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Comparative Proximate Compositions of Watermelon *Citrullus Lanatus*, Squash *Cucurbita Pepo'l* and Rambutan *Nephelium Lappaceum*

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ABSTRACT

The nutritional quality/contents of the pulp, seeds and rind of *Citrullus lanatus, 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 seeds of the fruits were all rich in oil, protein. Although there was a significant changes ($p < 0.05$) in the nutrient contents i.e protein, carbohydrate, crud fat, crud protein, moisture and ash content in the different parts of the fruits, the nutrients 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 livestock.

Keywords: *Comparative, Proximate-Compositions, Citrullus Lanatus, Cucurbita pepo'L, Nephelium Lappaceum*

1. INTRODUCTION

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. 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. The fibre content of fruits and vegetables has been reported to have beneficial effects on blood cholesterol and they aid in the prevention of large bowel diseases (IFT,1990 & Jenkins,1978). It has also been reported that populations that consume diet rich in fruits and vegetables have significantly lower rates of many types of cancers (Voorrips *et.al*. 2000). Fruits have high vitamin, mineral, fibre, phytochemcial and antioxidant in their pulps, seeds and rinds but they have not been given much importance in the diets of many Nigerians especially the seed and rind which most times are discarded. Due to ignorance of the nutritive value and their curative advantages, lack of proper storage facilities, poor distribution, rising cost of fruits, poor accessibility and affordability (Tindall & Florence,1983), most low income groups have not given fruit consumption much impotance in their daily diet. *Citrullus lanatus* can be used for smoothes, sorbets or granite depending on the texture whether smooth or coarse. The rind is also edible and is sometimes used as vegetable (Wada, 1930). In China, they are stir fried, stewed or more often pickled. The deskinned and de-fruited rind is cooked with olive oil, garlic, chilipepper, scallions, sugar and rum. Pickled *Citrullus lanatus* rind is also commonly consumed in the Southern United States (Mandel *et.al*. 2005).The inner rind which is usually light green or white contains many hidden nutrients and is edible, but most times is avoided due to its unappealing flavor. It contains mainly citrulline which is a known stimulator of nitric koxide (Science daily, 2008). *Citrullus lanatus* juice can be made into wine the seeds are consumed as snacks in china, Israel and elsewhere. The pulp is cooked and seeds eaten in Sudan Nigeria and Egypt (Goda, 2007). *Citrullus lanatus* contains a significant amount of citrulline and after consumption of several kilograms an elevated concentration is measured in blood plasma (Mendel *et.al*. 2005). In Africa, seed may be ground into a coarse flour or oil may be extracted from them, mature fruit may be prepared and used as summer squash (USDA, 2003). *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 arachinonic 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). Studies have shown that fruits and vegetables contain among other vital nutrients, an appreciable quantity of carbohydrate, proteins, fats, fibers, and 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 (proximate) contents of many locally available fruits pulp, seeds and rind which is most times discarded. The knowledge of the nutritive 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.

2. MATERIALS AND METHODS

2.1 Sources of Materials

8kgs of *Citrullus lanatus*, 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.

2.2 Collection and Treatment of Samples

Four *Citrullus lanatus* weighing 2kgs each, 8 *Cucurbita pepo'L* weighing 1kg each and 5kgs of *Nephelium lappaceum* were used for both the nutritional analysis and phytochemical screening. The fruits were bought at different times for the nutritional and the anti-nutrient analysis.4kgs of *Citrullus lanatus*, 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^{o}c and stored in a labeled air tight containers in a refrigerator. The same quantity was bought and used as fresh samples for the chemical evaluation and phytochemcial screening. The samples for drying were washed and cut open with a knife into small piece.*Citrullus lanatus* seeds were removed from the pulp before separating the red pulp from the rind. The seeds were washed, allowed to drain and placed on a foil. The spulp was chopped into shreds, allowed to drain and placed in another tray lined with foil, the rind was chopped into tiny cubes and placed in a separate tray line with foil, there were transferred into the oven. *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^{o}c.The seeds of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L* were dried in the oven for 24hours, rind and pulps for 48hours except the pulps of *Citrullus lanatus* which was dried for 72hours. 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 nine groups of samples were stored in airtight containers and labelled accordingly from which required quantities were scoped out for determination of their proximate composition.

