SCIENTIFIC EVALUATION OF SOME COMMON EDIBLE FRUITS OF SOUTH EASTERN NIGERIA

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ABSTRACT

Fruits are major sources of vitamins and minerals and contain water, fiber, sugars, proteins and phytochemicals to certain degrees. Edible fruits common to Southeastern Nigeria were subjected to scientific evaluation to identify their intrinsic values. Questionnaire and proximate analysis were utilized to unravel some of their relevant botanical attributes. Fruits species with the highest comparative overall nutritive indices include: *Solanum melongena, Vitex doniana, Aframomum melenguena, Dennettia tripetala, Dialum guineense, Napoleana vogelli, Ficus capensis, Dacryodes edulis, Persea americana, Chrysophyllum albidum, Landolphia owariensis, Ananas comosus, Spondias mombin* in that order. Dominant families in terms of numerical distribution of species include: *Annonaceae, Cucurbitaceae, Anacardiaceae, Moraceae, Sterculiaceae, Areceaceae, Burseraceae, Fabaceae* in that order. Species with the most encompassing individual Economic relevance include: *Elaeis guineensis, Cocos nucifera, Theobroma cacao, Musa sapientum, Citrullus lanatus, Citrus species, Ananas comosus Treculia africana, Mangifera indica, Cola acuminata, Anacardium occidentale, Nauclea diderichii, Canarium schweinfurthii, Telfeiria occidentalis Arachis hypogea, Dennettia tripetala, Solanum melongena, Persea americana, Psidium guajava, Dialum guineensis, Dacryodes edulis, Cucumeropsis manni et cetera.* To ensure tropical trees biodiversity, silviculture, botanical gardens, Orchards and massive tree planting campaigns must be embraced holistically for sustainability.

Key Points: Edible fruits, scientific evaluation, Solanum melongena, economic relevance, trees biodiversity.

1.1. INTRODUCTION

Fruits have been with man from ancient times, even the Holy Bible (AKJV, 2014) made so many references including the forbidden fruit that our first parents Adam and Eve ate (Gen. 11:12; 2:16-17). Fruits and vegetables (including vegetable oils) make a surprisingly large contribution to human diets. They are especially welcome because they typically contain high levels of vitamins, minerals, dietary fiber, and complex carbohydrates (Cunningham and Cunningham, 2006). Gill (1988) classified fruits into (a) simple fruits – derived from the ovary of a solitary carpel in a single flower. (b) Aggregate fruits – a group of separate fruits developed from carpels of a single flower. (c) Multiple fruits – usually coalesced and derived from an entire inflorescence. This is based on origin, texture and dehiscence of the fruits. Fruits are specialized plant structures borne on the stems and shoots of spermatophytes, particularly Angiosperms,

they bear the major organs of sexual perennation (seeds); they develop from fertilized ovaries; may be dry or fleshy, and can be seedless. True fruits develop exclusively from the ovary while false fruits develop additionally from other accessory structures of the flower. Ripen-Fruits are often sweet and edible; they are mostly divided (in cross section) into epicarp (outer), mesocarp (middle) and endocarp (innermost) layers. They are typically made up of: sugars, oils, proteins, water, fibers, minerals and vitamins. They contain the pigments chlorophyll and carotenoids. Examples abound: Citrus spps (orange, lime, lemon, grape, tangerine etc.), mango guava, pears, pawpaw, apple, pomegranates, figs, cashew, pineapple, Breadfruit, banana, plum, coconut, cocoa, berries, palm fruit, walnut, tamarind, star apple etcetera.

Fruits are profitably propagated in available arable (agricultural lands). Such arable lands are now history because of man's unsustainable habits. Ivbijaro (2006) reported that about 92000 hectares equivalent to a quarter of Nigeria's landmass was once forested and only half of the nation's forests remains as of now. Deforestation has been followed by erosion and, in some areas, desertification. The tropical forest Ecosystem which has the highest biodiversity of plants and animal species per unit of space as recognized globally is systematically and rapidly getting depauperised in holistic terms, as a result of overwhelming negative anthropogenic influences. This intractable state of affairs gets compounded by the day because the leadership in some of these places who control the principal resources, in blind pursuit of primordial interests and lacking the requisite will, wisdom and vision for true sustainability, have advertently and inadvertently paved the way for resources to be exploited to extinction. Why some of these fruit species are still available is because of man's primordial survivalistic instinct for food, clothing, shelter and income generation (subsistence agriculture). At this point in Global history, our embarking on massive tree planting and resource conservation is a much more responsible approach than our present state of laisser-faire attitude, apathy and inaction. Prudence must be shown in the management of all living species and natural resources, in accordance with the precepts of sustainable development. Only in this way can the immeasurable riches provided to us by nature be preserved and passed unto our descendants. The current unsustainable patterns of production and consumption must be changed in the interest of our future welfare and that of our descendants (paragraph 6, United Nations Millennium Declaration).

