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Quantitative Evaluation of Chemical Constituents of Seeds of *Dacryodes edulis*.

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ABSTRACT

Traditional medicine practitioners in Eastern Nigeria use leaves, roots, seeds and other parts of *Dacryodes edulis* in treatment and management of several disorders. It is necessary to investigate the chemical content of the plant responsible for its medicinal properties. The present study was designed to investigate the proximate, phytochemical, mineral and vitamins composition of seeds of *Dacryodes edulis*. Proximate composition was measured in dried powdered seed sample, while phytochemical, mineral and vitamin analyses were performed on ethylacetate and deionized water extracts. Standard procedures were adopted for all the chemical analyses. The phytochemical analysis of *Dacryodes edulis* aqueous seed extract showed that it contains alkaloids, flavonoids, saponins, tannins, phenols and glycosides. Flavonoids and saponins were significantly ($P < 0.05$) higher in ethylacetate extract than in deionized water extract, the difference between others were no significant ($P > 0.05$). The proximate composition of the seed was ash ($3.00 \pm 0.02\%$), moisture ($10.50 \pm 0.05\%$), crude fibre ($6.00 \pm 0.00\%$), fats ($10.20 \pm 0.01\%$), protein ($2.92 \pm 0.04\%$) and carbohydrate ($67.38 \pm 0.00\%$). The extracts contained Zn, Cu, Mg, Mo, Se, Co, Ca, Na, Mn, and K at concentrations that differed significantly ($P < 0.05$) between the extracts. Vitamins A, B₃, B₉, C and E were found in both extracts, while B₁, B₂ and B₆ were detected in water extract only. There was a significant difference ($P < 0.05$) between vitamin concentrations in the extracts. The biological activities of these chemical content of *Dacryodes edulis* seeds explain their various medicinal applications.

Key words: Phytochemicals, proximate composition, minerals, vitamins, *Dacryodes edulis*.

INTRODUCTION

The use of plants and their products for different purposes has been with man from the beginning. Aside food, plants are often used as medicine (Iwu, 2000; Ogunkunle and Tonia, 2006; Devendran, and Balasubramanian, 2011)[1],[2],[3]. All plants produce chemical compounds as part of their normal metabolic activities. These can be divided into primary metabolites such as sugars and fats found in all plants and secondary metabolites, e.g. alkaloids, tannins, saponins, phenols, etc. These secondary metabolites

and other chemical constituents of medicinal plants account for their medicinal value (Varadarajan *et al.*, 2008)[4]. Medicinal plants often exhibit a wide range of biological and pharmacological activities such as; anti-inflammatory, anti-bacterial and anti-fungal properties (Okwu and Ekeke, 2003; Oladejo *et al.*, 2003)[5],[6]. Extracts, syrups, infusions and concoctions prepared from different parts of these plants are used to remedy different ailments. Such ailments include; typhoid, anaemia, malaria, headache, etc (Okwu, 2005)[7]. In Nigeria many diseases were treated and are still being treated with medicinal plants with success. These diseases include malaria, epilepsy, infantile convulsion diarrhoea, dysentery, bacterial and fungal infections, mental illness, asthma, diabetes, worm infestation, pains and ulcers[8].

Dacryodes edulis, commonly known as African native pear or bush butter fruit plant, and *ube* in Igbo land, is a dioecious, shade loving, evergreen tree, indigenous to the Gulf of Guinea and widely cultivated in other tropical parts of Africa for its fruit. The edible fruit to which the plant owes its principal values is rich source of lipids, vitamins, proteins, minerals and other nutrients. The fruit yields a high content of essential oil. The plant has long been used in the traditional medicine in some African countries to treat various ailments such as wound and skin diseases, dysentery and fever. The extracts and secondary metabolites have been found to show biological activities such as antimicrobial, antioxidant and anti- sickle cell anaemia. The seeds contain oil with considerable nutritional value that can be harnessed to supplement feed for household ruminants (Ajiwe *et al.*, 1997; Adams, 1999; Obasi and Okoli, 1993; Ajibesin, 2005)[9],[10],[11],[12]. The exudates are used in traditional medicine as antibacterial agent and as incense. It is believed that the smoke and sweet smell from the exudates when burning wades off evil spirit [13]