2.3 Determination of Proximate/ Energy Composition

The sets of samples, that is, fresh and dried watermelon pulp, seeds, rind, fresh and dried Rambutan pulp, seed, rind, cooked and dried pumpkin pulp, seeds and rind were each analysed for the various proximate constituents by the methods of the association of official analytical chemist (A. O. A. C. 1991), The caloric value, carbohydrate content, crude fat, crude protein, moisture, ash and organic content, was determined by the macro-kjeldahl method (AOAC 1991) while Crude fibre was determined as specified by Joslyn, 1970.

2.4 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.

3. RESULT

The proximate/Energy component of fresh, cooked and dried pulp, seeds and rind of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita Pepo'L* are presented in table 1, 2 and 3, base on g/100g fresh and dried matter.

The results of the moisture content of *Citrullus lanatus* is presented in table 1. The statistical analysis reveals that the moisture content of the fresh seeds of *Citrullus lanatus* (48.75 ± 0.01) was significantly (P<0.05) lower when compared with the fresh pulp (91.82 ± 0.01). However, the fresh rind (67.75 ± 0.64) was significant higher than that of the fresh seeds but lower than the pulp at (P <0.05). The dry *Citrullus lanatus* seed (3.85 ± 0.02) was significantly (p>0.05) lower than the dry pulp, the rind (5.08 ± 0.02) was also significantly lower than the pulp (5.34 ± 0.01) but higher the seed at (P < 0.05).

Beside, the results of the ash content of *Citrullus lanatus* is presented in table1. Ash content of fresh *Citrullus lanatus* rind (0.41 ± 0.02) was significantly higher at (P < 0.05) when compared with the fresh pulp (0.21 ± 0.01) but significantly (p>0.05) lower than that of the seeds (1.01± 0.02). Dry *Citrullus lanatus* rind (3.07 ± 0.02) however was significantly higher than the seed (2.50 ± 0.04) and pulp (2.43 ± 0.01) at (P < 0.05). For the result of protein content of *Citrullus lanatus* is recorded in table 1. Fresh *Citrullus lanatus* rind (2.51 ± 0.06) was significantly higher at (P < 0.05) when compared with the fresh pulp (0.44 ± 0.05) but significantly lower than the fresh seeds (13.67 ± 0.10) at (P > 0.05). The dry sample revealed a similar difference with the rind (7.11 ± 0.00) significantly (p<0.05) higher than the pulp (0.83 ± 0.02) but lower when compared with the seeds (23.37 ± 0.07).

The results of the crude fibre content of *Citrullus lanatus* in table 1 also showed that fresh *Citrullus lanatus* rind (0.30 ± 2.34) when compared with the pulp (0.19 ± 0.43) was significantly higher at (P < 0.05) than the pulp. The seed (0.70 ± 0.01) however, it was significantly higher than the rind and pulp at (p<0.05). Dry *Citrullus lanatus* seed (2.33 ± 0.04) was significantly higher than the pulp (1.25 ± 0.02) but lower than the rind (2.91 ± 0.01) at P < 0.05. More so, fat content of fresh *Citrullus lanatus* seed (16.34 ± 0.02) was significantly higher at P < 0.05 when compared with the pulp (0.15 ± 0.01) and rind (0.15 ± 0.01). The dry sample showed that the seed (45.89 ± 0.47) was significantly higher than the pulp (0.38 ± 0.01) and the rind (0.21 ± 0.01) at P < 0.05. There was however no significant difference between the pulp and rind in both the fresh and dry samples as seen in table 1. The carbohydrate content of fresh *Citrullus lanatus* seed (19.53 ± 0.10) as seen in table 1 below, was significantly higher than the fresh pulp (7.19 ± 0.05) but lower than the rind at (P < 0.05). The fresh rind (29.65 ± 0.58) however was significantly higher than the seed at (P<0.05).Dry *Citrullus lanatus* rind (81.62 ± 0.05) was significantly higher when compared with the seed (23.06 ± 0.42) at (P < 0.05) but lower than the pulp (89.77 ± 0.03) at (P> 0.05). The caloric value of fresh *Citrullus lanatus* rind (129.99 ± 2.59) when compared with the fresh pulp (31.87 ± 0.08) was significantly higher at (P < 0.05) but lower than the fresh seed (279.86 ± 0.12) at (P > 0.05). Dry *Citrullus lanatus* pulp (365.82±0.04) however was significantly higher than the rind (356.81 ± 0.18) but lower than the seed (598.73 ± 2.35) at (P < 0.05).

