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# Utilisation potentials of *Conorandus panados* (Mnizee) fruits and seeds

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## ABSTRACT

The fruit and seed of *Conorandus panados* were analysed to determine its potentiality. Results obtained showed that the fruit has higher concentration of mineral elements and vitamin than common fruits like guava, wild *Cassipourea congoensis* and *Nuclea latifolia* found in the studied area. The mineral elements, vitamin and proximate composition of the seeds of *C. panados* are higher than those of *Deterium microcarpum, Balanites aegytiaca and Gemlina arboea.* The physico-chemical characteristics of the oil are within the range of physico-chemical characteristics of many edible oils like cottonseed, groundnut and corn oils. Deterioration results indicate that the shelf-life of the seed oil of *C. panados* may be 196 days, as against 84 days for *Adasonia digitata* and 96 days for *Prosopsis africana* used in the preparation of local condiments for flavouring dishes in Michika, Adamawa State and Hausa States in Nigeria. These suggest that the overall daily intake of the fruits and seeds could provide vitamin, mineral elements and proximate compositions better than *C. congoensis, N. latifolia, D. microcarpum, B. aegytiaca, and G. arboea*, subject to knowledge of the levels of the possible toxic substances. Also, the oil or the products of the oil would have longer shelf-life than those of *A. digitata* and *P. Africana*.
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**Key words**: Wild, seed oil, shelf-life, physico-chemical characteristics, antinutritional, deterioration.

## INTRODUCTION

In a continuous effort to determine the potentials of wild fruits and seeds (Nkafamiya et al., 2006: Nkafamiya et al., 2007a; Nkafamiya et al., 2007b), an attempt was made to determine the utilization potentials of the fruits and seeds of *C. panados*. In the study area (Nkafamiya Wulla Michika Local Government Area of Adamawa State), common or cultivated fruits and seeds like guava, orange, mango and cottonseeds are scarce. Wild fruits and seeds like *C. congoensis, N. latifolia* and the *C. panados* provide the necessary vitamin, oil, mineral, fat, protein and carbohydrate to the people living within the study area. Also, wild fruits and seeds are cheaper and this makes the affordability easier for low-income families with large family size (Eromosele and Eromosele, 1993; Nkafamiya et al., 2006; Nkafamiya et al., 2007c).

Mnizee is a wild mountainous plant found in Michika Local Government Area of Adamawa State. The plant is a creeping plant and normally found spreading over caves. Higgi community in Michika eats the fruit after peeling the back and also uses the fibre in decorating traditional basket called Kwachike in Higgi language. The plant provides one of the coolest shades for animals within the particular environment. The animals also feed on the fruits.

The plant produces flowers at the beginning of each season, which become increasingly prominent as the stem grows older. The fruit, which is not well known, resemble banana in all aspect with the exception that the fruit contains seeds shorter in length and smaller in size. The colour of the fruit is dark brown when unripe and brown when ripe. Presently, there is no information either on the fruits or seeds of this particular plant. Due to the fact that the common or cultivated fruits and seeds are scarce in the

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study area, we found it necessary to determine the potentials of wild fruits and seeds available, so as to supplement the scarce ones for the local people. This paper presents the potentials of fruits and seeds of *Conorandus panados*.

## MATERIALS AND METHODS

### Plant samples

Plant samples were collected from Nkafamiya, Michika Local Government Area of Adamawa State, of Nigeria. Samples were dried at room temperature and pulverised for subsequent analysis.

### Methods

The oil from the seeds of *C. panados* was soxhlet extracted with petroleum ether (40-60 $^{o}$C) and was then characterized by standard method for oil and fat analysis (AOAC, 1980). For the deterioration evaluation, the oil was stored for 262 days at room temperature (30 ± 2 $^{o}$C) under vacuum, and chemical parameters were tested at two-week intervals over the said period. The chemical parameters (peroxide value, iodine value, percentage of free fatty acids and saponification value) were tested based on America Oil Chemist Society methods (AOAC, 1980). All reagents used for the analyses were of analytical grades and were not subjected to further purification.

