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# NUTRITIONAL COMPOSITION AND MICROBIAL SPOILAGE OF *Dacryodes edulis* FRUITS VENDED IN SOUTHERN NIGERIA.

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**ABSTRACT**
**The nutritional composition and microbial spoilage of *Dacryodes edulis* fruit pulp were studied using standard procedures. Proximate analysis revealed that moisture content, lipids, protein, ash, crude fibre and carbohydrate ranged between 44.45-50.93%, 30.55-35.60%,2.89-4.16%, 2.65-2.76%, 1.52-1.61% and 9.75-12.59% respectively. The most abundant mineral element in the fruit pulp was phosphorus (692.55-698.40mg/100g) followed by potassium (540.81-553.15mg/100g), calcium (347.50-354.6mg/100g), magnesium (280.15-287.65mg/100g) and sodium (162.50-170.0mg/100g). The lowest concentration of nutrients use recorded for zinc (3.65-3.81mg/100g), iron (3.43-3.58mg/100g) and copper (0.38-0.45mg/100g). The heavy metals lead, cadmium, mercury and arsenic were not detected in all samples. The antinutrient levels in all samples were low following WHO standard for foods. The bacterial burden of fresh pulp samples was higher (2.82-3.18 log cfu/g.) than the fungi load (2.58-2.72 log cfu/g). Microbial spoilage resulted in log increase of these numbers. Of the seventeen microorganisms isolated from *Dacryodes edulis* pulp samples, *Erwinia carotovora* ,*Pseudomonas flourescens* and mostly with roasted or boiled maize (*Zea mays*) or sometimes with cassava in Nigeria. *Bacillus subtilis* had the highest frequencies of 32.7, 23.2 and 12.5% respectively amongst the bacteria. The predominant fungal Spoilage organisms were *Sacchacromyces, cerevisiae, Rhizopus stolonifer* and *Penicilium expansum.***

***Key words*:** *Dacryodes edulis* pulp, Nutritional composition, Microbial Spoilage.

## INTRODUCTION

Dacryodes edulis (G. Don) H.J. Lam, the African plum or safou is an evergreen tree indigenous to the central Africa and Gulf of guinea region. The tree has a relatively short trunk and a deep, dense crown. The bark is pale gray and rough with droplets of resin (Kapseu & Tchiegang, 1996). The preferential habitat of *Dacryodes edulis* is a shady, humid tropical forest. However, it adapts well to variations in soil type, humidity, 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 (Lam, 1985). The main use of *D. edulis* is its fruit which according to Kengue (1994) can take various forms and sometimes reach 15cm in length. The fruit can be eaten either raw, cooked in salt water, roasted in hot ash or grilled in the oven. It is consumed

The production and commercialization of African pear has been on the increase in the last few years. So important has been the trade that transactions are now known to cut across some national and international boundaries as reported by Awono *et al.,* (2002). The prime importance though has been because the fruit is rich in lipids. Infact research investigations into the chemical composition of safou has focused on the oil content (Omoti & Okiy, 1987; Kinkela & Bezard, 1993). Other studies in the past that has dealt mainly with the lipid and fatty acid content of the fruit are Bezard *et al.*, 1991; Kiakouama & Silou, 1990; Kapseu & Tchiegang, 1996). Recent reports on *D. edulis* fruit have been on the production, refining and characterization of the seed and pulp oil (Ikhuoria & Maliki, 2007; Arisa & Lazarus, 2008) while information on the chemical components is far from complete. Knowledge of the chemical composition of the fruit pulp is especially necessary given the rapid development of the international trade of the fruit and its consumption locally in Nigeria. Consumers needs for nutritious, ready-to-eat processed foods with good shelf life organoleptic property and portable is now on the increase throughout the world because of growing urbanization. Moreso consumers need to know what they are consuming and why.

The tree of *D. edulis* starts to produce between 4-5 years after cultivation. The fruits are harvested and transported to the market within 24 hours because of its very short shelf life. A huge quantity fruits go to the waste due to lack of proper post-harvest preservation. Microorganisms penetrate the intact cuticle of the fruits through natural openings or wounds during harvest. Microbial deterioration of the fruits leaves negative undesirable effect on fruit quality which not only affects the texture but the organoleptic properties, resulting in spoilage. The objective of this study therefore was to investigate the nutritional composition of *Dacryodes edulis* fruit pulp and the microorganisms responsible for its deterioration.