From table 2 the moisture content of fresh *Nephelium lappaceum* rind (72.05 ± 0.01) was significantly lower than the pulp (78.06 ± 0.01) but higher than the seed (34.28 ± 0.01) at (P< 0.05). Dry *Nephelium lappaceum* rind (3.03 ± 0.02) was significantly higher than the seed (2.67 ± 0.01) and but lower than the rind (7.33 ± 0.01) at (P < 0.05). Ash content of fresh *Nephelium lappaceum* rind (1.20 ± 0.04) as shown in (figure 2) when compared with the fresh pulp (0.60 ± 0.01) was significantly higher than the pulp at (p<0.05) but lower than the seed (2.20 ± 0.02) at (P > 0.05). The dry *Nephelium lappaceum* seed (2.46 ± 0.08) was significantly higher than the pulp (0.80 ± 0.09) at (P< 0.05). The pulp when compared with the rind (1.46 ± 0.08) was significantly lower at (P>0.05). Statistical analysis shows that crude protein content of fresh *Nephelium lappaceum* rind (2.04±0.06) was significantly higher than the fresh pulp (0.66± 0.01) but significantly lower than the fresh seed (11.06 ± 0.06) at (P<0.05). The seed was however significantly higher than the pulp at (P<0.05). Dry *Nephelium lappaceum* seed (16.21± 0.06) was significantly higher than the pulp (0.84 ± 0.01) and the rind (7.16 ± 0.05) at (P<0.05). That of the rind however was significantly higher than the pulp at (P<0.05). Statistically crude fibre content of fresh *Nephelium lappaceum* seed (0.62 ± 0.01) as seen in (figure 2) was higher than the fresh pulp (0.38 ± 0.01) but lower than the rind (0.70 ± 0.02) at (P<0.05). The rind when compared was with the pulp was significantly higher at (P<0.05). The dry seed (0.90 ± 0.01) was significantly higher than the pulp (0.50 ± 0.04) but lower than the rind (1.90 ± 0.08) at (P<0.05). However, statistical analysis reveals that fat content of fresh *Nephelium lappaceum* pulp (0.24 ± 0.01) when compared with the seed (18.19 ± 0.03) was significantly lower than the seed at (P>0.05). The seed was however significantly higher than the rind (0.23 ± 0.04) at (P<0.05). There was no significant difference between the rind and the pulp as shown in table 2. Dry *Nephelium lappaceum* seed (37.28 ± 0.86) was significantly higher than the pulp (0.31 ± 0.01) and rind (0.70 ± 0.00) at (P<0.05), but the pulp and rind were not significantly different at (P<0.05) in terms of fat.

