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Physico-chemical properties of Safou (*Dacryodes edulis*) fruits grown in Côte d'Ivoire

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ABSTRACT

Objectives: *Dacryodes edulis* is tropical multi-purpose tree, which produces fruits for human consumption. Unfortunately, this fruit grown in Côte d'Ivoire is still unknown to the public and is the subject of very few studies. The present study aims to characterize *D. edulis* fruits starting from their morphological to chemical properties.

Methodology and Results: Ripe fruits were collected from 3 sites (CNRA-Azaguié, Azaguié-Blida and Grand-Morié). The morphological characteristics measured (weight, length, diameter and pulp thickness) and identified 2 Ivorian safou varieties: *D. edulis* var. *edulis* and *D. edulis* var. *parvicarpa*. The proximate composition was as follow: moisture (43.02-46.80%), protein (18.66-20.20%), lipid (48.39-52.66%), ash (0.83-1.40%), crude fibre (2.70-3.13%), carbohydrate (14.66-17.82%) and vitamin C (3.06-3.36%). Based on the mineral analysis, the results showed that the most abundant mineral was calcium (531.31-1337.02 mg/kg), followed by potassium (552.39-646.05 mg/kg), zinc (130.48-136.18 mg/kg), sodium (51.54-108.01 mg/kg), magnesium (23.13-73.18 mg/kg), manganese (25.96-26.86 mg/kg) and iron (4.91-8.67 mg/kg). Most of high levels of nutrient content were observed in *D. edulis* var. *edulis*.

Conclusions and application of findings: *Dacryodes edulis* fruits are potential source of essential nutrient for Ivorian people and its oil could be used to develop cosmetic products.

Keywords: *Dacryodes edulis*, variety, morphological characteristic, proximate composition, mineral composition.

INTRODUCTION

The African pear tree (*Dacryodes edulis* (G.Don) H.J.Lam; Burseraceae) is a tropical oleiferous fruit tree that possesses enormous potential in Africa (Kengué, 1990). Various parts of the tree are used in traditional medicine (Okafor, 1983; Duru *et al*., 2012). The wood serves for firewood and carpentry (NDoye *et al*., 1997). The entire tree is used in Agro-forestry systems for soil conservation, fertility, shade and apiculture (Ndangang, 1989). *Dacryodes edulis* fruit or safou is popular in the diets of many Africans. It can be eaten raw, roasted or boiled in hot water, and is eaten alone or used in garnishing cooked or roasted maize. It could also be used as butter to eat bread (Duru *et al*., 2012). Indeed, the pulp of safou

cooked and seasoned serves spread (from Cameroon recipe). According to Ayuku *et al*. (2000), *D. edulis* has a potential to improve nutrition and food security. During the last three decades, more and more studies have been conducted on safou (*D. edulis*), essentially the tree and its fruit. The scientific researches on *D. edulis* focused on the characterization of propagation techniques of *D. edulis* tree (Kengué, 2002), the nutritive value of its pulp and its oil (Ajayi *et al*., 2006), and the oil extraction processes (Kapseu, 2009). These studies revealed excellent nutritional qualities of fruit pulp and interesting food processing properties of the oils extracted from the pulp and kernel safou (Poligui *et al*., 2013). These have also revealed the importance of this fruit nutritionally, therapeutically and cosmetic. The pulp, the only edible part of the fruit is particularly rich in lipids, indicated that safou could be an important source of oil (Ondo-Azi *et al*., 2013). Besides lipids, safou pulp contains substantial amounts of many other nutriments including proteins, carbohydrates, minerals, vitamins and fibres (Poligui *et al*., 2013). Because of domestication, safou has widespread in tropical Africa, but with the largest concentration in Central Africa (Cameroon, Gabon, Democratic Republic of Congo and Congo) where it is much cultivated. In Côte d'Ivoire, the first safou (*D. edulis*) trees were introduced before 1960s but disappeared (Bourdeaut, 1971). The second introduction of safou trees comes from Cameroon safou seeds in 1980 (Sonwa *et al*., 2002). The specific taxa existing in safou (*D. edulis*) are not clearly differentiated in Côte d'Ivoire. However, few scientific works have been published either on the physiology of the African pear tree or on the physicochemical characteristics of its fruit. This study investigated the morphological characteristics, proximate nutrient and mineral content of safou (*D. edulis*) fruits grown in Côte d'Ivoire in order to establish the classification of Ivorian safou fruits and provide information necessary for their wider use.