## MATERIALS AND METHODS

**Source of samples:** Sample of *Dacryodes edulis* fruits were obtained from five Nigerian States (Edo, Delta, Kogi ,Kwara and Ondo) and conveyed immediately in sterile plastic containers to the laboratory for analysis.

**Chemical analysis of *Dacryodes edulis* pulp** The matured ripe fruits were thoroughly washed in running tap water and thereafter rinsed three times with distilled water. With a sharp knife the fruit was split open, deseeded and the pulp separated for analyses on proximate, mineral composition and anti-nutrient contents.

**Proximate analysis:**
The protein content was determined by estimation of the total Nitrogen by *kjeldahl* method (AOAC, 1975a) while the moisture content of the pulp was determined by drying to constant weight in an oven at 105$^{o}$C (Osborne & Voogt, 1978). The percentage ash was determined by ignition in a muffle furnace at 550 $^{o}$C as described by Pearson (1976). The fibre content was estimated form the loss in weight of the crucible and its content on ignition. The fact/oil contained in the pulp was extracted using petroleum ether in a soxhlet extractor as described by AOAC (1975b). Carbohydrate composition was obtained by difference.

**Mineral analysis:**
The presence of the mineral element Na and K were determined using the flame photometer. Calcium and magnesium were determined by the versenate complexometric titration method using ethylene diamine tetra acetic acid (EDTA) as indicator (AOAC, 2000). Phosphorus, Copper, Zinc, Lead, Calcium and Chromium were determined using a Pye Unicam atomic absorption spectrophotometer.

**Anti-nutrient analysis:**
The method of Onwuka (2005) was employed in determining anti-nutrients such as phytate, oxalate, tannins and hydrogen cyanide present in the pulp of *Dacryodes edulis.*

**Microbiological analysis:**The pulp or mesocarps of *Dacryodes edulis* were cut aseptically using sterile forceps and Scalpels and Five grams (5g) aseptically weighed into conical flasks containing 50 ml peptone water. The contents were transferred into a sterile mortar and homogenized into a watery paste. Aliquots (0.1ml) of diluted homogenate were then plated. The standard plate count method described by Collins *et al.,* (2004) was used to determine the total viable cell count. For bacteria, samples were plated on Muller Hinton agar incubated at 37 $^{o}$C for 24 hr.

Fungal (yeast and moulds) counts were conducted using malt extract agar. Plates were incubated at room temperature 28 ± 2 $^{o}$C for 3-5 days. Microbial counts of the fruit pulp samples were reported as cfu/g. A total of three replicates was carried out in the isolation experiments.

**Isolation and identificaton of microorganisms:** Pure cultures of bacterial isolates were obtained by picking distinct colonies from countable plates and streaking on both Muller Hinton agar and McConkey agar. They were characterized and identified with their cultural, morphological and biochemical properties (Collins *et al.*, 2004; Cheesbrough, 2000). Fungal isolates were characterized based on their macroscopic appearance on culture medium,microscopic morphology and type of asexual spores produce (Barnett & Hunter, 1972; Samson & Van Reenen-Hoekstra, 1995).

**RESULTS**
Nutritional composition: The proximate, mineral and anti-nutrient analyses of *Dacryodes edulis* fruit pulp samples in Nigeria is shown in Table 1. The moisture content of the samples from all locations surveyed ranged from 44.45-50.93%. Fruit pulp samples from Delta and Ondo States had the highest moisture content of 50.93 and 50.24% respectively while Edo State had the lowest of 44.45%. The lipid content ranged from 30.55-35.60% with Edo State having the highest oil content and Ondo the least. Althuogh fruits are not very good sources of protein, but the protein content of *Dacryodes edulis* pulp samples in this study was between 2.89-4.16%. Ash content was almost the same for all samples ranging from 2.65-2.76%. The carbohydrate content was higher in Edo (12.59%) and least in Delta (9.75%).

