

Phytochemical Screening and Mineral Analysis of the Pulp of *Dacryodes klaineana* (Pierre) H.J.LAM

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Abstract

African native trees species have been renowned to have health protective properties and uses. Plants roots, barks, leaves, fruit parts and tingles have contributed massively to rural well-being through provision of drugs for the cure of many ailments. A lot of such trees have not been investigated and one of such trees is the *Dacryodes Klaineana*. Consequently the phytochemical screening and Mineral analysis of the pulp of *Dacryodes klaineana* (Pierre) H.J.Lam pulp was investigated via customary chemical methods. Result scoring revealed the presence of secondary metabolites such as flavanoids, tannins, saponins, alkaloids, and cardiac glycosides but free and combined antraquinones were absent. The presence of these secondary metabolites gives authority to the medicinal yield of the fruit pulp. The Mineral analysis of the sample pulp indicated the presence of essential minerals which includes calcium, Magnesium, potassium, zinc, sodium, iron, phosphorus, manganese and copper. These essential minerals contained in the pulp of *Dacryodes klaineana* may play an important role in health and nutrition if incorporated into diet and feed for animals. It is nevertheless recommended that more research on the pharmacological, morphological and biological actions on the fruit pulp and other parts of this tree species be looked extensively looked into.

Keywords

Phytochemical Screening, Mineral Analysis, Dacryodes klaineana and Pulp

1. Introduction

The forest is a domain whose inhabitants are subjugated by plants including medicinal plants. The requirement to study forest plant species according to [1] was based on extensive use of plant portions in folk medicine and offered a basis for the daily living of the people. Superior numbers of African indigenous trees species have been documented to have health defensive properties and uses [2-4]. Plants roots, barks, leaves, fruit parts and tingles have contributed massively to rural wellbeing through provision of drugs for the cure of many ailments [5]. This has led to the continuous research on many plants in Nigeria and around Africa for their medicinal properties. *Dacryodes klaineana* belongs to the family *Burseraceae* and is found majority in Nigeria to Zambia, Angola and commonly planted in other places [6]. The timber of *Dacryodes klaineana* in Nigeria is marketed as 'Orumu-eze' (Edo), Esan call it 'Akpogho'. This species is different for its fewer leaflets, slightly inflorescences and smaller fruits unlike *Dacrodes edulis* [7]. *D. Klaineana* has "tear like" as a drop of gum exuding from the bark when cut. It is dioecious, evergreen, medium-sized tree up to 25-30m tall. The inner bark is pink-brown or red-brown with turpentine smell just as the *D. edulis* [8]. *D. klaineana* flowers at the end of January – February in Nigeria, where the fruits are ripe in May- June. Natural regeneration by seedlings is abundant when heated with fire. The wood is used in construction and for mortars, axe handles and wagons. It has also been recommended for telegraph poles and railway sleepers, and it was also reported that D. Klaineana leaves are used to treat tachycardia and cough [9-11]. The ground leaf is used as enema applied against painful menstruation. The fruit is eaten raw or cooked and it has a high demand in the Eastern part of the country in Nigeria. The pulp is boiled or roasted to yield a kind of butter [8]. It was also reported that D. klaineana has great medicinal and economic values to local population because no part of the plant is toxic [12]. Hence, because the fruits of D. Klaineana are well demanded by the people in the Eastern part of Nigeria and the Edo central zone, there is a need to identify the phytochemicals and minerals present in the fruits of D. Klaineana. This study therefore attempts the qualitative presence of the secondary metabolites present in the fruits pulp of D. Klaineana through preliminary phytochemical screening and mineral analysis of the crude extract.

2. Methodology

The fruits of *D. klaineana* were obtained at Ubiaja, Esan North East of Edo State behind the office of FRIN (Forest Research Institute of Nigeria/Edo State Forestry Office) in June, 2018. It was authenticated by Mr. Daniel Omobhude, the taxonomist of the Moist Forest Research Station. The fruits were collected after dropping, washed and the edible pulp was removed and air-dried for one month at the Research Office, Ubiaja and pulverized to powder and sent to the Bio-medicinal Research Center and Biotechnology laboratory, Forestry Research institute of Nigeria, Ibadan, Oyo State, Nigeria for chemical analysis (Phytochemical screening and Mineral analysis)

2.1. Preliminary Phytochemical Screening

2.1.1. Test for Alkaloids

One gram of powdered sample (1 g) was stirred in 10 mL of 10% (v/v) HCl on a water bath and filtered. The filtrate was divided into three portions; Draggendorff's reagent, Wagner's reagent and Mayer's reagent were added separately to each portion. The formation of precipitate and turbidity was regarded as positive for the presence of alkaloids.