The refractive index (RI) and infrared (IR) spectrum were determined using the method described by AOAC (1980).

Ash, crude lipid, crude fibre and protein were determined by the methods reported by AOAC (1980). The carbohydrate content was calculated by difference. Energy value (kcal/kg) was calculated by multiplying the values obtained for carbohydrate, protein and fat, and adding up the values as described by Robson et al. (1972) and Maragoni and Ali (1987). For mineral analyses, 2 g of the dried, ground sample were mixed with 20 ml of nitric/perchloric acid (5:1v/v). The mixture was allowed to stand overnight and then heated to 80 $^{o}$C on a hot plate for approximately 2-3 hours after which a clear solution was then heated to dryness and reconstituted with deionized water. The concentration of the iron, zinc, calcium, manganese and magnesium were determined using atomic absorption spectrophotometer (Philip Model sp9, UK). Sodium, potassium and phosphorus were determined by flame emission techniques (AOAC, 1980). The content of β-carotene in the seeds was determined using the chromatographic procedure described by Ranagana (2004). Vitamin A was calculated using the relationship:

0.6 µg of β-carotene = 0.3µg pf pure vitamin A (Robson et al., 1972).

The vitamin C content was determined spectrophotometrically (λ = 760 nm) as described by Paul and Pearson (2005). Vitamins $B_1$, $B_2$ and E contents of the fruits were determined following the methods of AOAC (1990). All analyses were carried out in triplicate.

Total oxalate was determined according to Day and Underwood (1986). Saponin was determined using the method of Birk et al. (1963) as modified by Hudson and El-Difawi (1979), while phytate was determined using the method of Reddy and Love (1999). Tannin was determined using the method of Trease and Evans (1978). The presence of aldehyde in the oils was tested by the method described by Cocks and Van (1997).

### Statistical analysis

Data were analysed by Analysis of Variance (ANOVA). Duncan's Multiple Range Test was used to compare mean variance. Significance was accepted at 5% level of probability following the procedures of Steel and Torric (1980).

## RESULTS AND DISCUSSION

### Mineral composition

Table 1 presents the mineral composition of the fruits and seeds of *C. panados*. The fruits have higher values of all the mineral elements than the seeds except for iron. The mineral composition of fruits and seeds of *C. panados* are higher than those of cultivated fruits and seeds like guava and cottonseeds (Nkafamiya et al., 2006) and seeds of some wild plants (D. *microcarpum, N. latifolia,B. aegytiaca, G. arboea, A. digitata* and *P. africana*). The seeds of *A. digitata* and *P. africana* are of particular interest because they are used in the preparation of local condiments like Issai, a popular product in Higgi land (Michika Local

Government Area of Adamawa State, Nigeria), used for flavouring soups (Nkafamiya et al., 2007b). The high values of these mineral elements in *C. panados* indicate that these fruits and seeds will play a very vital role in the development of bones, teeth, as co-factor in enzymatic reaction, nerve impulse transmission and as a clotting factor compared to common or cultivated fruits like guava, wild fruits and seeds like *C. congoensis, N. latifolia, A. digitata* and *P. africana* (Nkafamiya et al., 2006; Nkafamiya et al., 2007c).

