IJST EXPLORE International Journal of Science and Technology
CENTRE OF PROFESSIONAL RESEARCH PUBLICATIONS
ISSN 2049-7318

International Journal of Science and Technology Volume 2 No. 1, January, 2013

Vitamins Composition of Pulp, Seed and Rind of Fresh and Dry Rambutan *Nephelium Lappaceum* and Squash *Cucurbita pepo'L*

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ABSTRACT

The vitamins contents of the pulp, seeds and rind of *Nephelium lappaceum* and *Cucurbita pepo'L* were evaluated. The study was carried out on both fresh and dried samples. Results of the investigation reveal that the fresh *Nephelium lappaceum* pulp, seed and rind were high in pro-vitamin A (carotenoid) content though lesser than those of *Cucurbita pepo'L. Nephelium lappaceum* pulp was superior in ascorbic acid compared with other parts. However, the rind of fresh *Cucurbita pepo'L* was also high in vitamin C compared with the seed and the pulp. Beside, the fruits were generally low in B vitamins but high in caloric value. Although there was a significant difference at ($p< 0.05$) in the vitamins contents in the different parts of the fruits, the vitamins in the seeds and rind which are the parts always discarded, can contribute immensely to recommended daily allowance and maintenance of good nutritional status and hence good health for both man and animals.

Keywords: *vitamins-content, pulp, seed, rind, rambutan (nephelium lappaceum, squash (cucurbita pepo'l).*

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1. INTRODUCTION

Fruits botanically are seed containing organs found in the ripened ovary of a flower. They are the parts of plants that produce seeds. Fruits mostly are fleshy and juicy some may be dried such as cereal, grains, nuts and legume pods. Fruits as reported by Kilgour (1987) form about 4% of the world's food supply. Fruits contain a high percentage of water averaging 85%, fats and protein in very small varying amounts, a fair proportion of carbohydrate present as cellulose, starch in small quantity and sugar. Beside their low energy value, they are known for their high micronutrients concentrations including carotene or provitamin A, vitamin k, ascorbic acid, riboflavin, iron, iodine and other mineral elements (Shiundu, 2004). The main contribution of fruits in nutrition is vitamins and the main source from which humans and animals derive their vitamin is from fruits and vegetables. Vitamin A is present in fruits as the precursor of carotenes (Alpha, Beta and Gamma) which can be converted to the vitamin in the body. Fruits such as pawpaw, oil palm, carrots and pumpkins provide large quantities of carotene. Ngoddy & Ihekeronye (1985) reported a value of 200 IU each for avocado pear and passion fruit. Fruits and vegetables provide vitamin and minerals in quantities high enough to provide the body with its needs (Fraser & Cooper, 2006). They have been linked to the management of anaemia because of their vitamin C content. When consumed with meals, they enhance iron status of the individual their high content of vitamin C improves absorption of iron (Wardlaw & Hamphl, 2007). Seeds and peels of grapes and pomegranates are also rich sources of natural antioxidant (Jayaprakash *et.al*. 2001). Research studies have recently shown that a diet rich in the vitamin antioxidants (Vitamin C and E) and the carotenoids is associated with improved health and a lower risk of coronary heart disease and cancer (Pamplona-roger,2008). Humans' posses great capacity to adapt physiologically to different types of foods. In spite of this, nutrition science has demonstrated that there are certain foods that cannot be eliminated, such as fruits and fresh vegetables (Pamplona-roger, 2008). As reported by Ngoddy & Ihekeronye (1985), fruits offer the most rapid methods of providing adequate supplies of vitamins, minerals and fibres to people living in the tropics. Most fruits and vegetables have low energy density and are recommended for weight management (Rolls & Ello-martins *et.al*, 2004). The optimal diet for everyone as recommended by

