

Phytochemical Screening and Medicinal Potentials of the Bark of *Dacryodes edulis* (G. Don) HJ Lam

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Abstract

The bark of *Dacryodes edulis* (G. Don) H.J Lam have been used over the years in rural communities across the tropical region for its medicinal potentials. Phytochemicals are bioactive constituents which are produced via secondary metabolism in relatively small amounts. To ascertain the phytochemical components responsible for the ethno-medicinal properties, a qualitative and quantitative screening of the bark of the tree was conducted. The phytochemical screening of the bark of *Dacryodes edulis* was sourced from benin city , south-south Nigeria revealed that alkaloids(18.13 mg/kg), Phenolic compounds (22.01 mg/kg), Flavenoids (60.91 mg/kg), Tannins (18.16 mg/kg), Saponins (3.16 mg/kg), Anthraquinones (12.16 mg/kg), Cardiac glycosides (0.81 mg/kg) and steroids (0.91 mg/kg) were significantly present in the sample. The presence of these phytochemicals gives credence to the medicinal benefits that the bark of this plant has been used for in the past years.

Keywords: *Dacryodes edulis*, Phytochemical screening, Flavanoids, Anthraquinones, Tannins

Introduction

Dacryodes edulis (G. Don) H.J Lam, the African pear, is an evergreen fruit common to the central Africa and the gulf of guinea region [1]. It has a relatively short trunk and a deep dense crown. It attains a height of 18-40 m in the forest but not exceeding 12 m in plantations. *Dacryodes edulis* preferably does well in a shady, humid, tropical forest. However it thrives well adaptively to variations in soil type, humidity, and temperature and day length. The natural range extends from Angola in the south, Nigeria in the North, Sierra Leone in the West and Uganda in the east. It is also cultivated in Malaysia [2]. *Dacryodes edulis* bears fruits which are edible, meanwhile the bark, leaves, stems, and roots are used as local medicine against some diseases [3,4]. The bark of the plant is pale grey in color and rough with droplets of resin [5,6]. The bark decoction is used for treatment of dysentery and anemia. The decoction is also used as a gargle or mouthwash, for tonsillitis, and general oral hygiene [7-9]. Extracts from the root and bark have also been administered from the treatment of leprosy and also the bark and leaves are boiled together and added to many traditional medicines for malaria treatment. The bark is ground and mixed with palm kernel oil for healing injuries. The leaves are compound with 5-8 pairs of leaflets. The flesh of the fruit is dark blue or violet. The results of phytochemical screening of the fruit, seed and leaves has shown the presence of alkaloids, tannins, Saponins, cyanogen glycosides, flavonoids and phytates [10,11].

Phytochemicals are biologically active, naturally occurring chemical compounds found in all the parts of plants, which are useful to humans than those attributed to macronutrient and micronutrients. They protect plants from various diseases and contribute also to plants aroma, flavor and color. In general plant chemicals that protect plant cells from environmental hazards such stress, pathogenic attack, forms of pollution drought and UV exposure are known as phytochemicals. These compounds are known as secondary metabolites and have various biological properties which makes many people in Nigeria use the various plants for medicinal purposes. There are more than a thousand known and unknown phytochemicals. It is also well known that plants produce these chemicals to protect themselves, but recent researches demonstrate that many phytochemicals can also protect

human against diseases. It is for this reason that this study will identify the bioactive components that are responsible for the medicinal properties of *D. edulis*.

The objective of this study was to identify and examine the medicinal benefits of the bark of *Dacryodes edulis* plant.

Materials and Methods

Collection of plant sample

Dacryodes edulis barks were gotten from a much matured tree from a residential area in Benin-City (6° 18.1510' N and 5° 37.2508' E), Edo state, Nigeria. Benin-city is within the tropical rainforest agro-ecological zone of Nigeria. The Bark of the plant was air dried at room temperature for about one month at Moist Forest Research Station, Benin-City.

Processing of plant samples

The air dried bark samples were now pulverised to powder using a ceramic mortar and pestle to obtain a powdered form of the plant were then stored in airtight containers.

Preparation of aqueous extract of plant samples

The aqueous extract from the bark of *Dacryodes edulis* plant sample was prepared by soaking 10 g of powdered samples in 200 ml of distilled water for 12 hr. The extract was then filtered paper or Whitman filter paper (Membrane, Glass, etc.).

Phytochemical analysis

Chemical tests were conducted on the aqueous extract of the bark sample by using standard methods.

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Qualitative Analysis on Phytochemical Constituents

Test for tannins

Half gram of powdered sample of each was boiled in 20 ml of distilled water in a test tube and then filtered. The filtration method used here is the normal method, which includes a conical flask and filter paper. 0.1% FeCl₂ was added to the filtered samples and observed for brownish green or a blue black coloration, which shows the presence of tannins.

Tests for Saponins

Two grams of powdered samples of the plant was boiled together with 20 ml of distilled water in a water bath and filtered. 10 ml of the filtered sample was mixed with 5 ml of distilled water in a test tube and shaken vigorously to obtain a stable persistent froth. The frothing was then mixed with three drops of olive oil and observed for the formation of emulsion, which indicates the presence of Saponins.

Test for flavonoids

A few drops of 1% NH₃ solution was added to the aqueous extract of each plant sample seen in a test tube. A yellow coloration was observed if flavonoids compounds are present.

Test for cardiac glycosides

One ml of concentrated H₂SO₄ was prepared in a test tube. 5 ml of aqueous extract from each plant sample was mixed with 2 ml of glacial CH₃CO₂H containing one drop of FeCl₃. The above mixture was carefully added to the 1 ml of concentrated H₂SO₄ so that the concentrated H₂SO₄ was underneath the mixture. If cardiac glycoside is present in the sample, a brown ring will appear, indicating the presence of the cardiac constituent.