**Vitamin contents**

The vitamin contents of the fruits and seeds of *C. panados* are presented in Table 2. The vitamins in the fruits are higher than those of *C. congoensis* and *N. latifolia* fruits. Vitamins in the seeds of *C. panados* are also higher than those in the seeds of *A. digitata* and *P. africana* (Nkafamiya et al., 2007c). This means that when consumed they serve as vitamin supplements in the study area, better than *C. congoensis* and *N. latifolia* which are also found in the study area. Vitamins A and E are particularly important in the prevention of night blindness and peroxidation, respectively (Wolf, 1984; Stampfer and Rimm, 1995; Vanpupped and Goldbohm, 1995; Nkafamiya et al., 2006). The level of vitamin C in the fruits of *C. panados* (450 ± 0.25 mg/100 g) is significantly higher when compared with values for orange (50 mg/100 g) and strawberries (59 mg/100 g) (Eromosele et al., 1991; Nkafamiya et al., 2006). The high values of vitamin C observed in the fruits are however depended on the stage of maturity and ripeness of the fruits (Kar and Mital, 1981; Nkafamiya et al., 2006). This means that the fruits of *C. panados* will prove more important in the prevention of scurvy, alleviate symptoms of common cold and vitamin A deficiency than those of *C. congoensis, N. latifolia,* orange and strawberries.

**Nutritional status**

Table 3 presents the nutritional status of the seeds of *C. panados*. Unlike the seeds of *A. digitatI* and *P. africana* used in the preparation of local condiments for flavouring soups (Barminas et al., 1998; Nkafamiya et al., 2007c), the seeds of *C. panados* have not been assigned any usage even though found in abundance. However, from the Table 3, it can be seen that the oil content of the seeds is high (47% w/w).

The proximate compositions of the seeds of *C. panados* are higher than those of cottonseeds (Eka and Isbell, 1984), papaya (Passera, 1981) and shelled rubber seeds (Ukhum and uwatsa, 1988). The seeds of *C. panados* have high food energy and may be used to supplement the daily energy intake of the consumers. The nutritional status of the seeds, based on the parameters in Table 3, seems to suggest that the seeds may be adequate for formulating animal feeds and also in the preparation of local condiment (Issai, for flavouring soups), subject to toxicological study of the seeds.

**Antinutrients**

Table 4 presents the results of antinutrients contained in the fruits and seeds. The antinutrients in these samples are below the antinutrients present in fruits and seeds of some wild plants (*D. microcarpum, C. congoensis. N. latifolia, B. aegytiaca* and *G. arboea*), and are low to significantly interfere with nutrient utilization. They are below the established toxic level (Ladeji et al., 2004; Nkafamiya et al., 2006; Nkafamiya et al., 2007a).

**Variation of peroxide value with time of storage**

Figure 1 presents the variation of peroxide value with storage time (days). It was observed as for the groundnut oil locally processed (Nkafamiya et al., 2007d), *A. digitata* and *N. latifolia*. (Nkafamiya et al., 2007c), that the peroxide value for the oil increased with time of storage and passed through a maximum. The maximum peroxide value for *C. panados* was attained after 196 days, and the change was not rapid as compared to *A. digitata* (84 days) and *P. Africana* (96 days) used for preparing local condiments for flavouring soups. The initial increase in peroxide value up to a maximum may be due to the fact that the rate of production of peroxide outweighs the rate of decomposition of the peroxide. The decrease in peroxide values may also suggest that the rate of decomposition of the peroxide outweighs the rate of production. Since the change in the peroxide value of *C. panados* is

**Table 1:** Concentration of mineral elements (mg/100 g) in fruits and seeds of *C. panados.*

| *C. Panados* | Zn | Fe | Ca | Na | K | Mg | P | Mn |
|---|---|---|---|---|---|---|---|---|
| Fruits | 11.50 ± 0.02 | 10.20 ± 0.51 | 125.00 ± 0.57 | 9.00 ± 0.27 | 290 ± 0.52 | 90.00 ± 0.11 | 281.01 ± 0.26 | 2.00 ± 0.73 |
| Seeds | 11.25 ± 0.20 | 10.21 ± 0.25 | 124.01 ± 0.32 | 8.97 ± 0.21 | 289.00 ±0.11 | 87.90 ± 0.61 | 279.21 ± 0.10 | 1.98 ±0.71 |

Values are means ± SD for 3 determinations.