The bark of the plant has long been used to cicatrize wound in Gabon (Ajibesin *et al.*, 2008)[14]. In this case, the bark is pulped and then applied directly to the wound. In Democratic Republic of Congo, the plant is employed for the treatment of diverse ailments. The decoction of the bark is taken orally to treat leprosy. It is also used as gargle and mouth-wash to treat tonsillitis (Bouquet, 1969)[15]. The bark is pulverized with melegueta pepper to cure dysentery, anaemia, and spitting blood; when mixed with palm oil, it is applied topically to relieve pains, debility, stiffness and skin diseases (Bouquet, 1969)[15]. The leaves are chewed with kola nut as an antiemetic. The leaf decoction is prepared to produce vapour that treats fever and headache (Bouquet, 1969). The leaves are often crushed and the juice released to treat generalized skin diseases such as scabies, ringworm, rash and wound, while the stem is employed as chewing sticks for oral hygiene [16].

MATERIALS AND METHODS

COLLECTION OF SAMPLES

The leaves of *Dacryodes edulis* were collected from Amachi community in Abakaliki L. G. A., and were identified by Taxonomists in the Applied Biology Programme of the Department of Biological sciences, Ebonyi State University.

SAMPLE PREPARATION

The *Dacryodes edulis* leaves were air-dried at room temperature. The dried samples were pulverized into fine powder and stored at low temperature (4°C) in air-tight containers.

PREPARATION OF EXTRACTS

Two hundred grams of the powdered leaves of *D.edulis* were soaked in 500ml of deionized water and ethylacetate separately for 24hours. Thereafter, the suspensions were filtered using muslin cloth. The filtrates were then subjected to rotary evaporation to get the semi-solid extracts. The extracts were stored at low temperature (4°C) in air-tight containers until they were used.

PHYTOCHEMICAL ANALYSIS

Quantitative phytochemical analysis was carried out on the extracts using standard procedures of [17],[18].

VITAMINSANALYSIS

Vitamins: Retinol, Ascorbic acid, and Tocopherol contents of the extracts were analyzed using A.O.A.C. (1990)[19] methods, while thiamin, riboflavin, niacin, and folic acid contents were determined using HPLC.

Mineral: mineral compositions were measured using the AAS method described by [20].

PROXIMATE COMPOSITION MEASUREMENT:

The proximate composition of the plant materials was determined by the method of [19].

RESULTS

The quantitative phytochemical analysis of *Dacryodes edulis* aqueous seed extract revealed the presence of alkaloids, flavonoids, saponins, tannins, phenols and glycosides in the extracts. The value of the phytochemicals in the extracts are shown in table I below.

Table I: Phytochemical composition of the extracts

Phytochemical	Water extract (mg/100g)	Ethylacetate extract (mg/100g)
Flavonoids	0.038 ± 0.001	0.07 ± 0.01
Alkaloids	17.83 ± 0.94	10.63 ± 1.12
Saponins	1.67 ± 0.06	3.67 ± 0.57
Tannins	24.50 ± 2.04	25.33 ± 1.96
Phenols	0.17 ± 0.01	0.13 ± 0.01
glycosides	0.14 ± 0.02	0.17 ± 0.01

Values are mean SD; n = 3.

PROXIMATE COMPOSITION OF SEEDS OF *DACRYODES EDULIS*.

The analysis of the proximate composition of the seeds of *Dacryodes edulis* shows that the sample contains Ash, Moisture, crude fiber, crude fat, protein and Carbohydrate. The percentage concentrations of the proximate composition of *Dacryodes edulis* seeds are shown in table 2 below.

Table II: Proximate composition of the seeds.

Component	Content (%)
Ash	3.00 ± 0.46
Moisture	10.50 ± 1.33
Crude fibre	6.00 ± 0.16
Crude fat	10.20 ± 1.03
Protein	2.92 ± 0.10
carbohydrate	67.38 ± 1.88

Values are mean SD; n = 3.

Mineral composition of ethylacetate extract of *Dacryodes edulis* seeds

The result obtained from mineral composition analysis of ethylacetate extract of *Dacryodes edulis* seeds (Fig.1) shows that zinc has the highest concentration of *Dacryodes edulis* seeds (22.33 ± 0.88), followed by magnesium (10.32 ± 0.01), calcium (6.41 ± 0.01), sodium (5.03 ± 0.02), copper (1.31 ± 0.01), manganese (0.71 ± 0.01), molybdenum (0.21 ± 0.01), and selenium (0.11 ± 0.01).