MATERIAL AND METHODS

Collection of plant material: Ripe fruits of safou (*D. edulis*) were collected from three localities of the Agneby region in South-East of Côte d'Ivoire (Azaguié, Azaguié-Blida and Grand-Morié) **(Figure 1)**. For fruit classification test, 5 trees were selected randomly and separately from the CNRA (National Agricultural Research Centre) Azaguié and Azaguié-Blida. Ten (10) trees were randomly selected from Grand-Morié. On each tree, 10 fruits were collected. A total of 200 fruits were used in this study. After the classification test, 3 samples (1 kg) of each safou variety were collected from each site for chemical analysis. A total of 18 samples were the subject of this study. For each collection, the safous were harvested at maturity from the trees, and packaged in bags in nets. They were immediately transported to the laboratory for further analysis.

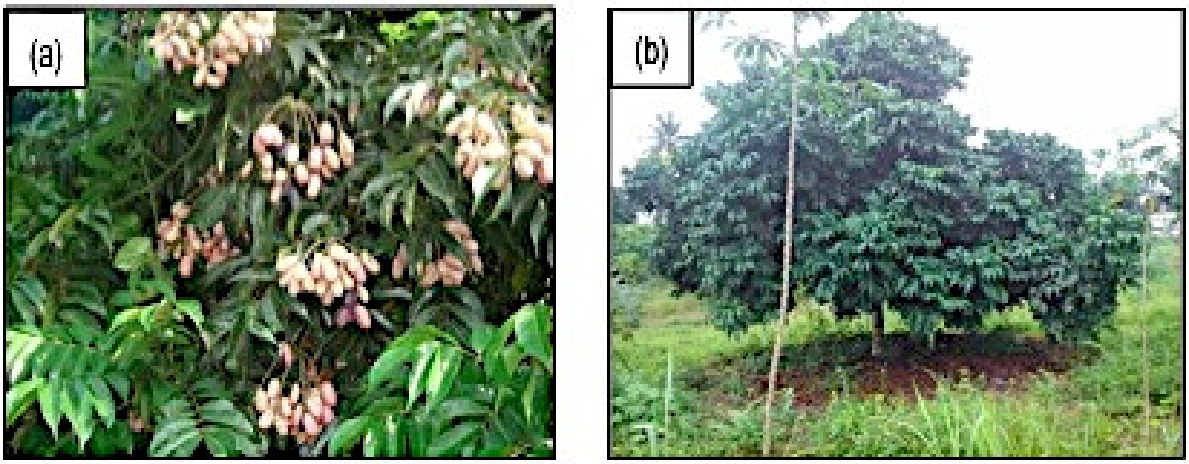

Figure 1: Safou (*Dacryodes edulis*) fruits (a) on tree (b) in Côte d'Ivoire

Morphological characteristics of safou (*D. edulis*) fruits: The diameter and length of fruit were determined using a Junior Roche-type calliper. The weight of the whole fresh fruit was obtained using a Mettler Toledo balance (Switzerland, accuracy 0.01). Each fruit was then pulped using a stainless steel knife. The length and weight of seed were also determined. Then, the pulp thickness was measured.

Sample preparation: The ripe fruits of each variety from safou (*D. edulis*) were thoroughly washed with distilled water and split open with a sharp knife to remove the seed from the pulp. Then the pulp obtained was ground into flour using a blender. The ground material obtained was used to perform chemical analyzes.

Physico-chemical analysis: Proximate analysis was carried out using the standard procedures of AOAC (2000). Moisture content was determined by drying in an oven at 103±2°C during 4 h to constant weight (NF standard V 04-348; AOAC, 2000). Ash content was assessed by incinerating dried samples in a muffle furnace at 550°C for 4 h (ISO 6884.28; AOAC, 2000). Protein content was calculated from nitrogen contents (N x 6.25) obtained using the Kjeldahl method (ISO 5983-1; AOAC, 2000). Lipid content was determined by the Soxhlet extraction method using hexane as solvent. Crude fibre content was estimated from the loss in weight of the crucible and its content on ignition. Carbohydrate content was determined by difference that is by deducing the mean values of other parameters (moisture, ash, protein and lipid) that were determined from 100. Vitamin C content was determined by titration with colorimetric method (NV 05-115; AOAC, 2000).