**Table 2:** Vitamins A, $B_1$, $B_2$, C, and E content (mg/100 g) of fruits and seeds of *C. panados.*

| *C. panados* | A* | $B_1$ | $B_2$ | C | E |
|---|---|---|---|---|---|
| Fruits | 80.00 ± 0.90 | 25.01 ±0.71 | 29.00 ±0.61 | 450.00 ±0.25 (411.21 ±0.70)[a] | 7.81 ±0.25 |
| Seeds | 70.01 ± 0.51 | 20.02 ± 0.21 | 24.06 ±0.31 | 376.00 ± 0.91 (370.00 ± 0.66)[a] | 8.05 ±0.26 |

*Values in µg/100 g; [a]Values in unripe fruits; Values are means ± SD for 3 determinations.

**Table 3:** Proximate composition (g/100 g dry weight) of seeds.

| *C. panados* | Crude fibre | Crude Lipid | Ash | Crude protein | Oil (%) | Moisture | Food energy | Carbohydrate |
|---|---|---|---|---|---|---|---|---|
| Seeds | 8.41 ± 0.51 | 15.20 ± 0.11 | 0.95 ± 0.57 | 32.51 ± 0.77 | 47 | 7.27 ± 0.57 | 4760 ± 0.75 | 67.05 ± 0.51 |

Values are means ± SD for 3 determinations.

**Table 4:** Oxalate, phytate, saponin and tannin content (%) of fruits and seeds of *C. panados*.

| *C. panados* | Oxalate | Phytate | Saponin | Tannin |
|---|---|---|---|---|
| Fruits | 8.05 ± 0.52 | 0.80 ±0.12 | 5.67 ± 0.57 | 1.98 ± 0.01 |
| Seeds | 7.67 ± 0.11 | 0.78 ± 0.35 | 5.09 ±0.27 | 1.56 ± 0.56 |

Values are means ± SD for 3 determinations.

not rapid, it might be possible that the oil or the products prepared using the seeds will not deteriorate fast; though the presence of metallic ions, which is one of the factors promoting oxidation after the formation of peroxide, may enhance oxidation (Rossell, 1984).

**Variation of iodine value with time of storage**

As observed in locally processed groundnut oil, *A. digitata* and *P. Africana* (Nkafamiya et al., 2007c; Nkafamiya et al., 2007d), the iodine value for the oil shows a non-uniform increase followed by a constant decrease (Figure 2). The fluctuating values may be due to dehydrogenation and saturation. The decrease in iodine values is an indication of lipid oxidation (Holiday and pearson, 1974; Nkafamiya et al., 2007c). As in the case of peroxide value, the decrease in the iodine values for *C. panados* was not as faster as for *A. digitata* and *P. Africana*. This may suggest that the oil or products prepared using the seeds will not deteriorate fast.

**Variation of free fatty acid (FFA) value with time of storage**

The variation of free fatty acid (FFA) with storage time is presented in Figure 3. The variation showed an initial increase over the period of study. The increase in FFA suggests that the reactions which lead to the formation of FFA occurred during storage process (Joseph, 1979; Magnus, 1992; Nkafamiya et al., 2007c).

**Variation of saponification value with time of storage**

The variation of saponification value (SV) with storage time is presented in Figure 4. The pattern of change in SV showed little increase over the period of study with storage time. This behaviour is parallel to other trends observed in the variation of other parameters for the oil. The increase in SV may indicate oxidation and the decrease suggest the onset of oxidation. From Figure 4 it can be seen that there are three transitions as observed in locally processed groundnut oil (Nkafamiya et al.,2007d), *A. digitata* and *P. Africana* (Nkafamiya et al., 2007c). The first transition suggests the formation peroxides and hydro-peroxide which decompose to give aldehydes and ketones in the second transition. The third transition also suggests the onset of oxidation (Rossell, 1984; Nkafamiya et al., 2007c).