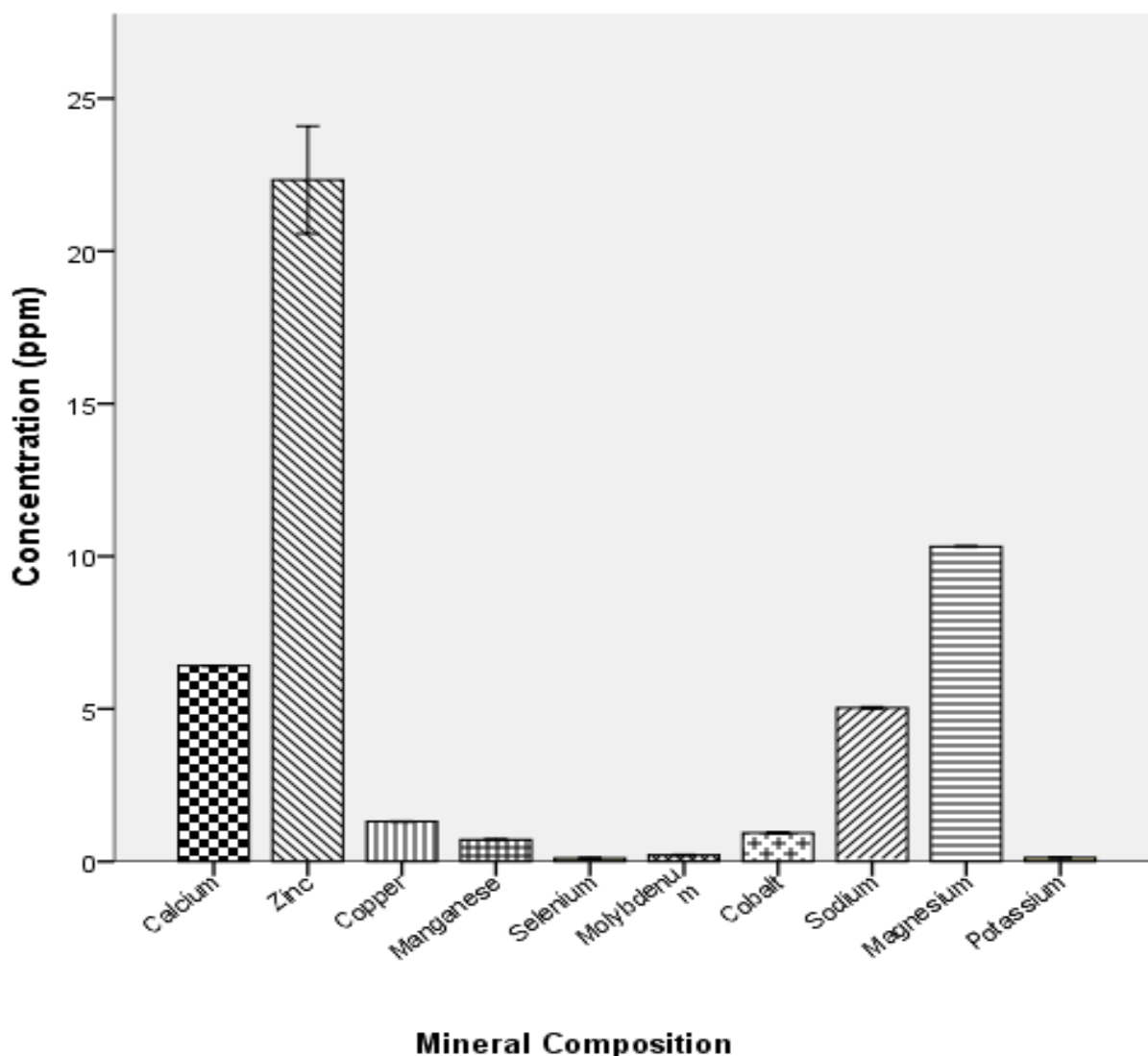


Fig. 1: Mineral Composition of Ethylacetate Extracts of *Dacryodes edulis* Seeds.

