

# Comparative Analysis of Phytochemical Compounds in Ethanolic Extracts of Leaf, Bark, and Root of *Dacryodes edulis* (G. Don) and their Medicinal Importance

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## ABSTRACT

The leaves, barks, and roots of *Dacryodes edulis*, one of the indigenous tree species commonly found in Africa, were qualitative and quantitative investigated for the presence and amount of phytochemical compounds to ascertain their medicinal usage. Leaves, bark, and roots of *Dacryodes edulis* tree species collected were subjected to both qualitative and quantitative analyses. The collected samples were tested for the presence of tannins, saponins, alkaloids, flavonoids, anthraquinones, mucilages, oses, and holosides, coumarin and reducing sugar using appropriate test kits.

The qualitative results are expressed as (+) for the presence of phytochemicals. The quantitative content of tannins, saponins, alkaloids, flavonoids, anthraquinones, mucilages, oses and holosides, coumarin, and reducing sugar in the barks, leaves and roots of the tree species were analyzed using standard instrumentation methods. The phytochemical screening of extracts of leaves, barks and roots of *D. edulis* revealed the presence of tannins, saponins, alkaloids, flavonoids, anthraquinones, mucilages, oses and holosides, coumarin, and reducing sugar in their samples. The values of the phytochemicals in the leaves are in order of reducing sugar > Tannin > flavonoids > saponin > Alkaloids > coumarin > mucilage > oses and Holosides > anthraquinones while their values in the barks and roots showed the order of reducing sugar > Tannin > saponin > flavonoids > Alkaloids > anthraquinones > oses and Holosides > mucilage > coumarin. The variety and quantity of phytochemical compounds significantly found in the barks, leaves and roots of the *D. edulis* tree species ascertained its medicinal importance.

(Keywords: *Dacryodes edulis*, phytochemical screening, reducing sugar, tannin, saponin, flavonoids)

## INTRODUCTION

The use of plant for traditional medicine is gaining more attention nowadays. Most of the indigenous tree species are being used in healing one or more ailments. Scientific evaluation of ethnopharmacological information from medicinal plants is necessary for the growth, availability, affordability and high safety herbal therapies (Alam et al., 2011). Phytochemicals are referred to as phytonutrients/compounds that are present in different types of plants which are consumed as essential nutrients by human and animal (Edeoga and Eriata, 2001; Kamba and Hassan, 2010). Thus, their presence in any plants is responsible for various uses of plants as medicinal purposes.

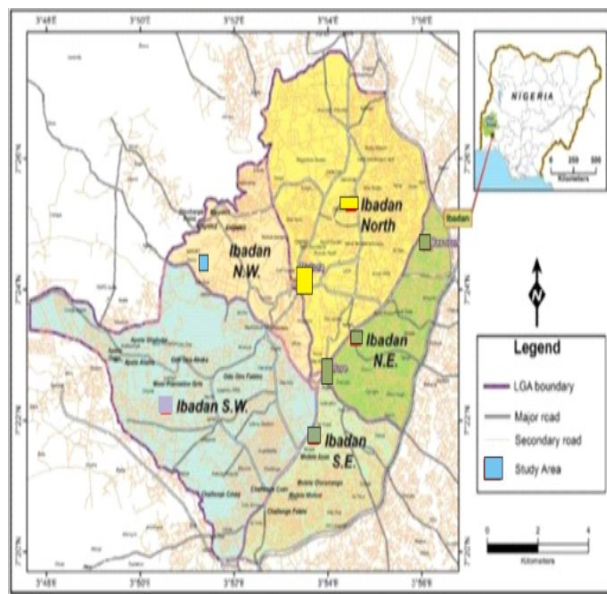
One of such commonly used medicinal plants is *Dacryodes edulis*. It is an evergreen and perennial tree species belonging to the family Buseraseae. The tree preferably grows well in a dappled, humid, tropical forest and in variation of soil types (Ogboru et al., 2015). *Dacryodes edulis* bears fruits which are edible, while the bark, leaves, stems, and roots are used as local medicine against some diseases (Neuwinger, 2000; Jirovetz et al., 2003). The bark of the plant is pale grey in color and rough with droplets of resin (Kapse and Tcheigang, 1996; Kinkela, 2006).