Many peoples and culture, the world over depend on fruits for their sustenance (food), income, animal, fodder, industrial raw material (oils, beverages, lubricants, illuminants, cosmetics, fibers, fuels, sugars, chemicals etc.), Pharmaceuticals, Agricultural propagules, Research materials. Many are of tremendous cultural, historical, aesthetical, religious, ethno botanical significance and even in the hospitality industry. Many wild animal species have a mutualistic Ecological relationship with fruits (Bats, birds, fishes, squirrels, monkeys, (other primates), rodents, reptiles, insects and some other invertebrates). In

recent times, the relative economic benefits of organic based resources tend to outstrip those of non-organic based resources, intrinsically and extrinsically. According to Cunningham and Cunningham (2006), they are the main stay of the food industry; raw materials; industry; waste and water recycling industry; renewable energy industry; noise and pollution industry; cleaner and safer environment industry; agriculture industry; conservation (Greenbelt) Industry; Education/Research Development Industry; Medical and Pharmaceutical Industry and Ecological Services Industry like: Air Purification; Clean Energy Sources, Clean Water Sources, Wildlife habitats, Recreation, Energy saving and aesthetics and Hospitality Industries. The aim of this research work is to ascertain as much as possible the overall relevance (status) of each fruit encountered. The objectives are to identify the fruit species found in this locality, their proximate composition and determine their utility indices.

2.1. LITERATURE REVIEW

According to the Holy Bible AKJV-Genesis 1(2014) and God said, let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so. And the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind; and God saw that it was good (1). Gill (1988) in his book, Taxonomy of flowering plants defined fruits as, a ripened ovary along with any adnate structures which mature along with it. (2). The Grolier Science Encyclopedia (2002) has this to say about fruits, seeds are contained inside fruits. There are dry fruits such as poppy capsule and pea pod which release their seeds through holes or by splitting open. There are juicy fruits, such as berries, which contain more than one seed. The cherry is a drupe or stone fruit. Its inner layer forms a woody pip or stone.

The blackberry is a cluster of small drupes. Its seeds are inside the tiny pips. Apples and pears are called pomes. They have a fleshy outer layer (the false fruit) around a core (the true fruit), which contains seeds. Pomes are often sweet to the taste to encourage animals to eat them and so help in the seed's dispersal. (3). Uno *et al* (2001) discussed fruits at length and defined a fruit as a seed container that develops from the ovary of a flower and, often, other tissues that surrounds it. As such fruits are products of flowers and thus occur only in flowering plants.

A fruit is important because it protects developing seeds and may help disperse mature seeds from the parent plant. Angiosperms have a remarkable diversity of fruit types, classified on the basis of the characteristics of the mature ovary. For example, a fruit may be fleshy or dry at maturity, or the ovary may be fused to other kinds of tissues. The importance of the different types of fruits is related to how they, and the seeds they contain, are dispersed from the parent plant, fleshy fruits are typically dispersed by hungry animals that carry off and eat the fruit, dispersing the seeds in the process. Dry fruits are typically dispersed

by the wind or contain seeds that are dispersed by the wind; these fruits and seeds possess features that aid their dispersal, such as wings or hairs. Fertilization and the production of seeds are usually prerequisites for the development of fruits. Chemical signals called hormones, are secreted by seeds as they develop. These hormones induce the ovaries to expand and mature into a fruit, an example of cell signaling. In agriculture and horticulture, naturally produced hormones or their synthetic counterparts are applied to some crops so that fruits will form and mature in synchrony, which makes harvesting more efficient and economical. Treatment of flowers with artificial hormones can also induce the formation of seedless fruits (e.g., seedless grapes) in the absence of fertilizations.