2.1.2. Test for Flavonoids (Lead Acetate Test)

One gram (1g) of the powdered sample was boiled with 10 mL of ethanol

- 1. To 5 mL of the extract was added 2 drops of ferric chloride. A dusty green colour was considered positive.
- 2. To 5 mL of the extract, a small quantity of diluted NaOH was added and drops of concentrated HCl were run down the side of the tube. A reddish colouration indicated the presence of flavonoids.

2.1.3. Test for Tannins (Ferric Chloride Test)

To 1g of the powdered sample was boiled in 10 mL

distilled water, filtered while hot and cooled. The filtrate was adjusted to 10 mL with distilled water. Then, few drops of ferric chloride reagent were added to 1 mL of the filtrate. The mixture was observed for the formation of blue, dark brown, blue black, green or green black colouration or precipitate.

2.1.4. Test for Saponins (Frothing Test)

Distilled water (10 mL) was added to 1 g of the powdered sample in a test tube and boiled for 10 minutes; the sample was filtered while hot and allowed to cool. 2.5 mL of the filtrate was diluted to 10 mL with distilled water and shaken vigorously for 20 minutes. The formation of persistent foam was an evidence of presence of saponins.

2.1.5. Test for Anthraquinones (Borntrager Test)

Free Anthraquinones: The powdered sample (1g) was shaken with 5 mL of chloroform for 10 minutes, it was filtered and 5 mL of 10% ammonia solution was added to the filtrate. The mixture was shaken and the presence of a pink, red or violet colour in the ammonia phase indicated the presence of free anthraquinones.

CombinedAnthraquinonones: one gram (1g) powdered sample was boiled with 5 mL of 10% HCl for 5 minutes and filtered while hot. The cooled filtrate was partitioned against equal volume of chloroform avoiding vigorous shaking. A clean pipette was then used to transfer the chloroform layer to a clean tube taking care not to include the aqueous layer. An equal volume of 10% ammonia was added to the chloroform extract. A pink, red or violet colour in the aqueous layer was considered positive.

2.1.6. Test for Cardiac Glycosides (Keller-Killiani Test)

A powdered sample (1g) was extracted with 10 mL of 80% ethanol for 5 minutes on a water bath. The extract was filtered and diluted with equal volume of distilled water. A few drops lead acetate solution were added, it was shaken and filtered after standing for few minutes. The filtrate was then extracted with aliquots of chloroform; the extract was evaporated to dryness on a steam bath. It was then dissolved in 2 mL of glacial acetic acid containing one drop of FeCl₃ solution in a clean test tube. 2 mL of concentrated sulphuric acid was then poured down the side of the tube so as to form a layer below the acetic acid. The formation of a purple or reddish – brown or brown ring at the interface and a green interface and a green colour in the acetic layer was taken for a positive result.

2.2. Mineral Analysis of *Dacryodes klaineana* Fruit Pulp

The crushed D. *klaineana* fruit pulp was subjected to mineral analysis following a technique described by Haynes and Francis (1993) with modest modifications. Major and trace elemental stuffing were determined using T60 UV-Visible Spectrophotometer, flame photometer and model 210VGD Buck Scientific Atomic Absorption Spectrophotometer mineral elements analyzed for are sodium, calcium, Magnesium, potassium, copper, iron, zinc and phosphorus.

3. Result

Table 1. Phytochemical screening of the Pulp Crude Extract of Dacryodes klaineana.

Phytochemicals	Scoring
Tannins	+
Flavanoids	+
Alkaloids Drangendoff Test	+
Wagner Test	-
Mayer Test	+
Cardiac glycosides	+
Free Anthraquinone	-
Combined Anthraquinone	-
Saponins	+
Flavanoids Alkaloids Drangendoff Test Wagner Test Mayer Test Cardiac glycosides Free Anthraquinone Combined Anthraquinone Saponins	+ + - + + - -

+= Present, - = Absent, ++ = abundant

Mineral analysis of the fruit pulp of D. klaineana

The result of mineral analysis of the *Dacryodes klaineana* (Table 2) revealed the presence of

Macronutrients (Ca, Na, Mg, K and Zn) and micronutrients (Fe, Cu, Mn and P) at varying values

Table 2. Mineral analysis of the seed kernel of D. klaineana in mg/g.