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 (Burkill, 2000; Ajibesin, 2011; Nayak et al., 2015). 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 study thus assessed the qualitative and quantitative of phytochemical compounds in the *Dacryodes edulis* tree parts to ascertain its medicinal usage.

## MATERIALS AND METHODS

### Description of the Study Area

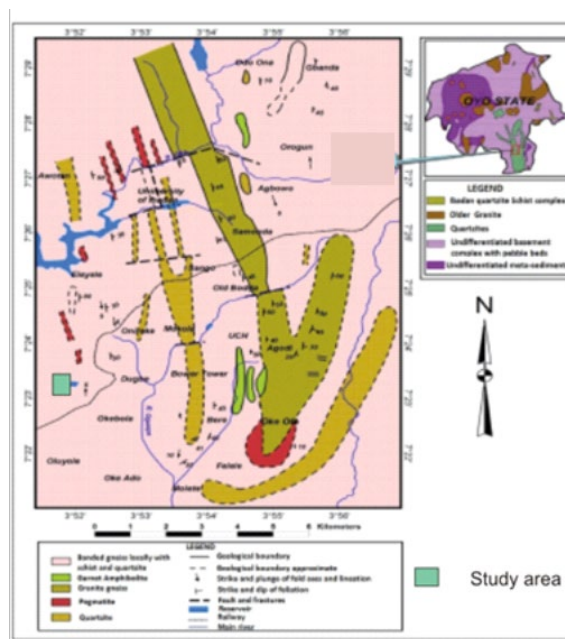
Ibadan city is located between longitude 7°20' and 7°40'E and latitude 3°35' and 4°10'N on the geographical map of Nigeria. Federal College of Forestry is located within Ibadan North West in Oyo State, southwestern Nigeria (Figure 1). Ibadan enjoys two distinct seasons namely, the rainy season between April to October and dry season between November and March. The rainy season is characterized by high rainfall with a mean annual rainfall of about 1237mm (Akintola et al, 2017). The dry season is also characterized by dry dust laden winds originating from the Sahara' desert and experiences occasionally low rainfall. Average temperature reaches a peak of 28.8°C in February and reaches a low of 24.5°C in August.



**Figure 1:** Location Map of the Study Area (Salami et al., 2017).

The study area falls within the tropical rain forest belt of Nigeria characterized by bush, herbs, shrubs, trees, grasses, palm vegetation and comparatively high temperature/plenty of sunshine and rainfall throughout the year. Most of the precipitation is received during the wet season and all the streams are perennial in nature (Akintola et al., 2017). Geologically, the study area fall within the Crystalline Basement Complex

rocks of Nigeria. They comprise igneous and metamorphic units such as gneisses, migmatites including older granite ridges and pegmatite. These rocks either directly exposed or covered by the shallow mantle of superficial deposits (Akintola, 2014). Dominant rock types in the area are quartzite of the Meta sedimentary series (Figure 2).



**Figure 2:** Geological Map of Ibadan Environ. (Amanambu. 2015).

### Collection of Processing of Plant Samples

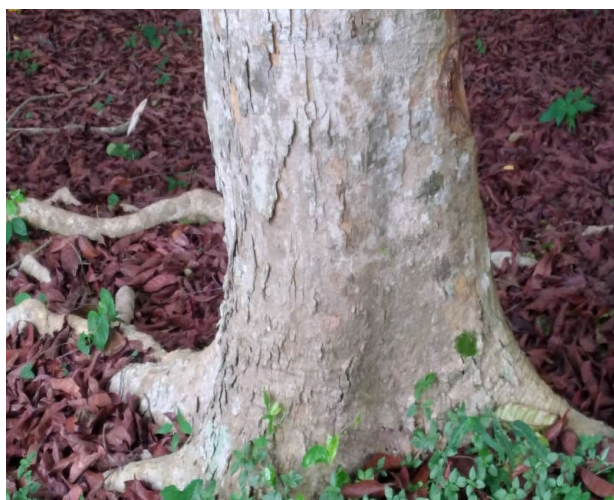
Five samples each of barks, leaves and roots of *Dacryodes edulis* tree species (Plate 1 and 2) were collected from “nursery A” belonging to Federal College of Forestry, Ibadan, Nigeria. Each of the samples were properly put in a brown envelope and labeled accordingly.