3.1. MATERIALS AND METHODS

About twenty-two fruit species (commonly) readily obtainable across most states in south East Nigeria was obtained, washed, labeled, oven dried and samples were subjected to proximate analysis. Prior to this, one hundred and fifty questionnaires having twenty core questions were distributed to some lecturers and enlightened elders at Nsukka (UNN), Ebonyi (EBSU) Umudike (MOUAU) Owerri (FUTO) and ULI (COOU) – 50 each. One hundred and twenty were recovered! The test item was face validated by lecturers at Uli (COOU) and test-retest method was used to establish reliability.

3.1.1. Proximate Composition

The following methods were used in the analysis.

A. **Determination of moisture content**

The gravimetric oven drying method (AOAC 2005) was used.

Exactly 5.0g of the sample was put in a previously weighed moisture can and dried in the oven at 105^0C for 3 hrs. It was cooled in a desiccator and reweighed. It was then returned to the oven and dried further. This time, the weight was taken every one hour of drying until no further reduction in the weight was obtained (constant weight was obtained). Moisture content was calculated using the formula below.

% moisture = W2-W3-W1 x 100

W1 = weight of empty moisture can, W2 = weight of can + sample before drying

W3 = weight of can + sample dried to constant weight.

B. **Determination of Protein content**

The kjeldhal titrimetric method was used in which the nitrogen content of the sample was determined and multiplied with factor 6.25, to obtain the crude protein (Chang 2003).

One gram of the sample was digested by boiling in 10ml of concentrated sulphuric acid in the presence of selenium catalyst. Boiling was done in a fume cupboard until a clear solution was obtained (the digest). The digest was carefully diluted to 100ml in a volume flask using distilled water. An aliquot, 10ml of the digest

was mixed with equal volume (10ml) of 45% NaOH solution in a semi-micro kjeldahl apparatus and distilled. The distillate was collected into 10ml of 4% Boric acid solution containing mixed indicator (bromocressol green and methyl red). A total of 50ml of distilled was collected and titrated against 0.02N H_2SO_4 solution from green to deep red endpoint. Meanwhile, a reagent blank was treated as described above but with no sample in it. The formula below was used to calculate the protein content.

(i). % Protein = % N2 x 6.25

(ii) %N2 = 100/W x N x 14/1000 x WF/Wax T-B

W = Weight of sample analyzed. N = Normal (conc.) of titrant solution of.

Vf = Total volume of digest. Va = Volume of digest distilled.

T = Titre value of sample. B = Titre value of reagent blank.

C. Determination of Fat content.

Fat content was determined using the continuous solvent extraction (Soxhlet) gravimetric method (Min and Boff, 2003).

A measure weight of the sample (1.5g) was wrapped in a previous weighed porous paper (Whatman No 1 filter paper). The wrapped sample was put in a soxhlet extraction reflux flask and mounted on an oil extraction flask containing 200ml N-hexane (solvent). The upper end of the reflux flask was connected to a condenser. The solvent in the flask was heated via a heating mantle until the solvent boiled, vaporized and condensed into the reflux flask and enveloped the wrapped sample. Contact between the sample and the solvent was maintained until the reflux flask filled up and siphoned over thereby carrying extracted oil (fat) down to the extraction flask. This process was allowed to go on repeatedly for about 2 hours (at least 14 refluxes). Then carefully, the defatted wrapped sample was removed with the aid of a pair of forceps, dried in the oven at 80^0C for 30 min, cooled in a desiccator and weighed. By difference, the weight of extracted fat was determined and expressed as a percentage of the sample weight using the formula below.

% Fat= W2-W3/W2-W1 x 100

W1 = weight of empty filter paper. W2 = weight of paper + sample before defatting. W3 = weight of paper + defatted dry sample.

D. Determination of Ash content.

Ash content was determined using the Furnace incineration gravimetric method (Harbers and Nielsen, 2003). A measured weight of the sample was weighed into a previously weighed porcelain crucible and burnt in a muffle furnace at 550^0C for about 2 hours (until the sample became grey ashes). After allowing it to cool to about 100^0C, it was carefully transferred to a desiccator and allowed to cool to room temperature

before it was reweighed. By difference, the weight of ash was obtained and expressed as a percentage of the sample. The formula below was used.