the world health and food and agriculture organization is a low-fat, and fibre diet rich in complex carbohydrate characterized by a frequent consumption of fruits and vegetables at least 400g daily as well as whole-grains, cereals and legumes at least 30g daily (WHO/FAO,2003). A variety of fruits and vegetables are however consumed in Nigeria on a daily basis, and they form an integral part of our diet but most times only the fleshy pulp of these fruits are consumed leaving the seed and the rind. *Nephelium Lappaceum* is a medium sized tropical tree. It is an evergreen tree growing to a height of 12-20m (Tindall, 1994). The leaves are alternate 10-30cm long, pinnate with 3-11 leaflets, each leaflet 5-15cm wide and 30-10cm broad. The fruit is round or oval drupe, 3-6cm long and 3-4cm broad. The leathery skin is reddish (rarely orange or yellow and covered with fleshy pliable spines. The seed is glossy brown 2-3cm with a white basal scar. *Cucurbita pepo' L* is a fruit of various vines of the botanical family Cucurbitaeceae. It comes in a wide variety of shapes, predominantly spherical, flattened, ovoid, and bottle shaped. Their rinds vary in colour from orange, yellow, green, white, black or even purple. Their pulp or flesh is generally orange or yellow and the centre area is filled with seeds (Pamplona-rodger, 2008). *Cucurbita pepo' L* is an annual plant, hispid and scarbrous, with a procumbent stem and branching tendrils. Its leaves are large, cordate, palmately s-lobes, or angled and denticulate. The flowers are very yellow, large axillary and the males long-pedunculate. The pepo, or fruits is subligeous, very large, roundish or oblong, smooth, yellow when ripe, furrowed and torulose, containing yellowish seeds resembling those of the *Citrullus lanatus*. *Nephelium lappaceum* fruit is usually sold fresh, used in making Jam and Jellies. It single brown seeds is high in certain fats and oil (Oleic and arachidic acid) valuable to industry and used in cooking and manufacturing of soap. Its roots, back and leaves have various medicinal uses and are used in production of dyes. A second specie of *Nephelium lappaceum* known as "wild" Rambutan is smaller in size than the usual red variety and is coloured yellow. The *Cucurbita pepo'L* has been essential crop in the Andes since the pre-columbian era. *Cucurbita* is a seasonal crop used as human feed, the flesh is eaten fresh, processed in different ways as dried, frozen, fried, candied or pickled (Teotia, 1992), and the seeds are utilized directly for human consumption as snacks after salting and roasting in Arabian countrie (Al khalifa, 1996). *Cucurbita* in culimnary terms is widely regarded as vegetable or as an ingredient in pies, soups, stews, bread and many other dishes, fresh pumpkins are sensitive to microbial spoilage, even at refrigerated conditions, they must be frozen or dried (Doymaz, 2007). Research has reveal that fruits and vegetables contain among other vital nutrients, an appreciable quantity of vitamin, fibre, antioxidants, phytochemicals and a daily consumption of at least 5 to 10 servings of a wide variety of fruits and vegetable is an appropriate strategy for significantly reducing the risk of chronic diseases and to meet nutrient requirement for optimum health (Liu, 2004). These fruits are consumed, fresh, canned or processed and its consumption results in the production of vast amount of agricultural waste from their seeds and rind, disposal of these Agricultural wastes can have a serious environmental impact which is becoming harder to solve. Much effort will therefore be needed to develop the nutritional and industrial potential of by-products waste and these under- utilized agricultural products. Despite the numerous nutritional benefits from fruits only a small portion of plant material is utilized directly for human consumption (El-Adaway *et.al*.1999), the remainder part may be converted into nutrient for either food or feed or into fertilizer. Although several research work have been done on the nutritional evaluation of some locally available fruits, Obizoba *et.al.* (2004), Akubor & Onimawo (2005), Animawo (2005), Adepoju & Adeniji (2008), Ene-obong (2001), Itam (1983), Essien (1994) and Edet (2004), not much has been done on the nutritional and anti-nutrient contents of many locally available fruits their pulp, seeds and rind which is most times discarded. The knowledge of the nutritive and the anti-nutrient content of various parts of these fruits will encourage their consumption in diverse ways and re-utilization of the vast amount of seeds and peels discarded as waste for human food, animal feed and fertilizer. Much has been reported on the nutritional value of fruits and how it can be used to effectively prevent nutritional deficiency in man as well as treat nutritional diseases. However, seeds and their rind have not been given much attention such that most times these parts of fruit are discarded even with their hidden nutrient. The seeds and rind which are often the waste part of the fruits have not generally received much attention with a view to being used or recycled rather than discarded. Interestingly the seed and rind of some fruits have higher vitamins, fibres, minerals and other essential nutrients activity than the pulp fractions (Jayaprakasha *et.al*. (2001). It became pertinent to evaluate the vitamins content of these fruits and their waste materials so that the knowledge derived can be used to encourage adequate consumption of fruits and re- utilization of the seeds and rind in possible value added applications.