Sample of barks, leaves and roots of the three tree species were air dried for two weeks. The air dried samples were pulverized to powder using a ceramic mortar and pestle to obtain a powdered form of the plant were then stored in airtight containers and labeled accordingly for laboratory analysis.. The extract from each of the samples (barks, leaves and roots) of *Dacryodes edulis* trees was prepared by soaking 10 g of each powdered samples in 200 ml of ethanol for 12 hr.

The extract was then filtered paper or Whitman filter paper (Membrane, Glass, etc.).



**Plate 1:** Leaves of *Dacryodes edulis* Tree. (This Study).



**Plate 2:** Bark and Roots of *Dacryodes edulis* Tree. (This Study).

### **Phytochemical Screening (Qualitative) Analysis**

The ethanolic extracts of bark, leaves and roots of *Dacryodes edulis* were tested for the presence of alkaloids, flavonoids, tannins, saponins, anthraquinones, mucilages, oses and holosides, coumarin and reducing sugar using methods described Trease and Evans, 1989; Trease and Evans, 1989; Sofowora, 2008; Roopashree et al.,

2008 and N'Guessant et al., 2009. The qualitative results are expressed as (+) for the presence and (-) for the absence of phytochemicals.

### **Quantitative Determination of Phytochemical Compounds in *Dacryodes edulis***

The total contents of alkaloids, flavonoids, tannins, saponins, anthraquinones, mucilages, oses and holosides, coumarin and reducing sugar in the barks, leaves and roots of *Dacryodes edulis* were analyzed using 6305 UV/Visible spectrophotometer (Wavelength range of 198 to 1000nm, Jenway UK). The procedures used for the analysis were described as follows:

**Determination of Alkaloids:** It was determined using the method described in Akintola et al, (2020). One gram each of the grounded samples of leaf, root, and bark of *Dacryodes edulis* were dissolved with 20 ml of 20% H<sub>2</sub>SO<sub>4</sub> in ethanol (1:1) and filtered. 1 ml of each of the filtrates (leaf, roots, and barks) was put into two different test tubes and 5 ml of 40% H<sub>2</sub>SO<sub>4</sub> was further added and mixed thoroughly. The mixture was covered and allowed to settle for 4 hours before taking the measurement. The measurements were taken using spectrophotometer at 568 nm for the two (leaf, roots, and bark) samples. The procedure was repeated three times and values were recorded.

**Determination of Flavonoids:** Flavonoids were estimated by method described in (Akintola et al, 2020). Two hundred (200) ml of ethyl acetate was added to 1g of each of the sample. The mixture was filtered and 5ml of the filtrate was measured into test tube, followed by addition of 5ml of dilute ammonia and the mixture was thoroughly shaken. The upper layers were collected and the absorbance was measured using spectrophotometer at 490nm. This was done for the leaf, root, and barks of *Dacryodes edulis*. The procedure was repeated three times and the values were recorded.

**Determination of Tannins Content:** Tannins were estimated using the method described in Akintola et al (2020). One gram (1 g) of each of the samples was put in separate conical flask and 10ml of water was added. The mixture was shaken at 5min interval for 30 min and filtered. About 2.5 ml of the filtrate was put in a 50ml flask, 1 ml of Folin-Denis reagent was added into it, followed by addition of Na<sub>2</sub>CO<sub>3</sub>. The

absorbance was read using spectrophotometer at 720nm after 90 min at room temperature. The method was used for the leaf, root and bark of *Dacryodes edulis*. The procedure was repeated three times and the values were recorded.

**Determination of Saponins:** Saponins content in barks, roots, and leaves of the studied tree were estimated using the method described in Akintola et al (2020). 10ml of petroleum ether was added to 1g of each of grounded samples in separate conical flasks. Another 10ml of petroleum ether was added to the mixture and decanted. The mixture was evaporated to dryness and 5ml of ethanol was added. 2 ml of the mixture was put in a test tube, allowed to settle for 30mins and the absorbance was read using spectrophotometer at 550nm. The procedure is repeated three times and the values are recorded.