%ash = W2-W1x 100/W

Where W= weight of sample analyzed. W1 = weight of empty crucible

W2=weight of crucible and ask.

E. Determination of crude fiber.

Crude fiber was determined using the Weende gravimetric method (BeMiller, 2003).

A measure weight of the sample was boiled under reflux, in 150ml of 1.25% H_2SO_4 solution for 30 minutes. Then, it was carefully washed into hot distilled water until traces of the acid was out. A twofold muslin cloth was used to trap the particles during the washing. The washed sample was transferred back to the flask quantitatively and boiled against, under reflux, for another 30 min, this time in 1.25% NaOH solution. It was again washed with hot distilled water to remove traces of the alkali. It was then transferred to a clean dry crucible and dried in the oven at 105^0C for 30 minutes, cooled in a desiccator and reweighed. It was then burnt in the furnace as in ash determination. It was cooled in a desiccator and reweighed. The formula below was used to calculate the crude fiber content.

% crude fiber = W2-W3x100/W

Where: W=weight of sample analyzed. W2=weight of crucible + sample after drying. W3 = weight of crucible + sample after ashing.

F. Determination of Carbohydrate.

Carbohydrate was calculated by difference (BeMiller 2003). The formula below was used.

% Carbohydrate = 100 - % (moisture + protein +Fat +ash +Fibre).

4.1. RESULTS

The results show that there are so many fruit species of the tropics and most of them are edible particularly in the raw state (Table 1). A few other species are not edible but most serve other purposes. About forty-four fruit species were identified. The seeds together with the fruits are edible in some, while in others only the fruits are edible. Dominant species are trees followed by shrubs, climbers, forbs and suckers. Most species are perennial, with very few annuals and much fewer biennials. The Table also shows that members of the *Annonaceae* family dominated our common fruits followed by *Curcurbitaceae, Anacardiaceae, Moraceae, Arecaceae, Burseraceae, Fabaceae, Sterculiaceae, Musaceae* etcetera.

Table 1. Botanical features of some common locally available edible fruits

S/N	Scientific name	Family	Common Name	Local Name	Growth	Habit
1	Ricinus communis L.	Euphorbiaceae	Castor oil	Ogili	Shrub	Perennial
2	Chrysophyllum albidum G. Don.	Sapotaceae	African star apple	Udara	Tree	Perennial
3	Elaeis guineensis Jacq.	Arecaceae	Palm fruit	Nkwu	Tree	Perennial
4	Dialum guineense	Caesalpiniaceae	Velvet tamarind	Cheleku	Tree	Perennial
5	Cocos nucifera L.	Arecaceae	Coconut palm	Aki oyibo	Tree	Perennial
6	Persea americana Mill	Lauraceae	Avocado pear	Ube oyibo	Tree	Perennial
7	Cucurbita pepo L.	Cucurbitaceae		Anyu	Trailer	Annual
8	Mangifera indica L.	Anarcardiaceae	Mango	Mangolo	Tree	Perennial
9	Nauclea diderichii De wild	Rubiaceae		Uburu	Tree	Perennial
10	Monodora myristica (Gaertner)	Annonaceae	African nutmeg	Efuru	Tree	Perennial
11	Psidium guajava L.	Myrtaceae	Guava	Gova	Tree	Perennial
12	Artocarpus heterophyllus Lam	Moraceae	Jackfruit		Tree	Perennial
13	Solanum melongena	Solanaseae	Egg plant	Anara	Forb	Annual
14	Cola acuminate (P.beauv.)	Sterculiaceae	Kolanuts		Tree	Perennial
15	Musa sapientum L.	Musaceae	Banana	Unere	Giant	Perennial
16	Garcinia kola Heckel	Clusiaceae	Bitter kola	Aki-inu	Forb	Perennial
17	Citrus sinensis (L.)	Rutaceae	Orange	Oroma	Tree	Perennial
18	Vitex doniana	Verbenaceae		Mbembe	Tree	Perennial
19	Ananas comosus	Bromeliaceae rhizomatous	Pineapple	Akwu-olu	Sucker	Biennial
20	Artocarpus altilis(Parkinson)	Moraceae			Tree	Perennial
21	Annona murichata	Annonaceae	Soursop		Tree	Perennial
22	Treculia Africana Decne	Moraceae	Ukwa	Custard	Tree	Perennial
23	Annona senegalensis	Annoncceae	Uburu ocha	Apple	Shrub	Perennial
24	Irivingia gabonensis Bailton	Ixonanthaceae	Bush	Ugiri	Tree	Perennial
25	Pentaclethra macrophylla Bentham	Fabaceae	Mango	Ukpaka	Tree	Perennial
26	Dennettia tripetala Baker fil.	Annonaceae	Pepper plant	Mmimi	Tree	Perennial
27	Telfeiria occidentalis Hooker fil.	Cucurbitaceae		Ugu		
28	Dacryodes edulis G.Don	Burseraceae	Local pear	Ube	Tree	Perennial
29	Cucumeropsis manni Naud.	Apocynaceae		Egusi	Climber	Annual
30	Landolphia owariensis	Cucurbitaceae		Utu		

