

## IMPROVED PLANT USAGE FOR QUALITY FOOD AND LIFE; A VERITABLE TOOL FOR NATIONAL DEVELOPMENT: THE CASE OF *VITEX DONIANA*

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### **Abstract**

*Biological resources remain pivotal to human survival and national development. Fruit crops, varieties of timber and non-timber forest products, etc. have continually contributed to the average African household, and by extension the nation, economically and with attendant health and nutritional benefits. Vitex doniana ('Oriri tree') are large evergreen trees, a non-timber forest product found throughout tropical Africa. Fruits are seasonal foods which easily get wasted and run out of season if not processed. The tree is presently not known to most Nigerians and there are threats of extinction due to lack of wide use and deforestation. This paper therefore sets out to create awareness on the bacteriological activities, nutritional values, quality food intake as well as market potentials of Vitex doniana for enhancement of National Development.*

**Keywords:** *Quality foods, Nutritional value, Vitex doniana, Biological resources, National development.*

## Introduction

The value of food quality to human survival and development cannot be overemphasized. Diseases due to pathogenic bacteria and fungi represent a critical problem to human health and they are one of the main courses of morbidity and mortality worldwide (WHO 1998, cited by Lagnika, Amoussa, Adjori and Sanni, 2012). Plants and plant products whether consumed in their roots, stems, leaves, seeds or fruits contribute a number of health benefits to human diet. The application of biological sciences in agriculture has become increasingly prominent in the past decades. This thus, helps create more nutritious foods and plants by-products with improved functional properties through biotechnology.

The term biotechnology refers to any technology, process or practice that modifies or harnesses any living organism or system to be useful to any human purpose (North, 2019). The word biotechnology is derived from ‘bio’ meaning life or living systems and ‘technology’ defined as scientific methods for achieving a practical purpose. Biotechnology is therefore a collection of technologies that employ living systems or properties derived from these systems for the production of industrial goods and services. The living systems can be of plants, animal or microbial origin.

Plant foods can be employed for a number of health benefits. As put by Langridge (2000) cited in Ajayi (2017), plant foods could be used as edible vaccines which can be used to create immunity against common viral and bacterial pathogens by producing antigenic proteins derived from them in edible plant parts. Plant used in traditional medicine may constitute an important source of new biologically active compounds.

Fruits are plant foods packed full of vitamins and minerals nutrients such as potassium, dietary fiber, vitamin c and foliate (folic acid), protein and fatty acid. These foods are packed full of antioxidant which help fight cancer-causing free radicals in our bodies and keep one healthy, help prevent premature aging and the onset of diseases. Fruits include apples, blackcurrants, black berries, oranges, raspberries, goji berries (Fruit Expert, 2010). Others include banana, cherries, coconut, grape, lime, peach, berries, date, guava, lemon, mango, pawpaw, pear, pine-apples, water melon and many other types.

Fruits are of great health benefits. For instance, dietary fruit helps to keep the digestive system running properly. Not only will this help expel waste products more effectively but it can also help prevent colon and bowel cancers as well, as there will be fewer toxins exposed to that area for less time. When taken in a wider range as much as possible, one stands the chance of getting different combinations of minerals, nutrients and enzymes in them. Eating fruit as part of one’s diet will make one feel better, more active and healthy. Any fruit will do, dried, frozen, fresh, tinned or fermented into juice. They are the natural and stable food for man. Fruits are seasonal foods, which easily get wasted and run out of season. The **Table 1** below by Nevo (1996) shows fruit nutrition facts in detail-