Mineral composition analysis: Minerals of safou (*D. edulis*) flour, such as iron (Fe), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), manganese (Mn) and zinc (Zn) were determined using atomic absorption spectrophotometer burner (AAS) (Varian, China) as described by AOAC (2000). The mineral constituents were determined by dried-ashing 10 g of the pulp in a muffle furnace at 550°C for 5 h until a white ash was obtained. Flour was acid-digested with a mixture of hydrochloric acid (6M) and nitric acid (0.1M). The filtrate was analyzed for various metal ions by AAS using cathode lamp.

Statistical analysis: All analyses reported in this study were carried out in triplicates. Mean value and standard deviation were calculated. Data were assessed by analysis of variance (ANOVA) and Duncan Multiple Range analysis (p=0.05), with the software Statistica 7.1 (Stat Soft Inc, Tulsa USA Headquarters). The correlation between the various parameters was examined by Principal Component Analysis (PCA) with the ADE4 Software.

RESULTS

Morphological characteristics of safou (*Dacryodes edulis*) fruits: The fruits length varied from 4.32 to 6.25 cm. Safou diameter ranged from 2.43 to 3.35 cm. The weight of safou ranged from 25.78 to 44.38 g. The thickness of the pulp fruits ranged from 0.15 to 0.22 cm. The length of seed from safou ranged from 3.15 to 4.10 cm. The weight of seed varied from 7.65 to 13.20 g. No significant difference (p=0.05) was observed in the different morphological characteristics studied between the trees 1, 6, 7, 8, 10, 11, 13 and 20. There is also no significant difference in the same parameters studied between the trees 2, 3, 4, 5, 9, 12, 14, 15, 16, 17, 18 and 19. **Table 1** shows the morphological characteristics of safou (*D. edulis*) fruits from Côte d'Ivoire.

Table 1: Morphological characteristics of safou (*Dacryodes edulis*) fruits*

Site	Tree	LF (cm)	DF (cm)	WF (g)	TP (cm)	LS (cm)	WS (g)
CNRA	T1	6.12±0.23^a	3.16±0.15^a	43.84±4.75^a	0.22±0.04^a	3.89±0.17^a	12.65±1.83^a
Azaguié	T2	4.59±0.26^b	2.86±0.29^b	26.94±3.93^b	0.17±0.04^b	3.20±0.27^b	8.72±0.87^b
	T3	4.46±0.51^b	2.76±0.13^b	26.42±4.42^b	0.15±0.05^b	3.17±0.31^b	7.78±1.57^b
	T4	4.32±0.19^b	2.43±0.16^b	25.78±3.75^b	0.15±0.03^b	3.15±0.23^b	7.65±1.46^b
	T5	4.42±0.22^b	2.65±0.18^b	26.23±3.95^b	0.15±0.05^b	3.17±0.22^b	7.70±1.21^b
Azaguié - Blida	T6	6.23±0.25^a	3.32±026^a	44.38±4.23^a	0.22±0.05^a	4.08±0.21^a	13.15±1.54^a
	T7	6.17±0.28^a	3.21±0.16^a	43.95±3.34^a	0.21±0.04^a	3.95±0.16^a	12.97±1.34^a
	T8	6.20±0.18^a	3.27±0.15^a	44.15±4.12^a	0.22±0.04^a	3.99±0.28^a	13.03±1.35^a
	T9	4.37±0.20^b	2.56±0.18^b	26.16±4.87^b	0.15±0.04^b	3.15±0.17^b	7.70±1.75^b
	T10	6.16±0.21^a	3.22±0.26^a	43.96±3.86^a	0.21±0.05^a	3.92±0.29^a	12.95±1.15^a
Grand Morié	T11	6.12±0.19^a	3.18±0.22^a	43.87±4.13^a	0.21±0.05^a	3.91±0.21^a	12.72±1.49^a
	T12	4.55±0.23^b	2.81±0.24^b	26.87±3.97^b	0.17±0.04^b	3.18±0.15^b	8.25±1.57^b