Quantitative Analysis on Phytochemical Constituents

Phenols

The quantity of phenols is determined using the spectrophotometer method. The fat free plant sample was boiled with 50 ml of Ether ((CH₃CH₂)₂O) for 15 mins. 5 ml of the boiled sample was then pipette into 50 ml flask, and 10 ml of distilled water was added. After the addition of distilled water, 2 ml of NH₄OH solution and 5 ml of concentrated CH₃(CH₂)CH₂OH is added to the mixture. The sample is made up to the mark and left for 30 mins to react for color development and measured at 505 nm wavelength using a spectrophotometer.

Cardiac glycosides

The Baljets reagent method was used (95 ml 1% picric acid+5 ml 10% NaOH). One gram of powdered sample was soaked overnight with 70% ethanol and filtered. The extract as purified by lead acetate and Na₂HPO₄ and 1 ml of freshly prepared Baljets reagent is added. The solution is now put in the curvette and read at 495 nm in the UV spectrophotometer.

Alkaloids

Five grams of plant sample is prepared in a beaker and 200 ml of 10% CH₃CO₂H in C₂H₅OH is added to the powdered plant sample. The mixture was covered and allowed to stand for four hours. The mixture was then filtered and the extract is allowed to become concentrated in a water bath until it reaches one-fourth of the original volume. Concentrated NH₄OH is added until the precipitation is complete. The whole solution is allowed to settle and the precipitate was collected and washed with dilute NH₄OH and then filtered. The residue is alkaloid which is then dried and weighed.

Tannins

Quantity of tannins was determined by using the spectrophotometer method. 0.5 g of plant sample is weighed into a 50 ml plastic bottle. 50 ml of distilled water is added and stirred for 1 hr. The sample is filtered into a 50 ml volumetric flask and made up to mark. 5 ml of the filtered sample is then pipette out into test tube and mixed with 2 ml of 0.1M FeCl₃ in 0.1M HCl and 0.008M K₄Fe(CN)₆·3H₂O. The absorbance is measured with a spectrophotometer at 395 nm wavelength within 10 mins.

Saponins

Twenty grams of powdered back of plant sample was put in a conical flask and 100 ml of 20% C₂H₅OH was added to the plant sample. The sample was heated over a hot bath for 4 hr with continuous stirring at about 550°C. The mixture is then filtered and the residue re-extracted with another 200 ml of 20% C₂H₅OH. The combined extracts are reduced to 40 ml over a water bath at about 900°C. The concentrated solution was then transferred into a 250 ml separator funnel and 20 ml of (CH₃CH₂)₂O is added to the extract and shaken vigorously. The aqueous layer is recovered while the (CH₃CH₂)₂O layer is discarded and the purification process is repeated. 60 ml of n-C₄H₉OH is added and the combined n-C₄H₉OH extracts is washed twice with 10 ml of 5% NaCl. The remaining solution is then heated in a water bath and after evaporation; the samples are dried in the oven to a constant weight.

Flavonoid

Ten grams of the plant sample is repeatedly extracted with 100 ml of 80% aqueous methanol at room temperature. The whole solution is then filtered through filter paper and the filtrate is later on transferred into a water bath and solution is evaporated until dryness. The sample is then weighed until a constant weight Table 1.

Results and Discussion

From the table above, *Dacryodes edulis* bark sourced from Benin-city, Nigeria was found to contain alkaloids (18.13 mg/kg), Phenolic compounds (22.01 mg/kg), Flavanoids (60.91 mg/kg), Tannins (18.16 mg/kg), Saponins (3.16 mg/kg), Anthraquinones (12.16 mg/kg), Cardiac glycosides (0.81 mg/kg) and steroids (0.91 mg/kg) were significantly present in the sample.

Alkaloids possess a lot of pharmaceutical activities which includes antihypertensive, antiarrhythmic, antimalarial and anti-cancer functions [12].

Anthraquinones and steroids constituents promote the plant in the treatment of treatment of therapeutic applications as arrow poisons or cardiac drugs as laxatives [13]. The presence of anthraquinones was reported to have anti-oxidant, antimicrobial, anti-viral, anti-malaria and anti-tumor activities [14]. The presence of alkaloids indicates that

Phytochemicals	Qualitative remarks	Quantitative remarks (mg/kg)
Alkaoids	+	18.13
Phenols	+	22.01
Flavenoids	+	60.91
Tannins	+	18.16
Cardiac Glycosides	+	0.81
Saponins	+	3.16
Anthraquinones	+	12.16
Steriods	+	0.91

Table 1: Quanlitative and quantitative analysis of phytochemical constituents of the bark of *Dacryodes edulis* in Benin-city, Nigeria.

the bark of *Dacryodes edulis* can be useful as a muscle relaxant in clinics as reported by Doughari [15]. The presence of flavonoids in plants indicates effects of anti-allergic, anti-inflammatory [16], anti-cancer [17,18], anti-oxidant [19] and hypo-lipidemic effects.

Tannin rich medicinal plants are used to heal a lot of illnesses; such as leucorrhoea, rhinorrhoea and diarrhea. More recently, tannins have gained medical interest, because of the high prevalence of deadly ailments such as AIDS and numerous cancers [20].

In the dyestuff industry, tannins are useful as caustics for dye and ink production. Also, in the food industry, tannins have proved usefulness in the purification of wine, beer and fruit juices and also as coagulants in rubber production [21].

Saponins are responsible for antimicrobial, antifungal, anti-inflammatory, anti-yeast and antidote activities. The function of Saponins in plants generally serves as anti-feedant and to protect the plant against microbes and fungi [22].

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