MINERAL COMPOSITION OF AQUEOUS EXTRACT OF *DACRYODES EDULIS* SEEDS

Result obtained from mineral composition analysis of aqueous extract of *Dacryodes edulis* seeds (Fig. 2) shows that copper has the highest concentration of minerals in aqueous seed extract of *Dacryodes edulis* (6.13 ± 0.06), followed by zinc (4.20 ± 0.12), cobalt (3.31 ± 0.02), magnesium (3.23 ± 0.11), manganese (2.18 ± 0.02), calcium (2.18 ± 0.01), sodium (2.17 ± 0.12), potassium (0.18 ± 0.01), molybdenum (0.14 ± 0.01), and selenium (0.11 ± 0.01).

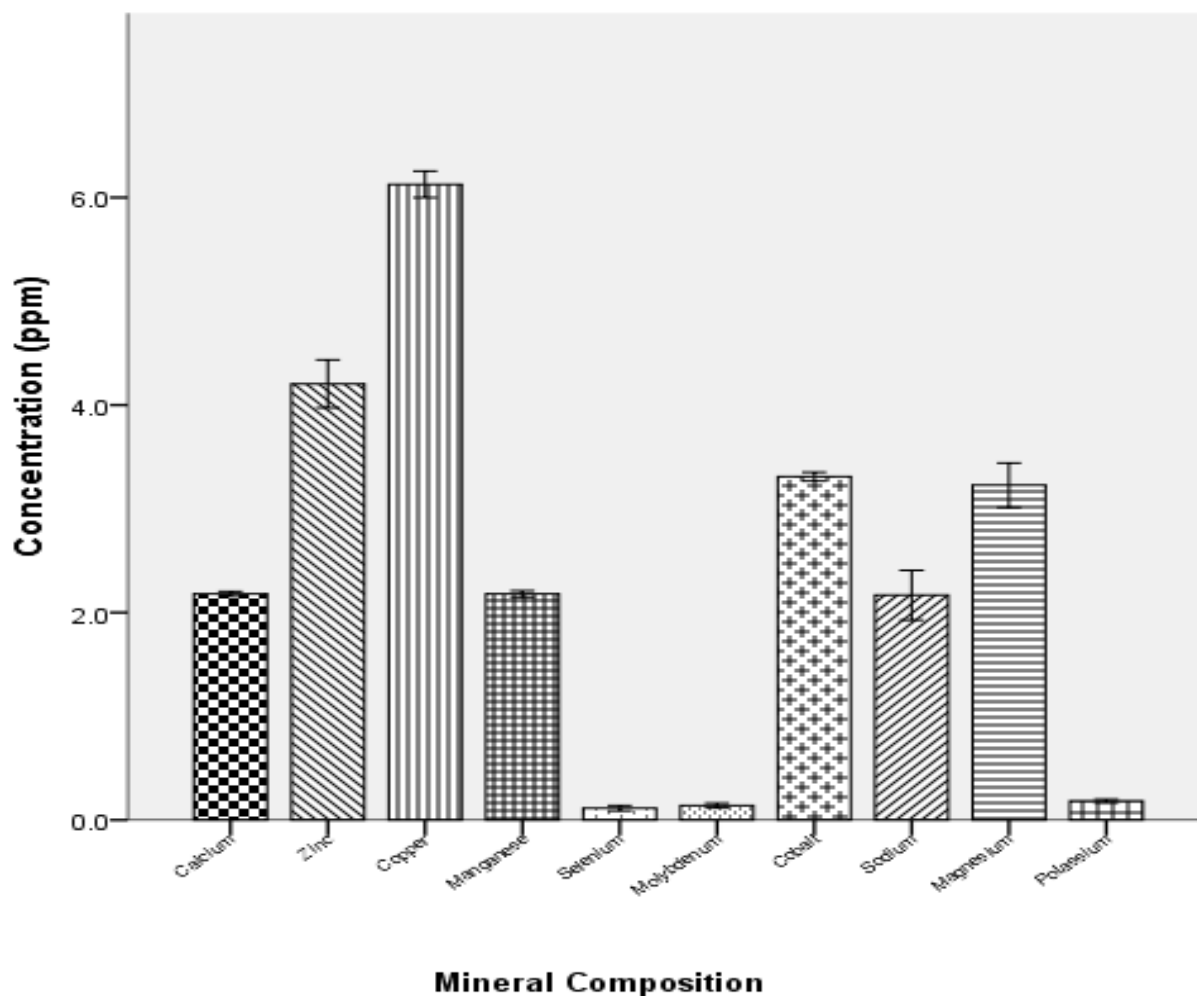


Fig. 2: Mineral composition of aqueous extract of *Dacryodes edulis* seeds.