**TABLE 1 . PROXIMATE ANALYSIS OF *Dacryodes edulis* FRUIT PULP SAMPLES.**

| Proximate Analysis(%) | Edo | Delta | Kwara | Kogi | Ondo |
|---|---|---|---|---|---|
| Moisture | 44.45±0.06 | 50.93±0.5 | 47.72±1.50 | 46.54±0.08 | 50.24±1.00 |
| Lipids | 35.60±0.01 | 30.87±0.2 | 34.15±0.5 | 34.48±1.1 | 30.55±0.7 |
| Crude protein | 3.03±0.02 | 4.16±0.01 | 3.14±0.3 | 2.89±0.06 | 3.00±0.08 |
| Ash | 2.76±0.01 | 2.68±0.03 | 2.71±0.01 | 2.70±0.1 | 2.65±0.04 |
| Crude fibre | 1.57±0.03 | 1.61±0.05 | 1.52±0.01 | 1.55±0.05 | 1.57±0.02 |
| Carbohydrate | 12.59±2.0 | 9.75±1.2 | 10.76±1.5 | 11.84±0.8 | 11.99±0.5 |

The mineral composition of *Dacryodes edulis* fruit pulp samples is shown in Table 2. In all samples evaluated, the most abundant mineral was phosphorus with values ranging from 692.55-698.40mg/100g. This was closely followed by potassium (540.81-553.15mg/100g), calcium (347.50-354.62mg/100g), magnesium (280.15-287.65mg/100g) and Sodium (163.50-170mg/100g).

The elements Zinc, Copper and Iron were present in small quantities. Zinc content ranged between 3.65-3.81mg/100g, iron (3.43-3.58mg/100g) and copper (0.38-0.45mg/100g) respectively. The heavy metals such as lead, cadmium; mercury and arsenic were not detected in all samples studied.

**TABLE 2 . MINERAL COMPOSITION OF *Dacryodes edulis* FRUIT PULP SAMPLES.**

| Mineral(mg/100g) | Edo | Delta | Kwara | Kogi | Ondo |
|---|---|---|---|---|---|
| Sodium | 168.31±3.5 | 163.50±2.8 | 166.70±1.6 | 168.55±2.3 | 170.00±0.8 |
| Potassium | 546.45±10.4 | 540.81±3.6 | 545.03±8.0 | 549.23±12.7 | 553.15±15.2 |
| Calcium | 350.24±4.6 | 352.18±6.1 | 347.50±2.8 | 350.00±4.0 | 354.62±7.8 |
| Phosphorus | 697.14±12.8 | 692.55±8.4 | 695.62±8.7 | 698.40±14.5 | 695.18±10 7 |
| Iron | 3.50±0.5 | 3.43±0.3 | 3.56±0.2 | 3.47±0.4 | 3.58±0.8 |
| Copper | 0.42±0.01 | 0.39±0.01 | 0.42±0.02 | 0.38±0.01 | 0.45±0.04 |
| Zinc | 3.76±0.7 | 3.75±0.5 | 3.70±0.2 | 3.65±0.3 | 3.81±0.5 |
| Magnesium | 285.8±5.2 | 285.60±4.6 | 280.15±2.1 | 283.46±3.0 | 287.65±6.7 |
| Lead | ND | ND | ND | ND | ND |
| Cadmium | ND | ND | ND | ND | ND |
| Mercury | ND | ND | ND | ND | ND |
| Arsenic | ND | ND | ND | ND | ND |

The anti-nutritional factors in *Dacryodes edulis* fruit pulp samples are presented in Table 3. The ant-nutrients were generally low. Phytates in all samples studied ranged between 1.378-1.490mg/100g with the highest obtained from Ondo State and the least from Kogi State. The cyanide content was between 0.002-0.006mg/100g. Total oxalates and soluble oxalates were highest in sample from Edo State with 13.45mg/100g and 7.92mg/100g respectively. The least oxalates was present in sample from kwara (12.31mg/100g). Tannins was highest in sample from Kwara State (0.781mg/100g) and lowest in Delta State (0.729mg/100g).

**MICROBIOLOGICAL ANALYSIS OF *Dacryodes edulis* FRUIT PULP**
The microbial burden of *D. edulis* fruit pulp samples in ambient storage is shown in Tables 4&5. The bacteriological load of fresh fruit pulp samples ranged from 2.82-3.18 log cfu/g (Table 4). Samples from Kogi and Kwara had considerably higher bacterial counts of 3.18 and 3.06 log cfu/g respectively compared to the rest. Sample from Edo state had the least bacterial count of 2.82 log cfu/g.