Table 1. Botanical Features of some common locally available edible fruits (continued)

S/N	Scientific name	Family	Common Name	Local Name	Growth	Habit
31	Theobroma cacao L.	Sterculiaceae	Cocoa		Tree	Perennial
32	Napoleana vogelli P. Beauv.	Napoleanaceae		Nkpodu	Shrub	Perennial
33	Aframomum melegueta (Rosc.)	Zingiberaceae	Alligator pepper	Ose oji	Forb	Perennial
34	Myrianthus arboreus	Urticaceae		Ujuju	Tree	Perennial
35	Uvaria chamae	Annonaceae		Ohia	Shrub	Perennial
36	Canarium scheweinfurthii Engl.	Burseraceae	Bush candle tree	Ube okpoko	Tree	Perennial
37	Carica papaya L.	Caricaceae	Pawpaw	Okwuru bekee	Tree	Perennial
38	Anarcadium occidentalis	Anacardiaceae	Cashew	Kashu	Tree	Perennial
39	Xylopia aethiopica Dunal	Annonaceae		Uda		Perennial
40	Spondias mombin L.	Anacardicieae		Ijikere	Tree	Perennial
41	Piper guineense	Piperacea		Uziza		Perennial
42	Terminalia catappa L.	Combretaceae		Ukwu frutu	Tree	Perennial
43	Citrullus lanatus(Thunb.)	Cucurbitaceae	Watermelon		Climber	Annual
44	Cucumis sativusL.	Cucurbitaceae	Cucumber		Climber	Annual
45	Arachis hypogea L.	Fabaceae	Groundnut	Opapa	Herb	Annual

Table 2 shows that the fruits with the highest moisture content, are in this order: Cherry species, Malay rose Apple, Mango, Pineapple, spondias, soursop, papaya, guava, irvingia, Banana, Orange, Garden egg etc. Fruits with the highest protein content are in this order: *Vitex, Ficus capensis, dennettia, Tamarind, Napoleana, Landolphia,* alligator pepper etc. Fruits with the highest fat content include: *Dacryodes*, Avocado, Solanum (G.E), tamarind. *Chrysophylum, Vitex, Aframomum,* landolphia, Spondias etc. Those with the highest fiber content include: Garden egg (S.M), Alligator pepper, Mmimi (Dennettia), *Napoleana, Chrysophylum,* Pineapple and Landolphia. Fruits with the highest Ash content include: Alligator pepper, *Napoleana, Vitex, Solanum melongena, Ficus capensis, Dacryodes* and *dennettia.* Fruits with the highest, Carbohydrate content include: Velvet tamarind, *vitex,* Avocado, *Ficus capensis, Dacryodes, Ananas* (S.M) etc. In summary therefore the species with the highest overall nutritive indices comparatively are as follows: *Solanum melongena* (Garden egg), *Vitex doniana* (Mbembe) Alligator Pepper (*Aframomum, Melengueta*) Mmimi, (*Dennettia tripetala*), Velvet tamarind (*Dialum guineense*) *Napoleana vogelli* (Nkpodu), *Ficus capensis, Dacryodes edulis* (Ube Igbo), Avocado *Persea americana, Chrysophyllum albidum* (Udara), *Landolphia* (utu), *Ananas comosus* (Pineapple), *Landolphia, Spondias* species etcetera. This

notwithstanding, the rest- Soursop, Papaya, Mango, Guava, Banana, Orange, Bush Mango species are all wonderful fruit species in their own right.