VITAMIN CONTENT OF THE EXTRACTS:

The vitamin composition of the extracts are shown in table III. Vitamins A, B₃, B₉, C and E were found in both extracts, while B₁, B₂ and B₆ were detected in water extract only.

Table III: Vitamin composition of extracts.

Vitamins	Water seed- extract (mg/100g)	Ethylacetate seed-extract (mg/100g)
Retinol(A)	0.95 \pm 0.100	6.411 \pm 0.017
Thiamine(B ₁)	0.0136 \pm 0.000	ND
Riboflavin (B ₂)	0.0064 \pm 0.000	ND
Niacin (B ₃)	0.0010 \pm 0.000	0.00088 \pm 0.000
Pyridoxine (B ₆)	0.26481 \pm 0.197	ND
Folic acid (B ₉)	0.182 \pm 0.003	0.189 \pm 0.001
Ascorbic acid (C)	0.204 \pm 0.001	0.019 \pm 0.001
Tocopherol (E)	25.63 \pm 0.050	20.22 \pm 0.030

The values are mean \pm SD of triplicate tests. ND= Not detected.

DISCUSSION

Phytochemical analysis results of aqueous and ethylacetate seed-extracts of *Dacryodes edulis* revealed percentage values of the bioactive compounds with significantly ($P < 0.05$) high values of tannins followed by alkaloids, saponins, phenols and flavonoids and lower values of glycosides in the extracts. The presence of phytochemicals in the extracts of seeds of *D. edulis* may be responsible for the applications of the plant extracts in traditional medicine for the treatment of many ailments, including cardiac and renal related disorders. For instance, most diseases affecting the heart and the kidneys are as a result of the oxidative reactions free radicals and antioxidant compounds like phenolic acids, polyphenols and flavonoids scavenge free radicals such as peroxide, hydroperoxide or lipid peroxy and thus inhibit the oxidative mechanisms in nucleic acids, proteins, lipids or DNA and can initiate degenerative disease (Rice-Evans *et al.*, 1997)[18]. Alkaloids have many pharmacological activities including antihypertensive effects (many indole alkaloids), antiarrhythmic effect (quinidine, sparteine), antimalarial activity (quinine), and anticancer actions (dimeric indoles, vincristine, vinblastine) and some alkaloids exhibit stimulant property such as caffeine and nicotine, morphine and are used as analgesic[21].

The results showed the presence of vitamins A, B₁, B₂, B₃, B₆, B₉, C and E in aqueous and ethylacetate extracts of *Dacryodes edulis* seeds. This study revealed that vitamins A, C and E were significantly ($P < 0.05$) higher in all the extracts than other vitamins. Vitamin C is water soluble with antioxidant activities which occur within aqueous medium in the body. It protects low density lipoprotein cholesterol against free radical damage and also it protects the body from cancer development, cardiovascular disease and aging processes (Adams *et al.*, 1999)[10]. The result revealed the presence of Na, Mg, Ca, Zn, Cu, K, Se, Mn and Co in the extracts. The concentration of Na, Mg, Ca and Zn were significantly ($P < 0.5$) higher than other minerals in all the extracts with Na having the highest concentration. Calcium is a co-factor that helps to maintain proper blood pressure and blood clotting. Increasing calcium intake in our diet is believed to lower high blood pressure and prevent heart disease[22].

The result on proximate analysis showed the presence of carbohydrate, protein, fat, moisture content, ash and fibre in the extracts. The concentration of carbohydrate is significantly ($P < 0.05$) higher than other proximate components in the seeds of *Dacryodes edulis*. The high carbohydrate content of the plant seeds is an indication that the plant can serve as a source of energy added to their medicinal value. The ash content also shows that they are important source of minerals.

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