While in storage for 12days, the bacterial counts of fruit pulp samples from Edo state increased steadily from 2.82 log cfu/g on day zero (0) to 5.60 log cfu/g on day 12 (Table 4 ). On day zero, sample from Delta state increased from 2.87 log cfu/g to 5.33 log cfu/g on day 10 and finally fell to 5.05 log cfu/g on day 12. The bacterial load of sample from kwara state rose from 3.06 log cfu/g on day zero to 5.73 log cfu/g on day 8 and the values declined to 5.26 and 5.01 log cfu/g on the 10th and 12th day respectively.The pattern of spoilage of sample from Ondo was similar, increasing from 2.96 log cfu/g to 5.63 log cfu/g on day 8 and then falling to 5.46 and 4.67 log cfu/g respectively on day 10 and 12. The bacterial count of sample from Kogi State rose from 3.18 log cfu/g to 5.16 log cfu/g on the 10th day and finally decreased to 5.28 log cfu/g on the final day.

The fungal biota of fresh and spoiled fruit pulp samples of *Dacryodes edulis* is shown in Table 5. The fungal load of all fresh samples ranged from 2.58-2.72 log cfu/g. With ambient storage, there was a proliferation of fungal numbers. Fungal proliferation was more in samples from Edo State with a ca 3.15 log cfu/g after 12days. This was followed by samples from Kogi (3.04 log cfu/g), Kwara (2.38 log cfu/g), Ondo (2.32 log cfu/g) and Delta (2.29 log cfu/g) in that order respectively.

In Figs 1 and 2 is shown the percentage occurrence of microbial isolates from *Dacryodes edulis* pulp samples. Bacterial isolated include: *Erwinia carotovora, Bacillus subtilis, Serratia marcencens, Flavobacterium* sp, *Klebsiella aerogenes, Pseudomonas fluorescens, Proteus vulgaris* and *Esherichia coli.*

**TABLE 3. ANTI-NUTRIENT COMPOSITION OF *Dacryodes edulis* FRUIT PULP SAMPLES.**

| Anti-nutrient content (mg/100g) | Edo | Delta | Kwara | Kogi | Ondo |
|---|---|---|---|---|---|
| Phytates | 1.486±0.02 | 1.481±0.01 | 1.475±0.01 | 1.378±0.03 | 1.490±0.01 |
| Cyanides | 0.004±0.001 | 0.004±0.001 | 0.003±0.001 | 0.002±0.001 | 0.006±0.002 |
| Total oxalates | 13.45±1.2 | 12.57±1.0 | 12.31±1.3 | 12.47±0.5 | 12.65±0.8 |
| Soluble oxalates | 7.92±0.7 | 7.84±0.5 | 6.98±0.8 | 7.57±0.4 | 7.86±0.6 |
| Tannins | 0.764±0.1 | 0.729±0.1 | 0.781±0.2 | 0.762±0.1 | 0.768±0.1 |

**TABLE 4. BACTERIAL BURDEN OF FRESH AND SPOILED FRUIT PULP SAMPLES OF *Dacryodes edulis***

| Sample source | BACTERIAL LOAD (Log cfu/g) DURING STORAGE PERIOD | | | | | | |
|---|---|---|---|---|---|---|---|
| | Day 0 | Day 2 | Day 4 | Day 6 | Day 8 | Day 10 | Day 12 |
| Edo | 2.82±0.05 | 2.90±0.10 | 3.45±0.02 | 3.69±0.13 | 4.34±0.18 | 5.47±0.05 | 5.60±1.00 |
| Delta | 2.87±0.41 | 2.98±0.52 | 3.37±0.03 | 3.73±0.04 | 4.48±0.26 | 5.33±0.14 | 5.05±0.21 |
| Kwara | 3.06±0.14 | 3.15±0.81 | 3.81±0.10 | 4.42±0.11 | 5.73±0.52 | 5.26±0.04 | 5.01±0.18 |
| Kogi | 3.18±0.23 | 3.24±0.14 | 3.40±0.05 | 3.58±0.03 | 4.26±0.10 | 5.14±0.14 | 5.28±0.52 |
| Ondo | 2.96±0.16 | 3.10±0.24 | 3.53±0.05 | 4.52±0.23 | 5.63±0.15 | 5.46±0.13 | 4.67±0.05 |

Values are means of triplicate determination and standard deviation from the means.