	T13	6.18±0.21[a]	3.21±0.17[a]	44.09±4.17[a]	0.21±0.05[a]	3.99±0.32[a]	12.95±1.34[a]
	T14	4.52±0.17[b]	2.79±0.28[b]	26.76±3.90[b]	0.17±0.04[b]	3.16±0.35[b]	8.17±1.81[b]
	T15	4.34±0.28[b]	2.55±0.16[b]	26.11±4.16[b]	0.15±0.04[b]	3.15±0.25[b]	7.69±0.97[b]
	T16	4.44±0.23[b]	2.65±0.21[b]	26.39±3.82[b]	0.16±0.05[b]	3.17±0.18[b]	7.75±1.45[b]
	T17	4.57±0.25[b]	2.85±0.12[b]	26.92±4.22[b]	0.17±0.05[b]	3.20±0.29[b]	8.65±1.22[b]
	T18	4.55±0.51[b]	2.78±0.25[b]	26.87±3.54[b]	0.17±0.05[b]	3.17±0.19[b]	8.70±1.35[b]
	T19	4.36±0.19[b]	2.66±0.15[b]	26.17±3.12[b]	0.16±0.04[b]	3.15±0.15[b]	7.98±1.54[b]
	T20	6.25±0.43[a]	3.35±0.22[a]	44.27±4.31[a]	0.22±0.04[a]	4.10±0.31[a]	13.20±1.25[a]

* Values given are mean ± standard deviation of triplicate determination. Means with different letters within the same row denote significant differences among cultivars (p=0.05).
T = tree; LF = length of fruit; DF = diameter of fruit; TP = Thickness of pulp; WF = weight of fruit; LS = length of seed; WS = weight of seed.

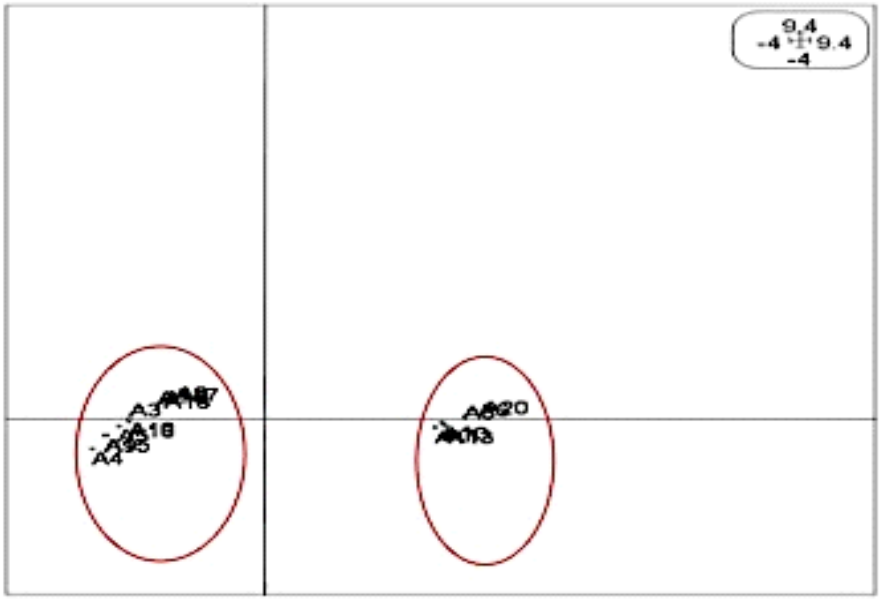

Figure 2: Variety of *Dacryodes edulis* fruits
1 = fruits of small sizes; 2 = fruits of large sizes

Principal Component Analysis (PCA) was used to visualize the variation in the morphological characteristics among Ivoirian safou (*D. edulis*) fruits of different trees **(Figure 2)**. This analysis showed two distinct groups of trees. The first group at left of the graph refers to the range 1 which contains trees with small fruits (length: 4.32-4.9 cm; diameter: 2.43-2.86 cm) and the second group at right of the graph refers to the range 2 which trees with large fruits (length: 6.12-6.25 cm; diameter: 3.16-3.35 cm).

Chemical composition of safou (*Dacryodes edulis*) fruits: The chemical composition of safou (*D. edulis*) fruits is showed in **Table 2**. The moisture content of fruits varied from 43.02 to 46.80%. The protein, carbohydrate and lipid contents ranged from 18.66 to 20.20%, from 14.66 to 17.82% and from 48.39 to 52.66%, respectively. The ash, crude fibre and vitamin C contents of fruits ranged from 0.83 to 1.40%, from 2.70 to 3.13% and 3.06 to 3.36%, respectively. There is no significant (p=0.05) difference between the two safou varieties in all chemical composition, excepted for lipid and oil contents. The levels of lipid and oil content were found to be higher in safou fruits from *D. edulis* var. *edulis* and *D. edulis* var. *parvicarpa*.