**Determination of Anthraquinnes:** This was determined using the method of Kuster and Rocha (2004). Grounded samples (1 g each) of leaf, root, and bark of *Dacryodes edulis* were soaked with 100 ml benzene in separate conical flasks for 10 min and filtered. 1 ml of the filtrates was mixed with 5 ml of 70 % H<sub>2</sub>SO<sub>4</sub> in test tubes and allowed to settle for some minutes. The absorbances of the two samples were measured using spectrophotometer at 284 nm. The procedure is repeated three times and the values are recorded.

**Determination of Mucilage Content:** This was determined using the method described by (Akintola et al., 2020). Powder of barks and leaves (10g each) of the studied tree was mixed with distilled water for 6 h and boiled for 30 mins. The mixture was left for 1 hour and filtered through muslin cloth. Ethanol was added to the filtrate to allow mucilage precipitation. The mucilage was separated and dried at temperature of 50 °C. The dried mucilage was then weighed and measured. The procedure was repeated three times and values were recorded.

**Determination of Oses and Holosides:** This was determined using the method described in Akintola et al (2020). Leaves and barks (5 g each) was put in separate conical flasks, mixed vigorously with 100 ml absolute ethanol, mixed and filtered. The filtrates were mixed gently with concentrated H<sub>2</sub>SO<sub>4</sub> (2 ml) in test tubes for 5 minutes and allowed to settle for some minutes. The dissolved Bromohymol (in absolute ethanol) and 2 drops of concentrated H<sub>2</sub>SO<sub>4</sub> was added to

the mixture and allowed to settle for 15 minutes. The absorbances of the mixture were read using spectrophotometer at 510 nm wavelength. The procedure was repeated three times and values were recorded.

**Determination of Coumarins:** This was determined using the method described in Akintola et al. (2020). Distilled water (2 ml) and 0.5 ml of lead acetate solution were added to 0.5 ml extract of each of the samples in separate test tubes and thoroughly mixed. Hydrochloric acid (8 ml) was further added to the mixture and left for 30 minutes at room temperature. The absorbance was measured using spectrophotometer at 320 nm wavelength. The procedure was repeated three times and the values were recorded.

**Determination of Reducing Sugar Contents:** 0.5g of sample was treated with 10ml of 0.80 of ethyl alcohol. 3 ml of 3, 5 dinitro-salicylic acid (DNSA) reagent was added to 3ml of the alcoholic extract in the test tube. The mixture was heated for 5 min in a boiling water bath. 1ml of 0.40 of Rochelle salt was added to the mixture while it was still warm. The mixture was allowed to cool and the absorbances were measured using spectrophotometer at 320nm wavelength. The procedure is repeated three times and the values are recorded.

### **Statistical Analysis**

Data were analyzed statistically using Statistical Package for Social Sciences (SPSS) version 21. Data were represented statistically and graphically. Means were evaluated with a level of significance of P< 0.05.

## **RESULT AND DISCUSSION**

### **Phytochemical Screening**

Phytochemicals are derivative metabolites in plants that aid their capability to overcome the fleeting or importunate duress related to their milieu and are of medical benefit to human (Molyneux et al, 2007). These secondary metabolites used for ethnomedicime have been broadly screened for the presence of phytochemicals by several researchers (Boham and Kocipai-Abyazan, 1994; Obadoni and Ochuko, 2001; Phillipson, 2001; Amadi et al.,

2004; Edeoga et al., 2005; Omale et al., 2010). These phytochemicals according to Samell et al. (2018) act as protective compounds for treatment of persistent diseases such as cancers, hypertension, and diabetes among others.

In this study, the phytochemical screening of ethanolic extracts of leaf, bark and leaf samples of *Dacryodes edulis* tree species (Table 1) revealed the presence of alkaloids, flavonoids, tannins, saponins, reducing sugar, anthraquinones, mucilages, coumarins, oses, and holosides. The wide varieties of these phytochemicals found in the leaves, barks and roots of the studied plants may be responsible for their various ethanomedicinal usages as described by previous researchers.