**TABLE 5. FUNGAL BURDEN OF FRESH AND SPOILED FRUIT PULP SAMPLES OF *Dacryodes edulis***

| Sample Source | FUNGAL LOAD (cfu/g) DURING STORAGE PERIOD | | | | | | |
|---|---|---|---|---|---|---|---|
| | DAY 0 | DAY 2 | DAY 4 | DAY 6 | DAY 8 | DAY10 | DAY 12 |
| Edo | 2.58±0.05 | 2.58±0.12 | 3.67± 0.03 | 4.43±0.06 | 4.87± 0.02 | 5.54 ± 0.51 | 5.73±0.10 |
| Delta | 2.61 ± 0.01 | 2.66 ± 0.03 | 3.45 ± 0.05 | 4.32 ± 0.51 | 4.79 ± 0.03 | 5.18 ± 0.10 | 4.90 ± 0.13 |
| Kwara | 2.65 ± 0.01 | 2.65 ± 0.02 | 3.79 ± 0.05 | 4.56 ± 0.12 | 5.64 ± 0.10 | 5.64 ± 0.20 | 5.03 ± 0.05 |
| Kogi | 2.72 ± 0.01 | 2.83 ± 0.04 | 3.58± 0.51 | 3.97 ± 0.01 | 4.83 ± 0.06 | 5.71 ± 0.04 | 5.76 ± 0.16 |
| Ondo | 2.63 ± 0.02 | 2.70 ± 0.01 | 3.62 ± 0.21 | 4.49 ± 0.01 | 5.57 ± 0.13 | 5.68 ± 0.17 | 4.95 ± 0.18 |

Values are means of triplicate determination and standard deviation from the means.