Mineral composition of safou (*Dacryodes edulis*) fruits: The mineral composition of safou (*D. edulis*) fruits is presented in **Table 3**. The results showed that safou fruits represent potential sources in mineral such as calcium (531.31 - 1337.02 mg/kg), potassium (552.39 - 646.05 mg/kg), zinc (130.48 - 136.18 mg/kg), sodium (51.54 - 108.01 mg/kg), magnesium (23.13 - 73.18 mg/kg), manganese (25.96 - 27.38 mg/kg) and iron (4.91

- 8.67 mg/kg). The mineral contents in *D. edulis* var. *edulis* were found to be relatively higher than those of *D. edulis* var. *parvicarpa*, excepted for potassium levels. However, no significant difference was observed for manganese and zinc levels between the two varieties from safou (*D. edulis*) fruit.

Table 2: Proximate composition of safou (*Dacryodes edulis*) fruits*

Parameter (%)	CNRA Azaguié		Azaguié - Blida		Grand Morié	
	Var. *pavicarpa*	Var. *edulis*	Var. *parvicarpa*	Var. *edulis*	Var. *parvicarpa*	Var. *edulis*
Moisture	43.02±1.58^{a}	46.80±1.20^{a}	44.80±0.95^{a}	45.16±0.52^{a}	45.00±1.12^{a}	45.73±0.63^{a}
Protein	20.20±1.69^{a}	18.94±2.13^{a}	19.40±1.30^{a}	19.23±0.76^{a}	20.18±1.81^{a}	18.66±1.75^{a}
Lipid	48.72±1.69^{a}	52.01±3.45^{b}	49.05±0.69^{a}	51.22±0.86^{b}	48.39±0,40^{a}	52.66±1.49^{b}
Ash	1.03±0.28^{a}	1.26±0.12^{a}	0.90±0.11^{a}	0.83±0.08^{a}	0.96±0.12^{a}	1.40±0.10^{a}
Crude fibre	2.96±0.34^{a}	2.86±0.18^{a}	2.70±0.20^{a}	3.06±0.16^{a}	3.13±0.27^{a}	2.83±0.06^{a}
Carbohydrate	17.17±1.90^{a}	14.75±1.73^{b}	17.82±1.19^{a}	15.03±0.45^{b}	17.38±0.28^{a}	14.66±0.15^{b}
Vitamin C	3.23±0.08^{a}	3.36±0.03^{a}	3.06±0.03^{a}	3.23±0.13^{a}	3.36±0.03^{a}	3.06±0.06^{a}

* Values given are mean ± standard deviation of triplicate determination. Means with different letters within the same row denote significant differences among cultivars (p=0.05).
Var. *parvicarpa* = *Dacryodes edulis* var. *parvicarpa*; Var. *edulis* = *Dacryodes edulis* var. *edulis*

Table 3: Mineral composition of *D. edulis* fruits*

Minerals (mg/kg)	CNRA Azaguié		Azaguié - Blida		Grand Morié	
	Var. *pavicarpa*	Var. *edulis*	Var. *parvicarpa*	Var. *edulis*	Var. *parvicarpa*	Var. *edulis*
Calcium	531.97±5.87^{a}	1307.66±37.75^{b}	531.31±4.97^{a}	1321.56±18.62^{b}	533.41±2.97^{a}	1337.02±16.01^{b}
Potassium	646.05±2.85^{a}	552.39±15.62^{b}	642.69±1.03^{a}	569.20±6.77^{b}	645.89±2.22^{a}	563.90±9.86^{b}
Sodium	51.57±0.97^{a}	108.01±2.91^{b}	51.54±1.05^{a}	104.42±1.06^{b}	53.69±0.29^{a}	107.17±1.59^{b}
Magnesium	25.14±1.08^{a}	71.95±1.63^{b}	23.13±0.23^{a}	73.18±0.69^{b}	26.70±0.61^{a}	73.12±1.04^{b}
Iron	5.97±1.07^{a}	8.50±0.48^{c}	4.91±0.09^{a}	7.71±0.24^{bc}	6.06±0.57^{ab}	8.67±0.24^{c}
Manganese	26.66±0.39^{a}	26.31±0.55^{a}	26.86±0.45^{a}	27.38±0.27^{a}	25.96±0.36^{a}	26.17±0.51^{a}
Zinc	134.09±5.08^{a}	133.34±2.88^{a}	132.63±3.46^{a}	130.48±1.82^{a}	133.51±3.34^{a}	136.18±4.33^{a}