Table 2: Proximate composition of some locally available fruits

Samples	Moisture	Protein	Fat	Fibre	Ash	Carbohydrate
Udara (C.albida)	64.33±0.15	0.41±0.02	3.43±0.63	7.69±0.08	3.19±0.04	21.29±0.16
Velvet tamarind	18.56±.09	5.81±0.27	4.17±0.01	3.17±0.01	1.89±0.03	66.14±0.29
Avocado pear	11.79±0.54	1.76±0.09	28.97±0.29	4.29±0.02	2.17±0.02	51.62±0.83
Mango (M.indica)	86.39±0.27	0.46±0.02	0.74±0.02	1.30±0.02	1.14±0.02	8.76±0.23
Guava (P.guava)	79.38±0.43	1.34±0.07	0.53±0.01	0.65±0.01	0.47±0.01	17.62±0.68
Cherry species	88.25±0.54	1.09±0.04	0.61±0.02	0.93±0.09	1.15±0.02	12.97±0..62
Garden egg	74.71±0.46	12.52±0.11	5.31±0.02	13.51±0.16	6.43±0.01	12.57±0.40
Banana fruit	76.85±0.11	1.25±0.03	0.92±0.05	1.77±0.1	.41±0.05	16.61±0.08
Orange fruit	75.97±0.13	0.84±0.03	0.61±0.01	3.61±0.05	2.09±0.02	17.33±0.16
Pineapple fruit	85.19±0.3	0.35±0.01	1.01±0.13	5.58±0.09	1.31±0.05	32.22±4.44
Sour sop fruit	81.14±0.27	1.03±0.03	0.77±0.08	1.33±0.06	1.35±0.04	14.39±0.21
Ugiri (Irvingia spp)	78.01±0.15	0.97±0.11	0.67±0.02	3.63±0.07	0.53±0.01	9.61±0.07
Malay rose apple	88.17±0.04	0.49±0.05	0.53±0.01	0.67±0.05	0.53±0.01	9.61±0.07
Mmimi (Dennettia)	66.47±0.05	6.39±0.03	1.99±0.04	0.42±0.07	4.84±0.07	9.87±0.03
Local pear	16.16±0.02	1.67±0.06	37.70±1.01	2.58±0.04	5.67±0.7	33.93±0.86
Utu (Landolphia)	68.73±0.24	2.19±0.02	2.29±0.03	5.15±0.03	6.21±0.02	16.1±1.07
Nkpodu (Napoleona Imperalis)	6.85±0.61	3.74 ±0.16	0.46±0.01	8.59±0.06	8.92±0.18	16.44±0.58
Alligator pepper	66.41±0.52	2.15±0.05	2.55±0.03	9.43±0.03	9.27±0.49	16.2±0.95
Akpuru iko (Ficus capensis	61.3±0.13	6.45±0.05	0.48±0.02	3.66±0.40	6.51±0.04	42.03±3.50
Mbembe (Vitex doniana	16.68 ±0.40	8.21±0.02	3.47±0.01	.86±0.20	8.69±0.04	62.08±0.09
Pawpaw fruit	80.20±0.03	0.83±0.11	0.61±0.01	1.27±0.01	0.48±0.05	16.61±0.08
Uvuru	81.95±0.07	21.17±0.04	2.04±0.06	4.85±0.4	2.16±0.02	6.83±0.44

Table 3 shows the utility indices of some locally available fruits. Some of the most useful plants according to utility indices include: members of the *Arecaceae, Rutaceae, Curcurbitaceae, Annonaceae, Anacardiaceae, Moraceae, Sterculiaceae* families in that order. Highly useful individual fruit species of this clime include: *Elaeis guineensis, Theobroma cacao, Treculia* Africana, *Mangifera indica, Citrullus lanatus, Anacardium occidentalis, Cocos nucifera, Musa sapientum, Arachis hypogea, Ananas comosus, Psidum guajava, Cucumeropsis mannii, Tlfeiria occidentalis, Dacryodes edulis* to mention just a few. Generally speaking, most fruits are basically sources of food, medicine, industrial raw materials and income.