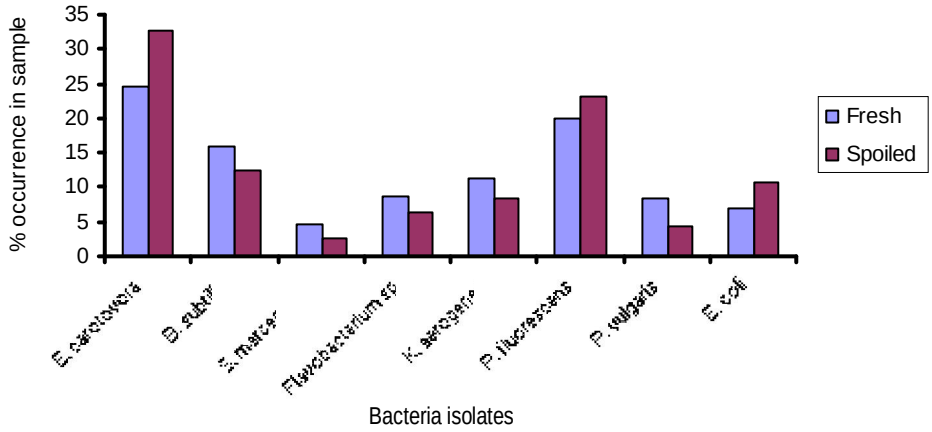


**FIG. 1. BACTERIAL ISOLATES FROM *Dacryodes edulis* FRUIT PULP**

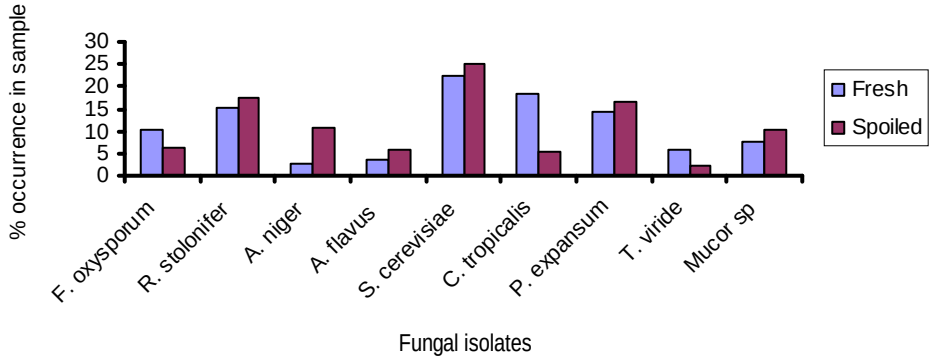


**FIG. 2 . FUNGAL ISOLATES FROM *Dacryodes edulis* FRUIT PULP**

**DISCUSSION**

The nutritional contribution of fruits to a healthy diet the world over can not be over emphasized. Knowledge of the proximate analysis of *Dacryodes edulis* fruit pulp is not only of primary importance to the average consumer but also to prospective industrialists who will rely on it for other uses. The moisture content of *Dacryodes edulis* fruit pulp samples which ranged from 44.45-50.93% was particularly high for this fruit, thus implicating its fast perishability and short shelf life. The quality and stability of some fruits has been attributed to their moisture content (Frazier & Westhoff, 1998).

Omogbai *et al.,* (2007) reported that some fruits are not very good sources of fats and are usually recommended as part of weight-reducing diets. However the fat content of *Dacryodes edulis* fruit pulp was in the range 30.55-35.60%. This value is considerably higher compared to other fruits such as apple with 0.4%, guava 0.4%, banana 0.39% and pawpaw with traces of oil. The high lipid content in the fruit pulp is significant for this fruit. Apart from the fact it contains linoleic acid, an important polyunsaturated fatty acid in human food which can prevent cardiovascular disorder, the oil is also rich in oleic acid which has oxidative stability important as frying oil (Ikhuoria & Maliki, 2007). Thus oils from this fruit can be exploited commercially as a source of edible and industrial fat which will in turn reduce dependence on the popular vegetable oils like coconut, palm and groundnut oils.

The protein content of the fruit pulp of *Dacryodes edulis* shown to be between 2.89-4.16% in this study although low, but will make significant contribution to diet in ameliorating protein malnutrition. The low values of the crude fibre (1.52-1.61%) and ash (2.65-2.76%) will enhance the quality control of the extracted oil. Carbohydrate composition (9.75-12.59%) which was moderate for the fruit pulp will meet with a good supply of calories.

Details of the mineral composition (Table 2) indicates that the fruit pulp of *Dacryodes edulis* is a rich source of mineral elements such as sodium (163.50-170.0mg/100g), potassium (540.81-549.23mg/100g), calcium (347.50-354.62mg/100g), phosphorus (692.55-698.40mg/100g), magnesium (280.15-287.65mg/100g), iron (3.43-358mg/100g),copper (0.38-0.45mg/100g), and zinc (3.65-3.81mg/100g). Thus the pulp of *Dacryodes edulis* being rich in vital minerals is nutritionally significant if consumed. Sodium for example is required for regulation of acid-base equilibrium, maintenance of osmotic balance and protects against dehydration in the body. Potassium is the chief cation of intracellular fluid and is also involved in protein synthesis. The mineral iron is vital for blood formation while calcium forms an indispensable component as well as gives hardness and strength to bones and teeth.

Phosphorus is important in the electron transport chain for energy generation and magnesium is involved in nerve and muscle function.

Although copper and Zinc are trace elements, their functions are very significant. Nutritionally, copper is essential for normal bone development, haemoglobin synthesis as well as the maintenance of myelin within the nervous system. Zinc is the most ubiquitous of all trace elements involved in human metabolism. More than one hundred specific enzymes require zinc for their catalytic function. This trace element plays multiple roles in the perpetuation of genetic material, including transcription of DNA, translation of RNA, and ultimately cell division (Brown *et al.,* 2002; Haase *et al.*, 2006) The non-detection of heavy metals like lead, cadmium, mercury and arsenic indicates the samples are free from toxic elements. The variation of the minerals in various samples can be attributed to their availability in the soil and subsequent differential uptake and incorporation in the fruit pulp.

The result of this study (Table 3) indicates the presence of anti-nutrients in the fruit pulp of *Dacryodes edulis*. However their compositions in the various samples were low in comparison to their lethal dosage. Munro & Bassir (1969) reported the lethal level of oxalate in man to be 2-5g.Phytic acid intake of 4-9mg/100g is said to decrease iron adsorption by 4-5 fold in humans (Hurrel *et al.*, 1992) leading to erythropoesis. High intake of tannic acid can affect human nutrition and metabolism.