***Fruit Nutrition Facts***

<b>Food</b>	<b>Energy</b>	<b>water</b>	<b>fiber</b>	<b>Fat</b>	<b>Protein</b>	<b>sugar</b>	<b>vit.A</b>	<b>vit.C</b>	<b>vit.B1</b>	<b>vit.B2</b>	<b>vit.B6</b>	<b>vit.E</b>
<b>substance = 100 g.</b>	<b>kJ/Kcal</b>	<b>%</b>	<b>g</b>	<b>G</b>	<b>G</b>	<b>g</b>	<b>ug</b>	<b>Mg</b>	<b>mg</b>	<b>Mg</b>	<b>mg</b>	<b>mg</b>
<a href="#"><u>Apple</u></a>	207/49	84	2.3	0	0.4	11.8	2	15	0.02	0.01	0.05	0.5
<a href="#"><u>Apricot</u></a>	153/36	87	2.1	0	1.0	8.0	420	5	0.06	0.05	0.06	0.5
<a href="#"><u>Avocado</u></a>	523/126	81	0.2	10	2.0	7.0	20	17	0.06	0.12	0.36	3.2
<a href="#"><u>Blueberry</u></a>	204/48	80	8.4	0	1.0	11.0	0	10	0.02	0.03	0.05	1.9
<a href="#"><u>Blackberry</u></a>	170/40	85	8.7	0	2.0	8.0	30	150	0.08	0.04	0.07	1.0
<a href="#"><u>Banana</u></a>	375/88	76	2.7	0	1.2	20.4	3	10	0.04	0.03	0.36	0.3
<a href="#"><u>Carrots</u></a>	48 /11	92	3.3	0	0.6	2.2	312	2	0.03	0.04	0.08	0.2
<a href="#"><u>Cranberry</u></a>	68 /16	89	4.2	0	0.0	4.0	0	15	0.00	0.01	0.07	0
<a href="#"><u>Cherry</u></a>	221/52	86	1.2	0	0.0	13.0	40	10	0.02	0.02	0.04	0.1
<a href="#"><u>Date</u></a>	1275/300	20	7.5	0	2.0	73.0	0	0	0.05	0.10	0.10	0.7
<a href="#"><u>Fig</u></a>	340/80	80	2.0	0	1.0	19.0	10	3	0.06	0.05	0.11	-
<a href="#"><u>Grapefruit, Red</u></a>	128/30	90	1.4	0	0.9	6.6	0	40	0.07	0.02	0.03	0.5
<a href="#"><u>Grapes</u></a>	274/64	83	2.2	0	0.6	15.5	0	3	0.03	0.01	0.08	0.6
<a href="#"><u>Guava</u></a>	306/72	81	5.3	0	1.0	17.0	30	218	0.04	0.04	0.14	-
<a href="#"><u>Gooseberry</u></a>	170/40	88	3.2	0	1.0	9.0	0	30	0.02	0.01	0.08	0.4
<a href="#"><u>Kiwi Fruit</u></a>	168/40	84	2.1	0	1.1	8.8	5	70	0.01	0.02	0.12	1.9
<a href="#"><u>Kumquat</u></a>	289/68	82	1.5	0	1.0	16.0	160	55	0.14	0.06	-	-
<a href="#"><u>Lemon</u></a>	51/12	96	1.8	0	0.0	3.0	0	40	0.06	0.02	0.04	0.8
<a href="#"><u>Lime</u></a>	156/37	91	0.3	0	0.0	7.0	0	40	0.03	0.02	0.08	-

<a href="#"><u>Lychee</u></a>	323/76	82	1.5	0	1.0	18.0	0	39	0.05	0.05	-	-
<a href="#"><u>Mandarin / Tangerine</u></a>	177/42	88	1.9	0	0.9	9.5	12	30	0.08	0.03	0.084	0.4
<a href="#"><u>Mango</u></a>	255/60	84	1.0	0	0.0	15.0	210	53	0.05	0.06	0.13	1.0
<a href="#"><u>Melon, Red Water</u></a>	153/36	93	0.6	0	1.0	8.0	30	6	0.04	0.05	0.07	-
<b>Food</b>	<b>Energy</b>	<b>water</b>	<b>fiber</b>	<b>fat</b>	<b>Protein</b>	<b>sugar</b>	<b>vit.A</b>	<b>vit.C</b>	<b>vit.B1</b>	<b>vit.B2</b>	<b>vit.B6</b>	<b>vit.E</b>
<b>substance = 100 g.</b>	<b>kJ/Kcal</b>	<b>%</b>	<b>g</b>	<b>g</b>	<b>G</b>	<b>g</b>	<b>ug</b>	<b>Mg</b>	<b>mg</b>	<b>Mg</b>	<b>mg</b>	<b>mg</b>
<a href="#"><u>Melon, cantaloupe</u></a>	122/29	89	0.6	0	0.9	6.3	7	32	0.05	0.02	0.10	0.2
<a href="#"><u>Olive</u></a>	586/142	75	4.4	14	1.0	3.0	50	0	0.03	0.08	0.00	2.0
<a href="#"><u>Orange</u></a>	198/47	87	1.8	0	1.0	10.6	2	49	0.07	0.03	0.06	0.1
<a href="#"><u>Papaya</u></a>	136/32	91	0.6	0	0.0	8.0	40	46	0.03	0.04	0.04	-
<a href="#"><u>Passion Fruit</u></a>	158/37	88	3.3	0.4	2.6	5.8	125	23	0.03	0.12	-	0.5
<a href="#"><u>Peach</u></a>	151/36	89	1.4	0	1.0	7.9	15	7	0.01	0.02	0.02	0.0
<a href="#"><u>Pear</u></a>	201/47	86	2.1	0	0.3	11.5	0.0	4	0.01	0.01	0.02	0.1
<b>Red Bell Pepper</b>	119/28	91	2.2	0	1.0	6.0	172	80	0.04	0.14	0.43	6.4
<a href="#"><u>Persimmon</u></a>	325/76	81	0.5	0	0.5	18.6	260	16	0.02	0.03	-	-
<a href="#"><u>Pineapple</u></a>	211/50	84	1.2	0	0.4	12.0	20	25	0.07	0.02	0.09	0.1
<a href="#"><u>Pomegranate</u></a>	343/81	82	3.4	0	1.0	17.0	10	7	0.05	0.02	0.31	-
<a href="#"><u>Plum</u></a>	177/42	84	2.2	0	0.8	9.6	18	5	0.02	0.03	0.10	0.7
<a href="#"><u>Strawberry</u></a>	99/23	91	2.2	0	0.7	5.1	10	60	0.02	0.03	0.06	0.4

