

## Short Communication

# Biochemical evaluation of *Cassipourea congoensis* (Tunti) and *Nuclea latifolia* (Luzzi) fruits

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The fruits of *Cassipourea congoensis* (Tunti) and *Nuclea latifolia* (Luzzi) were assessed chemically for the presence of mineral elements, vitamins A, B, C, E, and some antinutritional factors. Results obtained showed that *C. congoensis* had higher quantities of Cu, Co, Fe, Ca, Mg and Mn ( $0.25 \pm 0.02$ ,  $0.52 \pm 0.01$ ,  $6.70 \pm 0.13$ ,  $45.00 \pm 0.23$ ,  $85.00 \pm 0.11$  and  $0.35 \pm 0.12$  mg/g, respectively) compare to *N. latifolia* ( $0.15 \pm 0.01$ ,  $0.26 \pm 0.02$ ,  $1.80 \pm 0.21$ ,  $42.00 \pm 0.15$ ,  $70 \pm 0.21$  and  $0.21 \pm 0.01$  mg/g, respectively). Higher amounts of Zn ( $0.92 \pm 0.03$  mg/g) and P ( $29.00 \pm 0.15$  mg/g) were, however, observed in *N. latifolia*. Results of vitamins analysis showed that *C. congoensis* had the highest levels of vitamins A ( $69.00 \pm 4.10$  mg/g), B<sub>1</sub> ( $0.86 \pm 0.02$  mg/g), B<sub>2</sub> ( $0.94 \pm 0.03$  mg/g) and C ( $410.50 \pm 0.32$  mg/g), while vitamin E was higher in *N. latifolia* ( $1.18 \pm 0.49$  mg/g). The antinutritional results showed that oxalate, phytate and saponin were higher in *C. congoensis* ( $11.40 \pm 1.50$ ,  $2.57 \pm 0.41$  and  $8.16 \pm 0.4\%$ , respectively), while tannin was highest in *N. latifolia* ( $4.62 \pm 0.14$ ). This indicates that these wild fruits can serve as good sources of vitamins and mineral elements where cultivated fruits are scarce or out of season.

**Key words:** Food energy, Mineral elements, Antinutritional, *Cassipourea congoensis*, *Nuclea latifolia*.

## INTRODUCTION

Wild fruits are frequently consumed in Northern Nigeria as the dominant source of fruits especially in rural communities where a variety of edible fruits bearing trees abound. Some of these are cultivated while others grow in the wild. Several of these wild species bear fruits during the dry season when cultivated fruits are scarce (Nadro and Umaru, 2004). Wild fruits offer a convenient but cheap means of providing adequate supplies of mineral, fat, protein, carbohydrate and fiber to people living within the tropics (Carlowitze, 1985). Eromosele (1991) reported that some of these wild fruits have higher values of vitamins compared with levels found in cultivated fruits. In North eastern part of Nigeria where common fruits like oranges and bananas are in short supply, it is possible for wild fruits like *Cassipourea congoensis* (Tunti) and *Nuclea latifolia* (Luzzi) to provide the vitamin and mineral requirement of the local populace. Affordability as a factor is responsible for the high incidence of malnutrition in low income families that traditionally have large family size in the study area. Most

affected are children of preschool age group with most cases of morbidity related to inadequate intake of food containing essential nutrients (Madusolumuo and Akogun, 1998). The availability of these nutrients in wild fruits after ingestion also depends on the antinutritional factors present in the fruits. The antinutrients tend to bind to mineral elements there by forming indigestible complex. Oxalate for instance binds to calcium to form complexes (calcium oxalate crystals). These oxalate crystals formed prevent the absorption and utilization of calcium. The calcium crystals may also precipitate around the renal tubules thereby causing renal stones (Ladeji et al., 2004).

*C. congoensis* and *N. latifolia* are both forest trees, which grow in Mandara Hills in Michika Local Government Area of Adamawa State. *C. congoensis* is particularly used as a substitute for tamarind (*Tamarindus indica*) in preparing local pap in the study area. The plant also provides a cool shade compare to other trees in the area. The seeds of both are also known to contain oil (Eromosele and Eromosele, 1993). Little is however known about the nutritional content of these wild fruits and the level of antinutritional factors in these fruits. Here we present the vitamins, mineral elements and antinutri-

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**Table 1.** Concentration of mineral elements (mg/100 g) in the *Cassipourea congoensis* and *Nuclea latifolia*.

Fruits	Cu	Co	Fe	Ca	Mg	Zn	Mn	p
<i>Cassipourea congoensis</i> (Tunti)	0.25 ± 0.02	0.52 ± 0.01	6.70 ± 0.13	45.00 ± 0.23	85.00 ± 0.11	0.81 ± 0.14	0.35 ± 0.12	6.00 ± 0.32
<i>Nuclea latifolia</i> (Luzzi)	0.15 ± 0.01	0.26 ± 0.02	1.80 ± 0.21	42.00 ± 0.15	70.00 ± 0.21	0.92 ± 0.03	0.21 ± 0.01	29.00 ± 0.15

Values are means ± SD (mg/100 g) of 3 determinations.

tional content of *C. congoensis* and *N. latifolia*.