**Table 1:** Phytochemical Compounds found in *Dacryodes edulis* Tree Parts.

Phytochemical compounds	<i>Dacryodes edulis</i>		
	Barks	Leaves	Roots
Flavonoids	++	++	++
Saponins	++	++	++
Tannins	++	++	++
Alkaloids	++	++	++
Anthraquinines	+	+	+
Mucilages	+	+	+
Oses and Holosides	+	+	+
Coumarin	+	+	+
Reducing sugar	+++	+++	+++

+ means presence of the phytochemicals;  
 ++, +++ means in appreciable quality

The various parts of the tree are used for treatment of numerous ailments (Ajibesin et al., 2008). The bark of the tree is pulped and applied directly to the wound in Garbon and decoction of the bark is taken orally for cure of leprosy. Furthermore, the bark is mixed with meleguette pepper for ailments such as dysentery, anaemia, spitting of blood and as an emmenagogue while its mixture with palm oil is used for pain relieve by applying and robbing it on the affected areas, stiffness and skin diseases (Bouquet, 1968). The resin from the bark of the tree is used in Nigeria for treatment of parasitic skin diseases Ajibesin et al. (2008) while Ekpa (1993) reported that the bark resin can be mixed with lotions and creams for protection and smoothening of skins. Also the smell of the resin is believed to drive evil spirit when liberated through burning Sofowora (2008).

The leaves are chewed with kolanut for antiemetic and the sap of the leaves is used as ear drop for treating ear problems while the leaves are boiled with water to produce vapor for treatment of fever and headache (Ajibesin et al., 2008). The juice from the leaves can be used to treat all kind of skin problems such as scabies, ringworm, wound, rash what-a-view (Igoli et al., 2005).

### **Compounds in *Dacryodes edulis* Tree Parts**

The respective mean contents of phytochemical compounds in the extracts of leaves, barks and roots of *D. edulis* were tannin ( $4.82 \pm 0.35$ ,  $4.95 \pm 0.05$ ,  $5.24 \pm 0.07$ ), saponins ( $3.33 \pm 0.05$ ,  $75 \pm 0.012$ ,  $3.92 \pm 0.016$ ), alkaloids ( $3.12 \pm 0.60$ ;  $2.28 \pm 0.09$ ;  $1.75 \pm 0.24$ ); flavonoids ( $4.46 \pm 0.03$ ,  $3.05 \pm 0.12$ ,  $2.73 \pm 0.61$ ); anthraquinones ( $0.13 \pm 0.002$ ,  $0.23 \pm 0.002$ ,  $0.14 \pm 0.003$ ), mucilages ( $0.17 \pm 0.01$ ,  $0.16 \pm 0.02$ ,  $0.13 \pm 0.01$ ), oses and holosides ( $0.16 \pm 0.002$ ,  $0.22 \pm 0.003$ ,  $0.27 \pm 0.003$ ), coumarin ( $0.16 \pm 0.002$ ,  $0.11 \pm 0.001$ ,  $0.10 \pm 0.001$ ) and reducing sugar ( $112.92 \pm 0.3$ ,  $98.66 \pm 0.14$ ,  $89.65 \pm 0.03$ ) in mg/kg. (Table 1).

The statistical dispersion between the maximum and minimum values (range<2) showed little or no disparity between the values from the phytochemical compounds determined in the leaves, barks and roots of the *D. edulis* tree (Table 2). Also, the standard deviation (<0.5) indicated lower content values of the determined phytochemical contents. This indicated that the values (5 samples each of the leaves, barks and roots) in the statistical data set determined are closer to their mean values (Table 2).

Generally, with the values of range (<2), standard deviation (<0.5) and standard error of means and variance (<1), this implies that all the values of leaves, barks and roots sampled from 5 different *D. edulis* tree showed how the values are concentrated around the mean values determined (Table 2). The skwenees values showed both positive and negative value. The negative skewed values indicated that the mean and median values of the compounds determined in the sampled trees are less than the mode and verse versa for the positively skewed values. However, there is no difference in the values of mean, median and mode from the five samples of the tree parts determined as indicated by the standard error of mean (0.00) of the skweness value as shown in Table 1.

**Table 2:** Descriptive Statistics of the Quantitative Values of Phytochemical Compounds in the Leaves, Barks, and Roots of *D. edulis* Tree.