<a href="#">Tomato</a>	48/11	97	1.4	0	0.9	1.9	140	15	0.05	0.02	0.08	0.7
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Source: Nevo table 1996, Nevo Foundation, Netherlands Nutrition Centre.

## Biology and National Development

The knowledge of biology and biology education contribute immensely to the technological growth and development of any nation. It finds its way into Agriculture, Pharmacy, Ethnobotany, Medicine, Biotechnology and other related fields (Ahmad, Abubakar and Yau, 2018).

National development is holistic in approach. It is a process of reconstruction and development in various dimensions of a nation and development of individuals. It includes full growth and expansion of our industries, agriculture, education, social religion and cultural institutions. It is a round and balanced development of different aspects and facets of the nation viz. political, economic, social, cultural, scientific and material (Bawa, 2019).

Biological Sciences generate continuous innovation (technological, organizational, and managerial) generated by learning entities that have been shown to be responsible for not only productivity increases, but also for dynamic competitive advantage of firms, industries and nations in the unfolding global economy (Awosika, 2008). Particularly, plant biology has great potential to affect the welfare of the Nigerian nation. In the face of the present economic downturn, biological knowledge and technology breakthrough must be embraced by all. Forest foods contribute to rural livelihood development, and in general, serve as a bridge to food shortage; *vitex doniana* as a forest product has varieties of use with promising economic values, quality foods, health benefits and natural development.

### The Biology of *Vitex doniana* and its Nutritional Qualities for National Development

According to James, Owolabi, Bisalla and Jassium (2010), *Vitex doniana* is a savanna specie in wooded grassland and can also be found in forest edges. It can be found throughout tropical Africa. It is of the family *verbenaceae*. The leaves are simple, pentally arranged, broad, oval in shape and supported on a winged petiole with normal leaf smell.



Fig. 1: 'Oriri' leaves

The fruits in their unripe stage are usually green, round, small and apple-shaped. They are produced in clusters and carried in pairs with spots as dots as shown below –



**Fig. 2: 'Oriri' fruit when unripe**

Arbonnier (2004), describe the fruits as a globose drupe, glabrous, about 2.5cm long, surrounded at the base by the persistent calyx, widened into a cupule, blackish when ripe enclosing a hard stone embedded in a thin pulp.

'Oriri' as a name for this plant is native to the 'Esans' of Edo State in the South-South and to the 'Yorubas' of the South-West of Nigeria, the plant is called 'Igi-Oori' and it is common among the people of Osun State, where the fruit is called 'Oori-nla'. Other names include 'dinya' (Hausa), 'uchakoro' (Igbo), Fan, or 'Ewe Oyi' in Republic of Benin, black plum and *Vitex donaina* (Latin). The generic name '*Vitex*' is an old Latin name for the genus (Ky, 2008). 'Oriri' is a fruit crop, fleshy when ripe, apple-shaped, larger than when at the onset of growth, black in colour with the initial spots or dots of yellow-red becoming prominent. The fruit has a smooth shining epicarp. The flap gets darkened and may fall off or remain attached. When ripe, the fruits appear pleasant and attractive as shown in Fig. 3 below –



**Fig. 3: 'Oriri' fruits when ripe**

It is non-juicy, but internally, the edible part appears woolly or carpet in structure. The seeds are dark in colour, single, indehiscent. On nutritional characteristics, the fruits are edible, eaten by licking the fleshy inner part. Juicing liquid is often prepared from the fruit through local fermentation and extraction techniques. This when finished has organoleptic value close to that of honey in texture, colour and even in its pleasant sweet taste as shown in Fig. 4 below –



**Fig. 4: 'Oriri' fruit Juice**

The flowers are numerous, white, tinged purple, usually borne in short, stout axillary cymes on a long stalk. The calyx and pedicels are densely hairy (Bekele-Teseimma, Birnie & Tengnas, 1993). Flowering is usually during the second half of the dry season and Guinean areas, on well-drained soil (Arbonnier, 2004). For its reproductive biology, *Vitex* species generally exhibit hermaphroditism, where both functional male and female organs are in the same flower (Ky, 2008).