* Values given are mean ± standard deviation of triplicate determination. Means with different letters within the same row denote significant differences among cultivars (p=0.05).
Var. *parvicarpa* = *Dacryodes edulis* var. *parvicarpa*; Var. *edulis* = *Dacryodes edulis* var. *edulis*

DISCUSSION

Morphological characteristics as criteria of safou (*Dacryodes edulis*) classification determined in this study showed a broad variability among fruits from Côte d'Ivoire. This result could be explained by the extreme diversity of fruit shapes and sizes. Indeed, according to Kengué (2002), safou dimensions vary between 3 and 18 cm, and the shape can be oblong, conical, oval and spherical, with longitudinal grooves or shoulders. All morphological characteristics (length, diameter, weight, thickness) values obtained for Ivorian safou (*D. edulis*) were in agreement with those reported in literature (Onuegbu and Ihediohanma, 2008; Poligui *et al.*, 2013; Youmbi *et al.*, 2010). Indeed, physical characteristics on a large-scale samples of safou from Cameroon, Gabon and Nigeria, ranged from 3.98 to 8.07 cm for length, 3.09 to 3.60 cm for diameter and 34.56 to 47.28 g for weight from safou fruits; while for the safou seeds, they ranged from 4.00 to 4.70 cm for length and 5.96 to 14.03 g for weight. The Principal Component Analysis (PCA) revealed two distinct groups of Ivorian safou trees based on their physical parameters studied. This discrimination showed that the first tree group with small fruits (length: 4.32-4.9 cm; diameter: 2.43-2.86 cm) represents var. *parvicarpa* and the second tree group with large fruits (length: 6.12-6.25 cm; diameter: 3.16-3.35 cm) represents var. *edulis*. According to Okafor (1983), there are two safou varieties: *D. edulis* var. *edulis* and *D. edulis* var. *parvicarpa*. Var. *edulis* is characterized by large fruit usually more than 5x2.5 cm, with a thick pulp about 3.5-9 mm. Conversely, var. *parvicarpa* is characterized by small fruit usually less