Table 3. Utility indices of some locally available fruits

S/N	Scientific Name	Food plant	Medicinal pharmaceutical plant	Industrial raw material	Annonaceae	Others (Fuel, shade etc)	Ornamental Plants	Source of income	Fodder species
1	Monodora myristica	✓	✓					✓	
2	Artocarpus altilis	✓			✓				
3	Annona murichata	✓	✓		✓			✓	
4	Annona senegalensis	✓			✓				✓
5	Dennettia tripetala	✓	✓		✓	✓		✓	
6	Uvaria chamae	✓			✓			✓	
7	Xylopia aethiopica	✓	✓		✓			✓	
8	Cucurbita pepo	✓	✓		Cucurbitacea				
9	Telfeiria occidentalis	✓	✓		✓			✓	✓
10	Cucumeropsis mannii	✓			✓			✓	
11	Citrullus lanatus	✓	✓	✓	✓			✓	✓
12	Cucumis sativus	✓	✓		✓				
13	Mangifera indica	✓	✓	✓	Anacardiaceae	✓		✓	✓
14	Anacardium occidentalis	✓		✓	✓			✓	
15	Spondias mombin	✓		✓	✓			✓	✓
16	Treculia Africana	✓		✓	Moraceae	✓		✓	
17	Artocarpus heterophyllus	✓			✓		✓	✓	
18	Artocarpus altilis	✓			✓				
19	Theobroma cacao	✓		✓	Sterculiaceae			✓	
20	Cola acuminate		✓		✓	✓		✓	
21	Elaeis guineensis	✓	✓	✓	Arecaceae	✓	✓	✓	✓
22	Cocos nucifera	✓	✓	✓	✓	✓	✓	✓	✓
23	Dacryodes edulis	✓	✓	✓	Burseraceae	✓		✓	✓
24	Canarium Schweinfurthii	✓	✓	✓	✓	✓		✓	

5.1. **DISCUSSION**

Of the 45 fruit species encountered in this work, 33 could be eaten in the raw form without undergoing heating, boiling or roasting. 12 have to be adequately prepared to remove seed poisons, soften them and make them palatable. It is significant from table 2, that the pears (Local variety and Avocado) had the highest concentration of fats (37.70 and 28.97) respectively, taken into consideration the fact that plant fat is much healthier than animal fat. It is not surprising also that the sweeter the fruit (table 2), the higher the carbohydrate (sugar) / moisture combination. Pineapple: Ananas comosus (32.22/85.19); ficus capensis (42.03/61.3); pitanga cherry (12.97/88.25); malay rose apple (9.61/88.17); Banana (16.61/80.20); Mango (8.76/86.39); African star apple (21.29/64.33); Nauclea (6.83/81.95); Tamarind (66.14/18.56). In terms of mineral and vitamin concentration – Aframonum has the highest (9.27); followed by Napoleana (8.92); Vitex (8.69); Ficus (6.51); Solanum melongena (6.43); Landolphia (6.21); local pear (5.67); Dennetia

(4.84); and African star apple (3.19). Fruits are best eaten fresh; washed and seasoned with salt and pepper; and best eaten when it is neither unripe nor overripe.

5.2. CONCLUSIONS

A total of about 45 tropical fruit species were scientifically evaluated. The more popular families included *Annonaceae, Moraceae* and *Cucurbitaceae.* Most tropical edible fruit species are more of trees and perennials as opposed to shrubs, climbers and annuals. The Genera with the highest overall comparative nutritional indices include: *Solanum, Vitex, Aframomum, Dennettia, Dialum, Napoleana, Ficus, Dacryodes, Persea, Chrysophyllum, Landolphia, Ananas* etcetera. In terms of utility indices most useful families include: *Arecaceae, Rutaceae, Cucurbitaceae, Annonaceae, Anacardiaceae, Moraceae, Sterculiaceae* etcetera. Most importantly, most of our fruit species are excellent sources of food, phyto-medicine, industrial raw materials and income.

ACKNOWLEDGEMENTS

I am deeply grateful to Nwa-amaka Ikenwa who helped me to purchase the edible fruits used in this study from the local markets. The proximate analysis was done at the Springboard Analytical Research Laboratory at Awka. I appreciate Prof. G.C.Obi for the technical proof-reading of the original draft. Lastly I would like to thank the anonymous OJSE reviewer for providing useful comments that substantially improved the quality of the paper.

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