present study, it was below the result and also below the standard. Saponins are soap-like and have a general property of being able to form foam in water. They may serve as natural antibiotics, show microbial activities and are used in the treatment of fungal and yeast infections (Lorent et al., 2014).

The concentration of flavonoids in *D. edulis* was found to be (3.690 ± 0.270) and (3.590 ± 0.014) in*P. American.* When compared with the FAO/WHO standard (15 – 60%) it reveals that the results are below the standard. Oluwaniyi *et al.,* (2017) also reported the concentration of flavonoids in *D. edulis* to be (7.38 ± 0.001) and for *P. Americana* to be (20.33 ± 0.01) which are higher than the result of the present study. Flavonoids are potent water-soluble antioxidants and free radical scavengers which prevent oxidative cell damage. They have strong anticancer activity and protect against the different levels of carcinogenesis (Kumar and Pandey, 2013).

The concentration of tannins in *D. edulis* seed was found to be (3.315 ± 0.134) and (0.947 ±0.025) in *P. Americana* seed. The result of *D. edulis* was above the FAO/WHO standard for tannin (1.8mg/100g) while that of *P. Americana* was slightly below the standard.

Oluwaniyi *et al.,* (2017) reported the concentration of tannin in *D. edulis* and *P. Americana* seeds to be (0.24 ± 0.04) and (0.76 ± 0.17) respectively, which are both slightly below the result of the present-day study. Tannins are known to be bitter and form a high polyphenol complex with protein making it thereby unavailable in the diet. They may decrease the protein quality by decreasing its digestibility and palatability, but are on the other hand beneficial to human health given their role in preventing tooth decay and protecting from heart diseases and cancer.

The concentration of hydrogen cyanide in *D. edulis* was recorded to be (1.660 ± 0.100) which is within the FAO/WHO standard for Hydrogen cyanide, which is (0.5 – 3.5 mg/kg) and *P. americana* was reported to be (14.225 ±0.110) which is highly above the FAO/WHO standard for hydrogen cyanide.

Cyanide is one of the most potent, rapidly-acting, poisons known. Cyanides inhibit the oxidative processes of cells causing them to die very quickly. Aside from death, acute cyanide toxicity at small doses can cause headaches, tightness in the throat and chest and muscle weakness.

Conclusion

After conducting an analysis, it was discovered that both Dacryodes edulis and Persea americana seeds boast a rich phytochemical composition. These

phytochemicals are natural compounds synthesized by plants, primarily serving as defence mechanisms against fungal, bacterial, and viral infections, as well as deterring consumption by insects and other animals. They have been utilized in traditional medicine across different regions to address a wide range of human health issues, including metabolic, immunological, and neurological disorders.

Recommendations

Based on the results of the research, the paper highly recommends that pharmaceutical industries identify and utilize the phytochemicals found in Dacryodes edulis and Persea americana for the development and production of pharmaceutical drugs and dietary supplements. Additionally, the work emphasizes the importance of conducting further in-depth investigations into the phytochemical composition of both Dacryodes edulis and Persea americana to gain a comprehensive understanding of their potential applications and benefits.

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