than 5x2.5 cm, with a thin pulp about 2-3.5 mm. The moisture content of food is an indication of its water activity (Olutiola *et al*., 1991). Ikewuchi and Ikewuchi (2009) showed that the moisture in food is of great importance because it is involved in several biochemical and physiological reactions that occur in these foods. The moisture contents (43.02 to 46.80%) obtained in safou (*D. edulis*) fruits were higher than those obtained by Youmbi *et al*. (2010) and Duru *et al*. (2012) in the same species from Cameroon (31.27%) and Nigeria (32.10%), respectively. The highest value observed in safou (*D. edulis*) fruits could explain the perishable nature of these fruits and their rapid degradation. The crude protein contents of safou (*D. edulis*) fruits ranged from 18.66 to 20.20%. These values were similar to those of safou (*D. edulis*) fruits from Gabon (14-30%) (Poligui *et al*., 2013), but lower to that reported by Omoti and Okyi (1987) from Nigerian safou (25.90%). This rate will make significant contribution to diet in ameliorating protein malnutrition. According to Bratte (2011), a meal of safou and starches (cassava, bread) is a balanced ration. The carbohydrate content in safou (*D. edulis*) fruits varied from 14.66 to 17.82%. These levels suggest that safous are good sources of calories. However, the values obtained in this study were lower to those found by Ondo-Azi *et al*. (2013) in safou fruits from Gabon (30.91%). Safou (*D. edulis*) fruits contained high lipid level (48.39 to 52.66). Similar results were obtained by Ibanga and Okon (2009) and Ondo-Azi *et al.* (2013), which showed 68.29% and 70.17% of lipid contents in safou (*D. edulis*) from Nigeria and Gabon, respectively. Oil contents from 40 to 65% were also obtained in *D. edulis* fruits by Kengué (2002). The quality and quantity of oil are important to select the best safous. According to Ikhuoria and Maliki (2007), safou oil contains linoleic acid, which is important in the human diet because it prevents cardiovascular disorders, and oleic acid, which is also important in fried food. Thus, safou (*D. edulis*) oil could be a source of edible and industrial oil to reduce dependence on popular vegetable oils. The levels of crude fibre (2.70 to 3.13%) and ash (0.83 to 1.40%) in safou (*D. edulis*) fruits were low. These values were comparable to values as reported in literature (Duru *et al.*, 2012; Odo and Ibiam, 2013). The generally low levels obtained are useful because they contribute to improve the quality control of extracted oil. Vitamin C in safou (*D. edulis*) fruits ranged from 3.06 to 3.36%. Vitamin C is anti-scurvy; it helps in the construction of tissues, bones and it is resistant to infection. The levels obtained in this study were lower than those reported by N'Gozi-Olehi (2012) (8%) in these fruits. However, for all proximate composition, no significant (p=0.05) difference was observed between the two safou varieties, excepted for lipid contents. These results agree with the work of Ibanga and Okon (2009) who reported oil content in *D. edulis* var. *edulis* (68.29%) higher than *D. edulis* var. *parvicarpa* (54.68%). Moreover, our results showed that *D. edulis* var. *edulis* contained high levels of proximate composition compared to *D. edulis* var. *parvicarpa*. The analysis also revealed the presence of significant amounts of several minerals and most mineral levels appeared to be higher in *D. edulis* var. *edulis* compared to *D. edulis* var. *parvicarpa*. Calcium (531.31 - 1337.02 mg/kg) was found to be the most abundant mineral in safou (*D. edulis*) fruits, followed by potassium (552.39-646.05 mg/kg), zinc (130.48 - 136.18 mg/kg) and sodium (51.54 - 108.01 mg/kg). Poligui *et al.* (2013) reported values 690 mg/kg (calcium) and 80 mg/kg (sodium) in safou (*D. edulis*) from Gabon. Similarly, Omogbai and Ojeaburu (2010) reported 540.81 to 553.15 mg/kg (potassium) and 3.43 to 3.58 mg/kg (iron) in safou (*D. edulis*) from Nigeria. These nutrients are very vital to the body for proper growth and development. Calcium is used in the body to build bones, teeth, blood and nervous system (N'Gozi-Olehi, 2012). It activates ATPase during muscular contraction and it is important for blood coagulation (Ujowundu *et al*., 2010). It has been reported that potassium regulates the heartbeat, it is an important mineral used for muscular contraction maintaining electrolyte balance in humans and its presence in the flours is very useful (Taylor, 2003; Oulaï *et al*., 2013). It is the principal cation of intracellular fluid and it is involved in protein synthesis (Ujowundu *et al*., 2010). Sodium is associated with the regulation of acid-base equilibrium, protection against dehydration and maintenance of osmotic pressure in the body. It plays a role in the normal irritability of muscles and cell permeability (Schwart, 1975). Zinc is the most ubiquitous of all trace element involved in human metabolism. More than one hundred specific enzymes use zinc for their catalytic function. According to Haase *et al*. (2006), zinc plays an important role in transcription of DNA, translation of RNA and ultimately cell division. Results also showed that iron (4.91 - 8.67 mg/kg) is the least abundant mineral in safou (*D.edulis*) fruits. According to Taylor (2003), iron is a component of haemoglobin and ferrodoxin, and is cofactor with catalase and peroxidase enzymes.

CONCLUSION

The aim of this work was to determine the physico-chemical properties of safou (*Dacryodes edulis*) fruits grown in Côte d'Ivoire. This study revealed two varieties of safou (*D. edulis*) fruits: var. *edulis* and var. *parvicarpa*. These two safou (*D. edulis*) varieties were particularly rich in lipid, protein and carbohydrates, in addition to essential minerals (calcium, potassium, sodium and zinc). They could therefore serve as auxiliary sources of nutrients and thus could be consumed for dietary energy purposes. However, *D. edulis* var. *edulis* generally exhibited high levels of physico-chemical properties compared to *D. edulis* var. *parvicarpa*. It would be interesting, in further investigation, to establish the fatty acids profile of the oil and the amino acids profile of the proteins for these two safou varieties in order to explore their potential industrial use.

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