Tree parts	Phytochemical compounds	Values in mg/ kg						
		Range	Minimum	Maximum	Mean	Standard Deviation	Variance	Skweness
Leaves	Tannins	0.61	4.61	5.22	4.82±0.21	0.35	0.120	1.730±0.00
	Saponins	0.09	3.29	3.38	3.33±0.26	0.05	0.002	0.333±0.00
	Alkaloids	0.21	3.00	3.21	3.12±0.60	0.11	0.011	-1.430±0.00
	Flavonoids	0.10	4.41	4.51	4.45±0.03	0.02	0.003	0.586±0.00
	Anthra quinines	0.04	0.11	0.15	0.13±0.002	0.05	0.000	0.000±0.00
	Mucilages	0.10	0.11	0.21	0.17±0.002	0.05	-1.090	-1.010±0.00
	Oses and Holosides	0.10	0.11	0.21	0.16±0.002	0.05	0.589	0.586±0.00
	Coumarin	0.12	0.11	0.23	0.16±0.002	0.06	0.935	0.935±0.00
	Reducing sugar	1.04	112.41	113.45	112.92±0.30	0.52	-1.150	0.115±0.00
Barks	Tannins	0.12	4.89	5.01	4.95±0.35	0.06	0.004	0.000±0.00
	Saponins	0.40	3.52	3.92	3.75±0.12	0.21	0.043	-1.196±0.00
	Alkaloids	0.31	2.11	2.42	2.28±0.09	0.16	0.025	-0.826±0.00
	Flavonoids	0.41	2.81	3.22	3.05±0.12	0.21	0.045	-1.223±0.00
	Anthra quinines	0.03	0.22	0.25	0.23±0.01	0.02	0.000	0.935±0.00
	Mucilages	0.09	0.12	0.21	0.16±0.02	0.05	0.002	0.935±0.00
	Oses and Holosides	0.07	0.21	0.22	0.22±0.003	0.01	0.000	-1.731±0.00
	Coumarin	0.01	0.11	0.12	0.11±0.001	0.01	0.000	1.730±0.00
	Reducing sugar	0.47	98.44	98.91	98.66±0.14	0.24	0.056	0.680±0.00
Roots	Tannins	0.20	5.11	5.31	5.24±0.07	0.12	0.02	-1.730±0.00
	Saponins	0.30	3.81	4.11	3.92±0.09	0.16	0.03	1.620±0.00
	Alkaloids	1.39	1.22	2.61	1.75±0.24	0.75	0.57	1.610±0.00
	Flavonoids	0.21	2.61	2.82	2.73±0.61	0.11	0.01	-0.940±0.00
	Anthra quinines	0.01	0.14	0.15	0.14±0.003	0.01	0.00	1.731±0.00
	Mucilages	0.03	0.12	0.15	0.13±0.01	0.20	0.00	0.941±0.00
	Oses and Holosides	0.01	0.27	0.28	0.27±0.003	0.01	0.00	-1.731±0.00
	Coumarin	0.00	0.10	0.10	0.10±0.001	0.02	0.00	1.731±0.00
	Reducing sugar	0.11	89.60	89.71	89.65±0.032	0.05	0.003	0.282±0.00

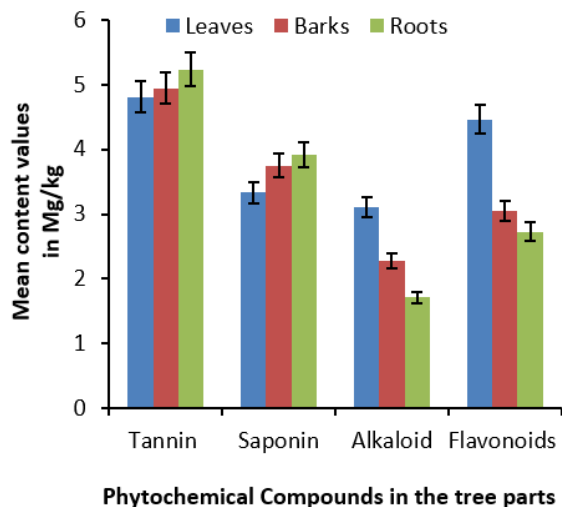
Generally, based on the descriptive statistics value, there is little or no differences among the five trees sampled.

The values of the phytochemicals in the leaves are in order of reducing sugar > Tannin > flavonoids > saponin > Alkaloids > coumarin > mucilage, oses and Holosides> anthraquinnes (Table 1) while their values in the barks and roots showed the order of reducing sugar > Tannin > saponin > flavonoids > Alkaloids > anthraquinnes

> oses and Holosides > mucilage > coumarin (Table 1).