Most fruits are eaten raw at their ripe stage, taking different colours from green as in pears; light green as in banana, apple, orange and tangerine; yellow as in pineapple and cashew, and red as in tomatoes, etc. 'Oriri' fruits come out brown-black in colour and are edible when ripe with sweet taste. The ripening of fruits is achieved by loss of green pigment (chlorophyll) leaving the yellow or other pigments which gives the characteristic colour of the fully ripe fruit (Ighalo, 1992). *Vitex doniana*, has numerous utilizations with promising economic potential for poverty alleviation in rural and peri-urban areas in Africa (Achigan *et al.*, 2014 in Opute, Idumah, Olugbire, Arabomen, 2016). The species regenerate naturally by seed and not suckers. Monkeys may despise the seeds. Forest fire may help break the seed coat before germination. The tree produces a teak-like termite resistance that is used as poles and other purposes in house building (Bekele-Teseimma, Birnie & Tengnas, 1993).

'Oriri' tree however, as compiled by Ky (2008), has the following characteristics: the fruit is sweet and tastes like prunes, and can be made into a jam. Leaves are often used as herbs for cooking. The leaves pods and seed are a good fodder. *Vitex doniana* is a favorite tree for hanging back beehives. The wood is used for fire wood and charcoal. The tree produces a teak-like termite resistant timber. It is quite hard and suitable for light building materials, furniture, carvings and boats. The fruit can be made into wine. The pounded leaves can also

be added to warm filtered grain beer and drunk. The bark yields a dye that can be used for cloth. The plants are also of great medicinal values, the fruit is used to improve fertility and to treat anemia, jaundice, leprosy and dysentery. The root is used for gonorrhoea, and women drink a decoction of it for backaches. The young tender leaves are pounded and the juice squeezed into the eyes to treat eye troubles. For other services, the heavy rounded crown of *vitex doniana* provides good shades, the tree has nitrogen fixing roots and the leaves can be used for mulch as soil improver. It is usually grown in fields and along boundaries for boundary support.

*Vitex doniana* is used by traditional healers alone or in a combination with stem bark of *Adansonia digitata* to treat diarrhoea, leprosy and dysentery; the leaves are used as antiseptic and anti-diabetic; the aerial parts are used in Mali as diuretic, tonifiant, aphrodisiac and bactericide. The plant is traditionally used to treat diarrhoea and infectious diseases; the fibers of the pod used as decoction to treat amenorrhoea. They can be used as a febrifuge, anti-dysenteric and in the treatment of small pox and measles; the bark of trunk is used in the treatment of malaria and also used to bath babies to encourage a smooth skin (Adjanohoun, *et al*, 1989; Muauda, *et al*, 2011; Goetz, 2006; Shahat, 2008; Kubmarawa *et al* cited by Lagnika, Amoussa, Adjori and Sanni, 2012).

The chemical composition of the tree *Vitex doniana* include the following: the fruits are acidic, the fruit juice has a P<sup>H</sup> of about 4.5 per 100g edible portion, the composition of the fruit pulp according to leung, Bussion & Jardin, 1968 cited in Ky (2008), consist of water 59.5-73.5g, energy 435KJ (104 kcal), protein 0.6-0.8, fat 0.1-1.3, carbohydrate 27.5g, fibre 1.3, calcium(ca) 20-47mg, iron (fe) 2.0-4.5mg, and ascorbic acid 6-18mg. The fruits are a good source of potassium and iron. The seed oil has high iodine and low saponification values and can be used for skin cream, resin and paint production. Dried seeds yield about 30% oil (Ladeji and Okoye, 1993; Lagnika, Amoussa, Adjori and Sanni, 2012).

For its nutritional value, *Vitex doniana* contains vitamins A and B. It is a good source of potassium and iron. The syrup made from the fruit pulp can be used instead of other syrups as nutritive sweetener. Jam prepared from the fruit as stated by Alobo (2000) showed no significant difference in flavour, colour and overall acceptability from a commercial plum jam. The *vitex doniana* jam was even preferred for consistency and spread ability.

## **Conclusion**

Products of *Vitex doniana* come with great nutritional and medicinal benefits that can promote healthy living and productivity. However, despite the socio-economic potentials of the tree, it is not known to most Nigerians, it is going into extinction due to poor conservation and low patronage at governmental level. It attracts presently rural popularity and tied to traditional medicine.

To harness science and technology for social-economic development and enhancement of quality of life through quality foods in this 21<sup>st</sup> century move, knowledge of the existence of plants like *vitex doniana*, its bacteriological activities and nutritional values, is a welcome idea.



## **Recommendation**

From the above conclusion, it is therefore recommended that efforts be made by all to:

- 1) Create awareness generally about the plant;
- 2) Government should help to re-sensitize the general populace towards good utilization, afforestation and general conservation ethics. This will encourage sustainability of the available species, increase utility, quality life and thus national development.

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