2. SOURCES OF MATERIALS

8kgs of *Cucurbita pepo'L* and 5kgs of *Nephelium lappaceum* were bought from the local markets in Calabar, Obudu and Obubra Local Government Area in Cross River State. The samples were bought when available in their fresh state and in sufficient quantity for the analysis.

3. COLLECTION AND TREATMENT OF SAMPLES

8 *Cucurbita pepo'L* weighing 1kg each and 5kgs of *Nephelium lappaceum* were used for vitamins analysis. 4kgs of *Cucurbita pepo'L*, and 2.5kg of *Nephelium*

lappaceum were bought, prepared and dried using a hot air circulating oven (Gallenkamp hot box size one) at 50°c and stored in a labeled air tight containers in a refrigerator. The same quantity was bought and used as fresh samples for the vitamins evaluation. *Nephelium lappaceum* rind was separated from the pulp using a knife before separating the pulp from the seed. The Rind was chopped into cubes, the pulp was shredded and the seed kernels were sliced into thin bits. Each sample was placed in a separate tray lined with foil. *Cucurbita pepo'L* was chopped into slices and cooked for 20 minutes, allowed to cool before separating the seed from the pulp and rind using a spartular. Each was placed in a separate tray lined with foil. The samples were introduced into the hot air circulating oven (Bs-250, Gallen Kamp oven) and dried at 50°c.The seeds of *Nephelium lappaceum* and *Cucurbita pepo'L* were dried in the oven for 24hours, rind and pulps for 48hours. Drying period was taken from the moment of introduction into the pre-heated oven. The dried samples were removed and grounded separately in a steel-bladed grinding mill to pass through a 30-mesh sieve AOAC (1991). The six groups of samples were stored in airtight containers and labelled accordingly from which required quantities were scoped out for vitamins.

4. DETERMINATION OF VITAMINS CONTENT

The vitamins in the fresh and dried samples were determined using the methods of association of vitamin chemists (A O V C 1966) vitamin A and B were determined using the spectrophotometer method described by Kirk and Sawyer, (1991) at 325nm. Vitamin B (Niacin, thiamin and Riboflavin) was determined using a flame photometer while viyamin C was estimated by the 24 dinitrophenol hydrazine methods as described in (A O A C 1966).

5. ANALYSIS OF DATA

The results of the proximate analysis and anti-nutrient screening were analysed for statistical significance by one way ANOVA (F- ratio) (Welkowitz, 1976) and student 't' test were applicable values at ($p<0.05$) were regarded as significant in comparison with appropriate control. All data were expressed as means of ± SEM.

6. RESULTS

The results of assessment of vitamins content of fresh and dried *Nephelium lappaceum* and *Cucurbita pepo'L* is presented in table 1 and 2 respectively based on mg/100g fresh and dried matter.