Mineral Element	Value mg/g
Sodium (Na)	0.14±0.04
Calcium (Ca)	1.0±0.25
Manganese (Mn)	0.60±0.11
Pottasium (K)	0.433±0.057
Magnesium (Mg)	0.024±0.09
Copper (Cu)	0.023±0.006
Iron (Fe)	0.70±0.152
Zinc (Zn)	0.20±0.07
Phosphorus (P)	0.16±0.03

±; Standard Error of Mean

4. Discussion

The bioactive compounds present (Flavanoids, Tannins, Saponins, Alkaloids and Cardiac glycosides) in the pulp of Dacryodes klaineana revealed medicinal properties as well as physiological activity [13-15]. The result agrees with the previous findings of [16-18] which showed that pulp of some fruits contain Flavanoids, Tannins, Saponins, Alkaloids and Cardiac glycosides/steriods. Flavanoids are polyhhdroxylates compounds known as antioxidants and are also associated with the treatment and control of cardiovascular diseases and lower the risk of arthritic pains [18-19]. Tannins are known for their antimicrobial, anthelminthic and anti-diarrhea properties [19]. Saponins are innate glycosides that act as hypoglycemic, antifungal and serum cholesterol lowing agents in animals. Alkaloids are versatile compounds vigorous in various ecological interactions, such as defense against bacteria, virus's e.t.c. Consequently plants with alkaloids have antioxidant and anti-inflammatory activities are considered to have curative properties which are beneficial in treating many ailments [20]. Cardiac glycosides are one of the most imperative drugs in therapeutics [21]. The most important use of the cardiac glycosides is its effects

in treatment of cardiac failure because it stimulates systolic contraction of the heart [22].

Essential minerals are excellent reducing agents usually required for all round well-being of the human body. Deficiencies of such essential minerals give rise to diseases in the body. Fruit pulp has being known from time immemorial to contain many of these minerals [23] These essential minerals contained in the pulp of Dacryodes klaineana may play an important role in health and nutrition if incorporated into diet. Calcium was the uppermost macromineral found in the pulp of D. klaineana (1.00±0.25 mg/g). It is used for a diversity of physiological processes such as regulating heart beat, building blood, bones, and hormones [24-26]. Magnesium, Potassium, Zinc and sodium were also found in the fruit pulp. Magnesium is needed for metabolic processes in the body which include energy production, synthesis of biomolecules, balancing hormones and formation of cell membranes and chromosomes in the body. Magnesium helps to maintain proper levels of other minerals such as Calcium, Potassium and Zinc. Sodium and potassium are life sustaining minerals and a very required in diet. They both act as electrolyte in the body and when too high can cause increased blood pressure, fatigue [20, 25]. The pulp of D. klaineana contains zinc which is a macro-mineral that is suitable for teeth and bone formation, cellular metabolic processes in the body, growth and development of the immune system, neurological function and reproduction [23, 25, and 26].

The pulp studied also contained appreciable amounts of micro-nutrients (Iron, Phosphorus, Manganese and copper). This was also found in various pulps of other fruits accessed by [20, 26, and 29]. These minerals help our body perform at its best. Most Individuals suffer from trace mineral deficiency because of eating available diet than healthy diet. Iron is used in red blood cells to carry oxygen to tissues around the body and is also a critical component of many metabolic proteins and enzymes. The functions of manganese include antioxidant activity in the mitochondria, assisting enzymes in metabolism, bone development and wound healing. Copper is a cofactor for certain enzymes drawn in energy making, connective tissue configuration and iron metabolism. Phosphorus is important because it forms a part of the bones in the form of the mineral hydroxyapatite. It is also used in cell membranes as DNA and RNA [23].

5. Conclusion

The evaluation of the Phytochemical and mineral composition of the pulp of *Dacryodes klaineana* showed that the pulp contains medicinal properties metabolites with the indications of the presence of secondary and essential minerals that are useful for man well-being when consumed or used. It is however suggested that more research on the pharmacological and biological activities on pulp and other parts of the tree species be looked into.

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