As shown in table 3, the carbohydrate content of the fresh rind (23.78 ±0.09) of *Nephelium lappaceum* was significantly higher than the pulp (19.67 ± 0.03) but lower than the seed (33.65 ± 0.09) at (P<0.05). The dry sample showed that the rind (85.72 ± 0.21) was significantly higher than the seed (42.08 ± 0.81) but lower than the pulp (91.06 ± 0.14) at (P<0.05). More so, the caloric value of fresh *Nephelium lappaceum* seed (342.55± 0.21) was significantly higher than the pulp (83.44 ± 0.06) and the rind (105.35 ± 0.29) at (P<0.05). The pulp was however lower than the rind at (P>0.05). The dry seed (518.68 ± 0.51) significantly, was higher than the pulp (370.39 ± 0.51) and rind (377.94 ± 0.70) at (P<0.05). From table 3, the moisture content of cooked *Cucurbita pepo'L* seed (49.16 ± 0.33) was significantly higher than the rind (41.54 ± 1.31) but lower than the pulp (94.61 ± 0.13) at (P<0.05). The pulp was however significantly higher than the rind at (P<0.05). There was no significant difference between the moisture content of the dry pulp, seed and rind at (P<0.05). Ash content of fresh *Cucurbita pepo'L* seed (0.40 ± 0.03) was significantly higher than the pulp (0.17 ± 0.01) but lower than the rind (0.81 ± 0.02) which was higher than then pulp at (P<0.05). Dry seed (3.15 ± 0.04) was significantly higher than the pulp (1.35 ± 0.02) and rind (2.46 ± 0.09) at (P<0.05). The rind was however higher than the pulp at (P<0.05). Statistical analysis showed that the crud protein of cooked *Cucurbita pepo'L* rind (1.35 ± 0.05) when compared with the pulp was significantly higher than the pulp (0.41 ± 0.06) at (P<0.05). The seed (10.08 ± 0.06) was significantly higher than the rind and pulp at (P<0.05). The dry seed (24.23 ± 0.06) was significantly higher than the rind (5.0± 0.06) and pulp (0.45 ± 0.02) at (P<0.05) as shown in table 3. Crude fibre content of cooked *Cucurbita pepo'L* seed (0.30 ± 0.02) as seen in (figure 3), when compared with the pulp (0.10 ± 0.01) was significantly higher than the pulp but lower than the rind (0.60 ± 0.05) which was higher than the pulp and seed at (P<0.05). The dry seed (0.20 ± 0.01) was significantly lower than the pulp (1.25 ± 0.01) but the rind (1.80 ± 0.02) was significantly higher than the pulp at (P<0.05). However, fat content of fresh *Cucurbita pepo'L* rind (0.37 ± 0.02) was significantly lower than the seed (17. 05 ± 0.00) but higher than the pulp (0.09 ± 0.01) at (P<0.05). The dry seed (33.31 ± 0.11) was significantly higher than the pulp (0.17 ± 0.00) and rind (0.42 ± 0.01) at (P<0.05). The rind however was significantly higher than the pulp as seen in table 3. The carbohydrate content of cooked *Cucurbita pepo'L* seed (23.03 ± 0.32) as seen in table 3 when compared with the pulp (4.62 ± 0.16) was significantly higher than the pulp but it was significantly lower than the rind (55.33 ± 1.31) at (P<0.05). The dry rind (88.68 ± 0.09) was significantly higher than the seed (35.45 ± 0.11) but lower than the pulp (94.47 ± 0.06) at (P<0.05). More so, caloric values the cooked *Cucurbita pepo'L* seed (285.81 ± 1.39) was significantly higher than the pulp (20.93 ± 0.60) and rind (230.05 ± 5.56) which was higher than the pulp at (P<0.05). The dry pulp (381.21 ± 0.19) however was significantly higher than the rind (378.54 ± 0.33) but lower than the seed (538.55 ± 0.40) at (P<0.05) as seen in table 3.

4. COMPARISON BETWEEN PULP, SEED AND RIND OF FRESH AND DRY SAMPLES

Table 1. Proximate composition of fresh and dried watermelon (*Citrullus lanatus*)

	Moisture (g/100g)	Ash (g/100g)	Crude protein (g/100g)	Crude fibre (g/100g)	Fat (g/100g)	CHO (g/100g)	Caloric value K/Cals
FWMP	91.82 ±0.01	0.21 ±0.01	0.44 ±0.05	0.19 ±0.01	0.15 ±0.01	7.19 ±0.05	31.87 ±0.08
FWMS	48.75 ±0.01*	1.01 ±0.02*	5.67 ±0.10*	0.70 ±0.01*	16.34 ±0.02*	28.14 ±0.10*	282.23 ±0.12*