**Variation of refractive index with time of storage**

Figure 5 shows the variation of refractive index (RI) with storage time. The RI of the oil increased with the storage time and this may be due to the formation of oxidation products (Nkafamiya et al., 2007c). Studies have shown that RI increases by 0.0001 as rancid odour is noticeable (Rossell, 1984). This also confirmed the result obtained from saponification value.

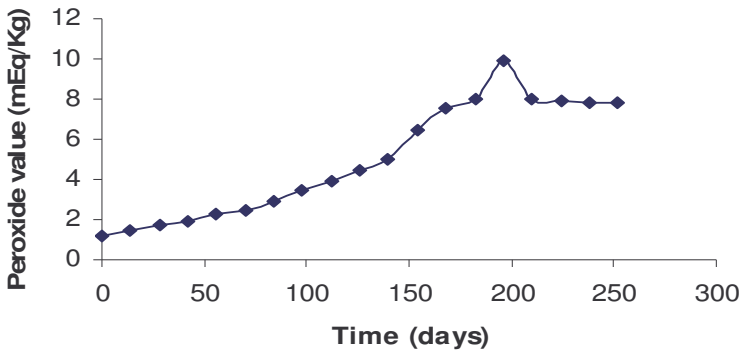


**Figure 1:** Variation of peroxide value with storage time in days.

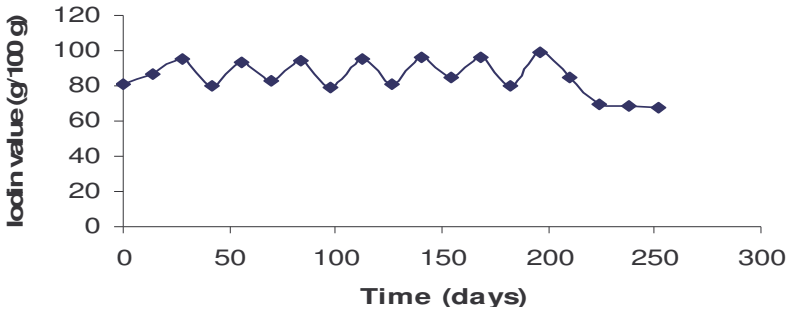


**Figure 2:** Variation of iodine value with storage time in days.

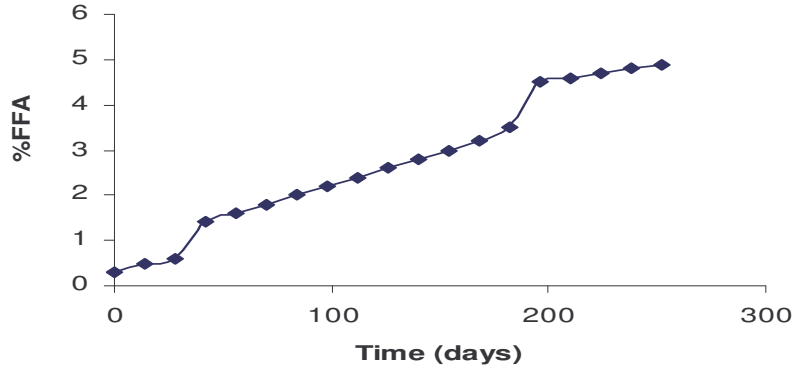


**Figure 3:** Variation of free fatty acid during storage.

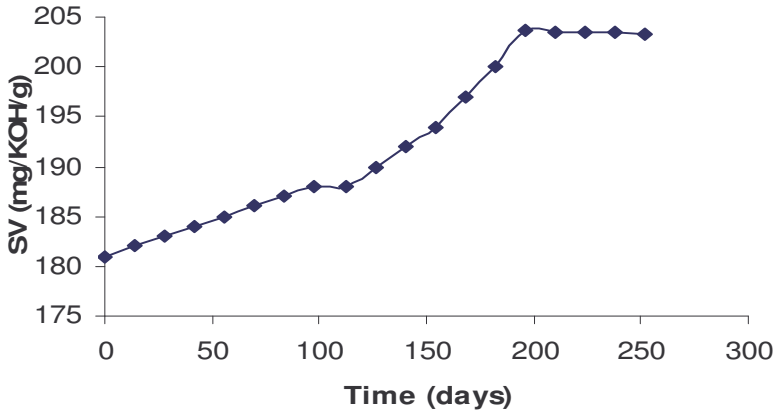


**Figure 4:** Variation of saponification value with storage time.

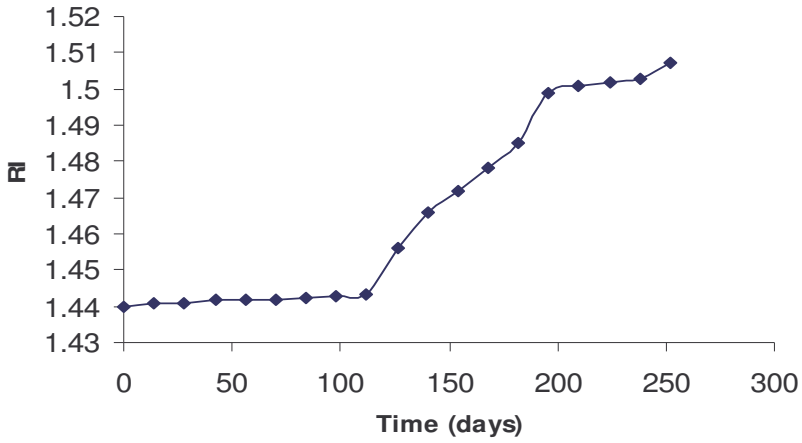


**Figure 5:** Variation of refractive index of oil during storage.

To confirm the oxidation of the oil, a chemical test was carried out to test for the presence of aldehyde, which is responsible for the unpleasant odours in oil (Nkafamiya et al., 2007c). The test showed that at the beginning of the study, aldehyde was absent and present at the end of study.

**IR spectroscopy of the oil**

The IR spectroscopy of the oil showed bands at 3470-3494 $cm^{-1}$, strongly suggesting the presence of hydro-peroxide; at 1745-1740 $cm^{-1}$, suggesting ester C=O stretching which indicates possible formation/presence of aldehyde, ketones and acids; at 1650-1654 $cm^{-1}$, suggesting conjugation of double bonds; and