Higher proportions of reducing sugar were found in the leaves, roots and barks of the tested tree (Table 2). The higher mean content value of the reducing sugar was found in the leaves followed by the barks and the roots (Figure 5). There is a significant difference at  $p < 0.05$  in the mean content values of leaves, barks and roots of *D. edulis* tree (Figure 5).

Some researchers stated that mixture of reducing sugars formed a building block in the production of phytoalexins, antimicrobial substances found in plants which accumulate quickly at areas of irreconcilable pathogen infection (Kodera et al, 2002; Dhalel and Markandeya, 2011). Thus, the abundance of reducing sugars in the extract of leaves, barks and roots may account for its high antibacterial action.



**Figure 3:** Comparison of Mean Content Values of Tannin, Saponin, Alkaloid and Flavonoids in the Leaves, Barks, and Roots of *D. edulis* Tree.

Tannin is one of the phytochemical compounds that are found in significant quantity in the roots, barks and leaves of *D. edulis* tree (Figure 3). However, the higher mean content values of tannin are significantly found in roots than the barks and leaves (Figure 3). It has been reported that tannin possesses antiviral, antibacterial, antitumor, diuretic and anti-inflammatory properties (Okigbo et al., 2009; Khanbabaee and Van Ree, 2001).

The tannin rich medicinal plants are used to cure a lot of ailments such as leucorrhoea, rhinorrhea and diarrhea and stressed further that recently, tannins have gained medical attention due to the high prevalence of deadly ailments such as ADIS and numerous cancers (Blytt et al., 1988). Moreover, the compounds have been reported to be used for soothing and skin regeneration. These, thus account for its numerous usages in treating various skin related problems as stated by

several researchers (Ekpa, 1993; Igoli et al., 2005; Ajibesin et al., 2008).

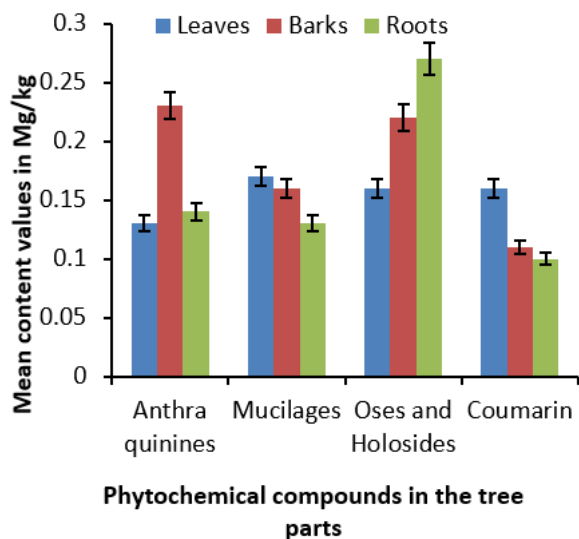
Flavonoids though present in appreciable proportions in the ethanolic extract of leaves, barks and root (Table 2) are more in leaves than barks and roots (Figure 3). Several researchers have reported that the presence of flavonoids in plants is an indication of antimicrobial, indicates effects of anti-allergic, anti-inflammatory anti-cancer, anti-oxidant and hypo-lipidemic effects (Chang et al, 2002; Cushnie and Lamb, 2005; De Sousa et al, 2007; Cushnie and Lamb, 2011; Essiet et al, 2011).

Saponins are the third highest proportions of phytochemicals in barks and roots but fourth in leaves of *D. edulis* tree. Saponins are present in significant amount in the tested samples as shown in Table 2 and Figure 3. They are responsible for antimicrobial, antifungal, anti-inflammatory, anti-yeast and antidote activities. Its function in plants generally serves as anti-feedant as well as protecting the plant against microbes and fungi (Skene and Sutton, 2006). According to Skeikh et al. (2013) and Sodipo et al. (2000) saponins as a phytochemical compound have the ability to coalesce with the cholesterol, impart bitter taste and caused hemolytic activity in water solution and can also be used for fungi infections.