From the tables below, the pro-vitamin A content of fresh *Nephelium lappaceum* as shown in table 1revealed that the rind (10.60 ±0.17) when compared with the seed (3.42 ± 0.00) was significantly higher than the seed at ($P<0.05$). In the dry sample, the rind (41.20± 0.17) was still significantly higher than the seed (5.46 ± 0.17) at ($P<0.05$). The pulp had (0.00 ± 0.00) values for both fresh and dry samples. Statistically, cooked *Cucurbita pepo'L* as presented in table 2 revealed that cooked *Cucurbita* seeds (71.97±0.17) was significantly lower than the pulp (121.03±0.29) but significantly higher than the rind (20.28 ± 0.24) at ($P<0.05$). Dry *Cucurbita* seed (104.27 ± 0.17) was significantly higher than the rind (41.20 ± 0.17) but lower than the pulp (141.36 ± 0.17) at ($P<0.05$). However, statistical evaluation of thiamine content of fresh and dry *Nephelium lappaceum* pulp, seed and rind were significantly different at $P<0.05$ when compared with each other. In table 2, cooked *Cucurbita pepo'L* seed (0.10 ± 0.00) and rind (0.10 ± 0.00) were significantly higher than the pulp (0.06 ± 0.00) at $P<0.05$. Similarly, the dry *Cucurbita pepo'L* seed (0.09 ± 0.01) and rind (0.09 ± 0.01) were significantly higher than the pulp (0.04 ± 0.00) at ($P<0.05$). There was no significant difference in the seed and rind. More so, Comparatively Riboflavin content of fresh *Nephelium lappaceum* rind (0.06 ± 0.01) was significantly lower than the seed (0.09 ± 0.01). The seed however was significantly higher than the pulp (0.06 ± 0.00) at ($P<0.05$). There was no significant ($P<0.05$) difference between the pulp, seed and rind as shown in table 1. Only the fresh and dry pulp of *Cucurbita pepo'L* recorded values of as high as (0.17 ± 0.00) and (0.15 ± 0.01) for Riboflavin which was not detected in both fresh and dry seeds and rind. Beside, scientific investigation reveals that fresh *Nephelium lappaceum* rind (0.31 ± 0.01) was significantly lower than the pulp (0.78 ± 0.01) but higher than the seed (0.08 ± 0.03) at ($P<0.05$). Niacin content of the dry seed (0.06 ± 0.00) and rind (0.22 ± 0.02) of *Nephelium lappaceum* were significantly lower than the pulp (0.56 ± 0.01) but the rind was significantly higher than the seed at ($P<0.05$). Fresh *Cucurbita pepo'L* seed (0.47 ± 0.01) was significantly lower than the pulp (0.88 ± 0.00) but higher than the rind (0.31 ± 0.01) at ($P<0.05$). Similarly, Niacin content of dry *Cucurbita pepo'L* seed (0.31 ± 0.01) was significantly lower than the pulp (0.83 ± 0.01) but higher than the rind (0.26 ± 0.02) at ($P<0.05$). Table1 and 2 shows that the ascorbic acid content of fresh *Nephelium lappaceum* rind (7.43 ± 0.05) was significantly lower than the pulp (52.29 ± 0.63) but was higher than the seed (4.69 ± 0.59) at ($P<0.05$). The dry rind (5.12 ± 0.08) when compared with the pulp, (52.35 ± 0.59) was significantly lower than the pulp but was higher than the seed (2.93 ± 0.59) at ($P<0.05$). Comparatively, Ascorbic acid content of cooked *Cucurbita pepo'L* rind (16.43 ± 0.59) was significantly higher than the seed (6.45 ± 0.59) at ($P<0.05$). The rind and pulp (15.25 ± 0.59) were not significantly different at ($P<0.05$). Similarly, the dry rind (8.21 ± 0.59) was significantly higher than the seed (2.93 ± 0.59) but the seed was lower than the pulp (6.45 ± 0.59) at ($P<0.05$).

7. DISCUSSION

The fresh and dried pulp, seeds and rind of *Nephelium lappaceum* and *Cucurbita pepo'L*, were analysed and interpreted.

The results of vitamin content of fresh and dry *Cucurbita pepo'L* pulp and seed were closely comparable to that of Pamplona (2008) and USDA (2003) who worked on the nutrient contents of fruits.That of *Nephelium lappaceum* were closely comparable with Tindall (1994), values obtained for pro-vitamin A content in fresh *Cucurbita pepo'L* pulp(121µg) was lower than the findings of Pamplona (160µg) for *Cucurbita*, USDA (366iu). Pro-vitamin A was not detected in the seeds as observed in other study (0µg). Ascorbic acid content of the different parts of the fruits was low but it was however found to be higher in this study (59.29mg) in fresh pulp of *Nephelium lappaceum* than the value obtained in the findings of USDA (4.9mg). Exception of pro-vitamin A, the B vitamins and ascorbic acid were lower in the dry sample than the fresh samples. This might be as a result of the characteristics of these vitamins. The B and C vitamin are known to be water soluble and heat labile which may be the reason for their reduction. Carotene generally are unaffected by most processing methods, as reported by Vieth (1979) the loss of fat soluble vitamin during cooking is usually lower than their water soluble counterpart, this could also be the reason for the increased pro vitamin A content in the dry and more concentrated sample. According to Anderson (1966) fruits when fresh provides vitamin C which is essential for strong blood vessels and healthy gums, but results from this study has shown that dry fruits also contain an appreciable amount of vitamins as in fresh fruits, which agrees with Pamplona (2008) who stated that fresh ripe fruits evidently provides the greatest level of vitamin, flavonoids and antioxidants but if not available, it is always better to eat fruits that has been preserved by some methods than not to eat it at all. The major purpose of this study was to compare the vitamin composition of fresh and dried pulp, seed and rind of *Nephelium lappaceum* and *Cucurbita pepo'L*. It explored vitamin contents of the different parts of these fruits. Finally this study was determined to carryout quantitative and qualitative nutritional of vitamins contents of the fruits pulp, seed and rind.