at 159-1164 $cm^{-1}$ and 1100 $cm^{-1}$, suggesting the presence of methyl ester and secondary alcohol (Coates, 2004). Others at 970, 853-890 and 797-799 $cm^{-1}$ suggest the presence of trans-isomer, peroxides and epoxy. These bands may be indicating the formation of new compounds (due to decomposition of hydro-peroxide), which were not present at the beginning of the study but were detected at the end of the study. These compounds are assumed to be products of degradation, which are responsible for the deterioration of the oil.

In conclusion, analyses of the fruits and seed oil of *C. panados* indicate that the fruits and seeds have some potentials over guava, *C. congoensis, D.microcarpum, N. latifolia, B. aegytiaca, A. digitata, P. Africana* and cottonseeds. This is because the fruits and seeds of *C. panados* have higher concentration of mineral elements, vitamin, and proximate composition. In addition, the changes of the chemical and physical parameters indicate that the rejection point of the oil may be reached 196 days after extraction, as against the 84 days for *A. digitata* and 96 days for *P. africana*. From these results, it may be concluded that the seeds of *C. panados* are better than those of *A. digitata* and *P. Africana* used in the preparation of local condiments for flavouring dishes ("Daddawa Higgi" and "Daddawa Hausa", respectively). Result (Proximate and mineral composition of the seeds) also indicates that the seeds can find immediate application in the formulation of animal feeds, subject to toxicological studies.

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