Alkaloids are the fifth phytochemicals in term of quantity (amount of contents) found in leaves, barks and roots of the tested plants. It is found in highest quantity in leaves than in barks and roots (Figure 3). Alkaloids possess a lot of pharmaceutical activities which includes antihypertensive, antiarrhythmic, antimalarial and anti-cancer functions (Ogboru et al., 2015). The presence of alkaloids in the barks of the *Dacryodes edulis* indicated its usefulness as a muscle relaxant in clinics (Doughari, 2012; Ogboru et al., 2015). This further buttresses its usefulness as pain relieve by applying and robbing it on the affected areas, stiffness and skin diseases (Bouquet, 1968).

The mean content of anthraquinones was found to be significantly high in leaves than in the barks and roots of the tree (Figure 4). The anthraquinones constituents promote the plant in the treatment and therapeutic applications as arrow poisons or cardiac drugs as laxatives (Pharkphoom et al., 2009; Firn, 2010) while Demirezer et al. (2001) stated that the presence

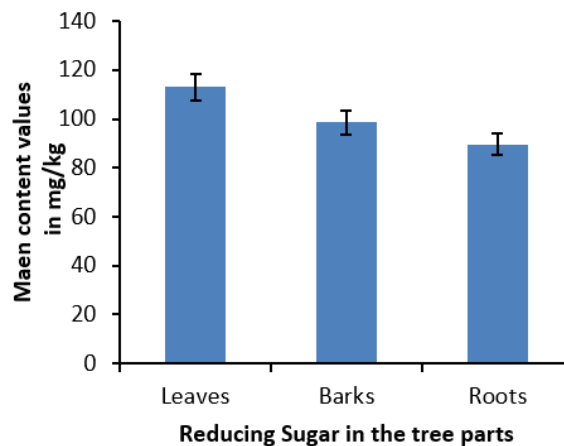
of anthraquinnes was reported to have anti-oxidant, antimicrobial, anti-viral, anti-malaria and anti-tumor activities.



**Figure 4:** Comparison of Mean Content Values of Anthraquinnes, Mucilages, Coumarins, Oses and Holosides in the Leaves, Barks and Roots of *D. edulis* Tree.

Mucilage, coumarins, oses and holosides were also found in small quantities in the leaves, barks and roots extract of the studied tree (Figure 5). The mucilages are favourable in stool firmness and can also prevent sudden dehydration while coumarins, as polyphenon compounds have anti-inflammatory, antimicrobial and anticoagulant properties Somboro et al (2011).

Comparing the results of some of the phytochemical compounds in the barks of the studied tree with the similar study of Ogboru et al, (2015) on the barks of the same tree in Benin city, Nigeria, it was observed that the results determined in this study was lower than the results from the study with the exception of tannins which is a little higher than the previous study of Ogboru et al, (2015). The difference in the content of the determined phytochemical compounds in the two studies may be attributed to the location of study, age of the plants and the method of extractions.



**Figure 5:** Comparison of Mean Content Values of Reducing Sugars in the Leaves, Barks, and Roots of *D. edulis* Tree.

**Table 3:** Comparison of the Results of Some of the Compounds in the Barks of the Studied Tree with the Previous Study.

Phytochemical compounds	Mean content in mg/kg	
	This Study (2020)	Previous study (Ogboru et al, 2015)
Flavonoids	4.95±0.35	60.91
Saponins	3.75±0.12	3.16
Tannins	2.28±0.09	18.16
Alkaloids	3.05±0.12	18.43
Anthraquinines	0.23±0.01	12.16
Mucilages	0.16±0.02	-
Oses and Holosides	0.22±0.003	-
Coumarin	0.11±0.001	-
Reducing sugar	98.66±0.14	-

The numerous presence and appreciable quantities of phytochemical compounds in the leaves, barks and roots of *D. edulis* tree has further confirmed its diverse medicinal usage.

## CONCLUSION

The phytochemical screening/analysis showed that *D. edulis* tree extracts contain mixture of phytochemicals such as alkaloids, flavonoids, tannins, saponins, anthraquinnes, mucilages, oses and holosides, coumarin and reducing sugar as secondary metabolites with potential biological activities.



Thus, the variety and quantity of phytochemical compounds significantly found in the barks, leaves and roots of the *D. edulis* tree species ascertained its medicinal importance.

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