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

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ABSTRACT

The study investigates the comparative analysis of the phytochemical composition of *Dacryodes edulis* and *Persea Americana* seeds collected from Ikot Osurua, Ikot Ekpene Local Government Area of Akwa Ibom State, using standard analytical procedures. The phytochemical compositions of *Dacryodes edulis* and *Persea Americana* seeds exhibit unique variations compared to other plant

species. Notably, the presence of alkaloids, saponins, flavonoids, tannins, and hydrogen cyanide in these seeds demonstrates distinctive phytochemical profiles, as indicated 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). The paper reveals the presence of various phytochemicals in both plant species and different concentrations of alkaloids, saponins, flavonoids, tannins, and hydrogen cyanide in the two seeds, with some concentrations falling below, exceeding, or meeting FAO/WHO standards. The results demonstrate that the concentrations of these phytochemicals vary from the FAO/WHO standards, indicating their potential for pharmaceutical use and defense against pathogens. In conclusion, the study highlights the potential of *D. edulis* and *P. Americana* as sources of valuable supplements.

Keywords: *Phytochemicals , Dacryodes edulis, Persea Americana,pathogens,Supplements*.

Introduction

Persea Americana, 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 increased over the last few years (Whiley & Schaffer, 2002).

Persea Americana, a tropical fruit rich in lipids and minerals, is *a potential* goldmine for the pharmaceutical industry. The plant, abundant in phytochemicals, has been a staple in traditional medicine for treating various ailments, from hypertension to stomach ache.

On the other hand, *Dacryodes edulis*, a rich source of nutrients such as lipids, proteins, and vitamins, is a highly consumed commodity both

locally and internationally, giving it a high economic value.

Persea Americana and *D. edulis*, plants rich in nutritional value and used to manage health problems, have a hidden treasure in their seeds. These seeds, often discarded as waste, are actually a rich source of valuable chemicals.

By extracting these chemicals, we can open up a new revenue stream for various pharmaceutical industries. The seeds are rich in phytochemicals, boasting 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 consumption by insects and other animals (Gruter et al., 2022). Some phytochemicals have been used as poisons, and others as traditional medicine.

Phytochemicals generally 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 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 are carefully selected to ensure accurate and reliable results. These 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, and heating mantle.

The reagents used, such as Methanol, ethanol, NH4OH, Acetic acid, picrate acid, ferric chloride, distilled water, potassium ferro, and Cyanide, are of the highest quality and meticulously handled.

Sample Collection and Preparation

The samples were obtained from a market at Ikot Osurua, Ikot Ekpene Local Government Area. They were then conveyed to the laboratory in nylon, where a botanist authenticated them as *Persea Americana* and *Dacryodes edulis*. The seeds were then removed from the fruits, hed, and sliced into smaller

pieces. The samples were then sundried for some days until completely dried. They were then ground using mortar and pistol into powdered form and 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 with utmost caution until the precipitate was collected, washed with dilute ammonium hydroxides, and 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 20 ml 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. In a mechanical shaker, 50ml of distilled water was added and shaken for one hour. 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.

$$\frac{(\text{Absorbance Test} - \text{Blank})}{\text{concentrated standard}} \times \frac{100}{1}$$

Absorbance standard x Weight of sample

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.

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

Determination of Cyanide glycosides

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

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

Results and Discussion

Table 4.1 shows the result of the comparative study of phytochemical composition in *Dacryodes edulis* seed and *Persea Americana* 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 results above revealed that alkaloids, Saponnins, and hydrogen cyanide were most abundant in *P. Americana* and minor in *D. edulis.* Flavonoids and tannins were most abundant in *D. edulis* and minor in *P. Americana.*The concentration of alkaloids found in *D. edulis* was (18.215 ±0.276) and (21.511 ± 0.157) in *P. Americana*. 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 various 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 (14.120 ±0.170), and in *P. Americana,* it was (19.622 ±0.120). The result reveals that the samples were within the FAO/WHO standard for saponins (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. Compared with the present study's result, it was below the result and below the standard. Saponins are soap-like and have a general property of forming foam in water. They may serve as natural antibiotics, show microbial activities, and are used to treat 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.* The results are below the standard compared with the FAO/WHO standard (15 – 60%).

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 anticancer solid activity and protect against the different levels of carcinogenesis (Kumar & Pandey, 2013).

The concentration of tannins in *D. edulis* seed was (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 them 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). *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 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. They are primarily defense mechanisms against fungal, bacterial, and viral infections and deter insect and animal consumption.

They have been utilized in traditional medicine across different regions to address various human health issues, including metabolic, immunological, and neurological disorders. The potential benefits of these phytochemicals for human health are vast, offering hope for the future of pharmaceutical research.

Recommendations

Based on the research results, the paper strongly recommends that

pharmaceutical industries explore and utilize the phytochemicals found in *Dacryodes edulis* and *Persea Americana* for the development of pharmaceutical drugs and dietary supplements. Furthermore, the study emphasizes the ongoing need for in-depth research into the phytochemical composition of these seeds to fully understand their potential applications and benefits.

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