Akwaowo *et al.,* (2000) reported that a high intake tannins is linked to cancers in man, poor protein utilization as well as kidney and liver toxicity. Thus anti-nutrients in general pose severe nutritional challenge to animals and man as they complex with enzymes, proteins, vitamins, mono and divalent cations particularly Na+, K+, $Ca^{2+}$, $Mg^{2+}$ and $Fe^{2+}$ thus reducing their bioavailability (Olomu,1995; Nolan *et al.*, 1987). The cyanide content of the samples which range from 0.002-0.006mg/100g is quite low and will not cause any health impairment. However consumption of the raw fruit pulp leaves a bitter taste. It is advisable to consume the cooked fruit instead of the raw one to avoid cyanide poisoning. Moreso, cooking has been found to eliminate these anti-nutritional factors in foods (Liener, 1994).

The microbial burden of the fresh fruit pulp of *Dacryodes edulis* samples was considerably lower compared to the spoiled samples (Table 2). The rapid proliferation of both bacteria and fungi within the first six days of storage shows that adequate nutrients were available for microbial growth. However, increase in storage time and biodegradation led to a fall of both bacterial and fungal

populations in some samples (DELTA, KWARA and ONDO) a phenomenon possibly due to exhaustion of nutrients for sustainability. Frazier & Westhoff (1998) reported that the availability of nutrients is crucial to increase or decrease of microbial numbers in fruits during spoilage.

The percentage occurrence of microbial isolates from *Dacryodes edulis* fruit pulp is shown in Fig. 1. Eight bacterial and nine fungal general were associated with both fresh and spoiled samples in storage. The findings from this study is in agreement with Nwufo *et al.,* (1989) who had earlier reported four soft rot microorganisms *(Botryodiplodia theobromae, and Aspergillus niger, Rhizopus stolonifer and Erwinia* sp*)* as deteriogens of *Dacryodes edulis* fruits.

The last three organisms were isolated in the current study. The moulds isolated in this study: *Fusarium oxysporum, Rhizopus stolonifer, Penicillium expansum, Mucor* sp *and Trichoderma viride* produce spores which are found in the air or soil and even on aerial part of plants. From these sources, they get in contact with harvested fruits causing spoilage. The yeasts *Saccharomyces cerevisiae and Candida tropicalis* which may be found in association with many fruits are yeasts of industrial importance. *Aspergillus flavus* and *Aspergillus niger* are known for their lipolytic abilities. They accelerate the breakdown of fats by lipases into free fatty acid and glycerol thereby causing spoilage of oil containing fruits. A preponderance of fungi in the spoiled fruit pulp samples is because the fruit is acidic (pH.3.85). Acidic foods favour the growth of fungi than bacteria (Frazier & Westhoff, 1998). Prominent among the bacterial isolates are *Erwinia carotovora, Pseudomonas, fluorecens, Bacillus subtilis and Serratia marcencens.* The first two have been reported as causative organism for bacterial soft rots. They can like fungi hydrolyse pectin giving rise to a soft mushy appearance or consistency (Liao *et al.*, 1993).

The soft-rotting fluorescent pseudomonads, when considered together with soft-rot *Erwinia*, present a formidable challenge to commercial fresh product operations from the farm to retail and wholesale outlets (Liao *et al.,* 1993; Liao *et al*., 1997).

The presence of bacteria such as *Escherichia coli, Proteus vulgaris, Klebsiella aerogenes and Flavobacterium* spp is suggestive of contamination from soil, harvesting equipment, handling, storage fascilities and on food-contact surfaces throughout the distribution chain. Except of *Escherichia coli*, all other bacterial isolate are of no importance as agents of food borne disease. However the fruits of *Dacryodes edulis* should be properly processed prior to consumption to avoid opportunistic infections (Lund *et al.*, 2000). Fresh fruits Such as *Dacryodes edulis* are among the more challenging of food products to commercially produce and distribute. Losses due to post harvest spoilage or pathological decay are a result either of latent infections in the field that become active following harvest or of cross-contamination during harvest, cleaning, storage and distribution. Therefore spoilage management should begin in the filed using an integrated strategy of good agricultural practice (GAP).The richness of *Dacryodes edulis* fruit pulp in protein, carbohydrates and oil will continue to endear it as a dietary contribution in Nigeria and as a source of oil for various industrial applications world-wide.

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