FWMR	67.75 ±0.64*^{,a}	0.41 ±0.02*^{,a}	2.51 ±0.06*^{,a}	0.30 ±0.01*^{,a}	0.15 ±0.01^{a}	29.65 ±0.58*^{,a}	129.99 ±2.59*^{,a}
DWMP	5.34 ±0.01	2.43 ±0.01	0.83 ±0.02	1.25 ±0.02	0.38 ±0.01	89.77 ±0.03	365.82 ±0.04
DWMS	3.85 ±0.02*	2.50 ±0.04*	23.37 ±0.07*	2.33 ±0.04*	45.89 ±0.47*	23.06 ±0.42*	598.73 ±2.35*
DWMR	5.08 ±0.02*^{,a}	3.07 ±0.02*^{,a}	7.11 ±0.00*^{,a}	2.91 ±0.01*^{,a}	0.21 ±0.01^{a}	81.62 ±0.05*^{,a}	356.81 ±0.18*^{,a}

FWMP = fresh water melon pulp; DWMP = dry water melon pulp;
FWMS = fresh water melon seed; DWMS = dry water melon seed;
FWMR = fresh water melon rind; DWMR = dry water melon rind.
Values are expressed as mean ± SEM, n = 3, *p<0.05 vs pulp; a = p<0.05 vs seed.

Table 2. Proximate composition of fresh and dried rambutan (*Nephelium lappaceum*)

	Moisture (g/100g)	Ash (g/100g)	Crude protein (g/100g)	Crude fibre (g/100g)	Fat (g/100g)	CHO (g/100g)	Caloric value K/Cals
FRP	78.46 ±0.01	0.60 ±0.01	0.66 ±0.01	0.38 ±0.01	0.24 ±0.01	19.66 ±0.03	83.44 ±0.06
FRS	34.28 ±0.01*	2.20 ±0.02*	11.06 ±0.06*	0.62 ±0.01*	18.19 ±0.03*	33.65 ±0.09*	342.55 ±0.21*
FRR	72.05 ±0.01*^{,a}	1.20 ±0.02*^{,a}	2.04 ±0.06*^{,a}	0.70 ±0.02*^{,a}	0.23 ±0.04^{a}	23.78 ±0.09*^{,a}	105.35 ±0.29^{a}
DRP	7.33 ±0.01	0.20 ±0.09	0.84 ±0.01	0.10 ±0.04	0.31 ±0.01	91.22 ±0.14	371.03 ±0.51
DRS	2.67 ±0.01*	1.06 ±0.08*	16.21 ±0.06*	0.30 ±0.01*	37.28 ±0.86*	42.45 ±0.81*	570.16 ±4.57*
DRR	3.03 ±0.02*^{,a}	1.06 ±0.08*^{,a}	7.16 ±0.05*^{,a}	0.60 ±0.08*^{,a}	0.70 ±0.00^{a}	84.42 ±0.21*^{,a}	372.62 ±0.70*^{,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 3. Proximate composition of cooked and dried pumpkin (Squash gourd) (*Cucurbita pepo'L*)

	Moisture (g/100g)	Ash (g/100g)	Crude protein (g/100g)	Crude fibre (g/100g)	Fat (g/100g)	CHO (g/100g)	Caloric value K/Cals
CPP	94.61 ±0.13	0.17 ±0.01	0.41 ±0.06	0.10 ±0.01	0.09 ±0.01	4.62 ±0.16	20.93 ±0.60
CPS	49.16 ±0.33*	0.40 ±0.03*	10.08 ±0.06*	0.30 ±0.02*	17.05 ±0.00*	23.01 ±0.32*	285.81 ±1.39*
CPR	41.54 ±1.31*,a	0.81 ±0.02*,a	1.35 ±0.05*,a	0.60 ±0.05*,a	0.37 ±0.02*,a	55.33 ±1.31*,a	230.05 ±5.56*,a
DPP	2.36 ±0.01	1.15 ±0.02	0.45 ±0.02	1.00 ±0.01	0.17 ±0.00	94.07 ±0.06	381.21 ±0.19
DPS	1.67 ±0.01	0.90 ±0.04*	24.23 ±0.06*	0.20 ±0.01*	33.31 ±0.11*	39.69 ±0.11*	555.47 ±0.40*
DPR	1.71 ±0.02	2.46 ±0.09*,a	5.01 ±0.06*,a	1.80 ±0.02*,a	0.42 ±0.01*,a	88.68 ±0.09*,a	378.54 ±0.33*,a