8. CONCLUSION

The results obtained from this study have shown that the The pulp and rind of each of the fruits contained an appreciable amount of vitamin C which was significantly higher than that of their seed, *Nephelium lappaceum* with high vitamin C while *Cucurbita pepo'L* had low vitamin C. Pro-vitamin A content was observed in the pulp, seed and rind of each fruits at different level but the pulp and seeds of *Cucurbita pepo'L* and rind of *Nephelium lappaceum* recorded a significantly higher values compared with the other parts of the fruits. Generally, the B vitamin content of each part of the fruit was very low. The results of these investigations have significant implications. Chemical evaluation of the vitamins content of the fresh and dried Fruits has shown that the *Nephelium lappaceum* and *Cucurbita pepo'L* seeds and rind contains an adequate amount of vitamins which could be used for food formulation for human consumption especially young growing children.

Table 1. Vitamin contents of fresh and dried rambutan (*Nephelium lappaceum*)

	Carotene (µg/100g)	Thiamine (mg/100g)	Riboflavin (mg/100g)	Niacin (mg/100g)	Ascorbic Acid (mg/100g)
FRP	0.00 ±0.00	0.02 ±0.00	0.06 ±0.00	0.78 ±0.01	58.29 ±0.63
FRS	3.42 ±0.00	0.02 ±0.00	0.09 ±0.01*	0.08 ±0.03*	4.69 ±0.59*
FRR	10.60 ±0.17[a]	0.04 ±0.00	0.06 ±0.01[a]	0.31 ±0.01*,[a]	7.43 ±0.05*,[a]
DRP	0.00 ±0.00	0.01 ±0.03	0.05 ±0.00	0.56 ±0.01	52.35 ±0.59
DRS	5.46 ±0.17	0.01 ±0.00	0.05 ±0.00	0.06 ±0.00*	2.93 ±0.59*
DRR	41.20 ±0.17[a]	0.02 ±0.00	0.05 ±0.00	0.22 ±0.02*,[a]	5.12 ±0.08*,[a]

FRP = fresh rambutan pulp; DRP = dry rambutan pulp;
FRS = fresh rambutan seed; DRS = dry rambutan seed;
FRR = fresh rambutan rind; DPR = dry rambutan rind.
Values are expressed as mean ± SEM, n = 3.

*p<0.05 vs pulp; a = p<0.05 vs seed.

Table 2. Vitamin contents of fresh and dried pumpkin (Squash gourd) (*Cucurbita pepo'L*)

	Carotene (µg/100g)	Thiamine (mg/100g)	Riboflavin (mg/100g)	Niacin (mg/100g)	Ascorbic Acid (mg/100g)
CPP	121.03 ±0.29	0.06 ±0.00	0.17 ±0.00	0.88 ±0.00	15.25 ±0.59
CPS	71.97 ±0.17*	0.10 ±0.00*	0.00 ±0.00	0.47 ±0.01*	6.45 ±0.59*
CPR	20.28 ±0.24*,a	0.10 ±0.00*	0.00 ±0.00	0.31 ±0.01*,a	16.43 ±0.59a
DPP	141.36 ±0.17	0.04 ±0.00	0.15 ±0.01	0.83 ±0.01	6.45 ±0.59
DPS	104.27 ±0.68*	0.09 ±0.01*	0.00 ±0.00	0.31 ±0.01*	2.93 ±0.59*
DPR	41.20 ±0.17*,a	0.09 ±0.01*	0.00 ±0.00	0.26 ±0.02*,a	8.21 ±0.59a

CPP = cooked pumpkin pulp; DPP = dry pumpkin pulp;
CPS = cooked pumpkin seed; DPS = dry pumpkin seed;
CPR = cooked pumpkin rind; DPR = dry pumpkin rind.
Values are expressed as mean ± SEM, n = 3.
Values are expressed as mean ± SEM, n = 3.
*p<0.05 vs pulp; a = p<0.05 vs seed.

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