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

5. DISCUSSION

The fresh and dried pulp, seeds and rind of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L*, were analysed and interpreted. The values of proximate composition of fresh *Citrullus*, *lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L* that is moisture, crude fibre, ash, fat and protein agrees with the findings of Potter and Hotchkiss (1997), Osse (1990), shiela (1978), Bollard (1970), Tindall (1994) and Pamplona (2008) who worked on nutrient components of food, reported a range value of fibre 0.1g-6.8g for fruits and 0.5g-5.2g for seeds. This report is similar to the findings in this study the seeds have a significantly high values than the pulps. Fruits are not very good sources of fat as reported by Ngoddy and Ihekeonye (1985). Shiela (1978) also reported that Nitrogenous component of fruits is low (0.4g – 0.6g) as compared to seeds, leaves and some other plants parts and tissues and were thus similar to the values for protein in this study for the fresh and dry pulp. The carbohydrate content of the pulp and rind in the dry sample were significantly higher than the seeds in the three fruits but the seeds had higher caloric value than the pulp and rind, this could be as a result of the variations in the protein and fat content of the different parts of the fruits. From this study, it was observed that seeds of *Citrullus lanatus*, *Cucurbita pepo'L* and *Nephelium lappaceum* have high levels of protein and lipid. This agrees with previously published work on these seeds by Sricantha and Erdman, (1984), (El-Adaway *et. al*. 2001). Although crude protein and lipid of the seeds of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L* showed lower values than the previously published work, the relative values obtained indicates that these seeds have nutritional quality favourably comparable with other oil seeds and may be utilized as high protein and iol sources in some food formulation for human consumption. These variations in the protein content of the pulp, seed and rind of the fruits in this study agrees with earlier work by Sampson (1980) who reported that fruits are low in total nitrogenous components as compared to seeds, leaves and some other plant parts and tissues. Sheila (1978) also reported that fruits are not very good sources of fats and are thus recommended as part of weight reducing diets as observed in the pulps of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L* pulp but (Murkovic *et*. al. 2002) reveals that *Cucurbita pepo'L* seeds are rich in oils as in *Citrullus lanatus* and Paprika. The seeds of *Citrullus lanatus* are excellent sources of protein (35g) and oil (50g) as reported by (El-Adaway *et. al*. 2001); Sciantha and Erdman (1984) reported protein (11.9-14.1g) and oil (37.1-38.9g) for *Nephelium* seeds which agrees with the results obtained in the study that the seeds of these fruits contained higher levels of protein and fats than the pulp and rind these seeds in combination with other products can be used to fortify protein content of locally formulated diet for children. The rind however contains an appreciable amount of protein (7.11g) *Citrullus lanatus*, (7.16g) *Nephelium lappaceum* and (5.01g) *Cucurbita pepo'L* which might be the reason for the high citrulline content, in the rind of *Citrullus lanatus*, an amino acid that plays an important role in human body's urea cycle as reported by Pons (2003).

6. CONCLUSION

The results obtained from this study have shown that the there is no significant difference in the nutritional contents of the pulp, seed and rind of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L*. There is a significance differences in nutritional content of the pulp, seed and rind of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L*, the level of crude protein and fat in the seeds of *Citrullus lanatus*, *Nephelium lappaceum* and *Cucurbita pepo'L* is significantly high compared with the pulp and rind of each fruit. Ash and crude fibre content were significantly high in the rind and seed of each fruit when compared with pulp. Though the seed of Nephelium lappaceum is rich in essential nutrients much work has not been done on the seed to access the safety of the seeds for human consumption. However, the nutrient contents in the different parts of the fruits, the nutrients 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.

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