## MATERIALS AND METHODS

### Materials

Plant samples were collected from Nkafamiya, Michika Local Government Area of Adamawa State, of Nigeria. Samples were dried under room temperature and made into powder for subsequent analysis. All the reagents used were of analytical grades.

### Methods

Mineral elements: Mineral elements analysis was carried out spectrophotometrically using atomic absorption spectrophotometer (Philip model SP 9). Phosphorus was however measured by flame emission technique (AOAC, 1980).  $\beta$ -carotene, vitamins B<sub>1</sub>, B<sub>2</sub>, C and E content of the fruits were determined following the AOAC methods of 1990. Vitamin A was calculated using the relationship:

$$0.6 \mu\text{g } \beta\text{-carotene} = 0.30 \mu\text{g of pure vitamin A.}$$

Vitamin C was determined titrimetrically by the modified Tillmann's methods (Pual, 1967). Total oxalate was determined according to Day and Underwood (1986) procedure. Saponin was determined using the method of Birk et al. (1963) as modified by Hudson and El-Difrawi (1979). Phytate was determined using Reddy and Love (1999) method. Tannin was however determined using the method of Trease and Evans (1978).

## RESULTS AND DISCUSSION

Results of mineral analysis of the two fruits are as presented in Table 1. *C. congoensis* had higher levels of Cu (0.25 ± 0.02 mg/g), Co (0.52 ± 0.01 mg/g), Fe (6.70 ± 0.13 mg/g), Ca (45.00 ± 0.23 mg/g), Mg (85.00 ± 0.11 mg/g) and Mn (0.35 ± 0.12 mg/g) compare to values obtained in *N. latifolia* [Ca (0.15 ± 0.01 mg/g), Co (0.26 ± 0.02 mg/g), Ca (42.00 ± 0.15 mg/g), Fe (1.80 ± 0.21 mg/g), Mg (70.00 ± 0.21 mg/g) and Mn (0.21 ± 0.01 mg/g)]. Zn and P were however higher in *N. latifolia* (0.92 ± 0.03 mg/g and 29.00 ± 0.15 mg/g, respectively) compare to values observed in *C. congoensis* (0.81 ± 0.14 mg/g and 6.00 ± 0.32 mg/g, respectively). The high values of calcium, phosphorus, and magnesium observed

in the fruits indicate that these fruits can play a vital role in the development of bones, teeth, co-factor in enzymatic reaction, nerve impulse transmission and as a clotting factor (Hatton and Mc carron, 1994). These values are even higher compare with values obtained in guava (23 mg/100 g for calcium and 25 mg/100 g for phosphorus).

Though the levels of copper present in the analysed fruits are relatively low compare to other sources, they will however help to alleviate symptoms associated with copper and iron deficiency such as hypercholesterolemia, demineralization of bones, microcytic anemia and decreased immunocompetence when consumed in large amount especially by pregnant and menstruating females who do not get adequate iron in their diet (Dollman, 1986). The iron levels in the fruits which range between 1.8 – 6.7 mg/100 g is 2-5 times higher than values obtain in fruits like orange (0.2 mg/100 g) and mango (0.4 mg/100 g) (Eromosele, 1991). The consumption of these fruits will also help to alleviate symptoms of magnesium and zinc deficiency such as weakness, cardiac arrhythmia, poor growth, impairment of sexual development and poor wound healing often observed in the study area where majority are alcoholics.

Table 2 presents the vitamins A, B<sub>1</sub>, B<sub>2</sub>, C and E content of the wild fruits. Both fruits contained adequate amounts of the vitamins analysed. When consumed together they can serve as vitamin supplements in the study area. Vitamins A and E are particularly important in the prevention of night blindness and peroxidation (Wolf, 1984; Stampfer and Rimm, 1995; Vanpuppel and Goldbohm, 1995). The levels of ascorbic acids in *C. congoensis* (410.50 ± 0.32 mg/100 g) is significantly higher ( $P < 0.05$ ) when compare with values for orange (50 mg/100 g) and strawberries (59 mg/100 g) (Eromosele, 1991). The high values of ascorbic acid observed in the fruits are however depended on stage of maturity and ripeness of the fruits (Kar and Mital, 1981). These fruits will prove important in the prevention of scurvy and alleviate symptoms of common cold (Simon, 1992; Hemila, 1994).

Table 3 shows the results of antinutrients present in the two fruits. However levels of antinutrients in the analysed fruits are lower to significantly interfere with nutrients utilization. They are below the established toxic

**Table 2.** Vitamins A, B<sub>1</sub>, B<sub>2</sub>, C and E content (mg/100 g) of the fruits.

Fruits	A	B <sub>1</sub>	B <sub>2</sub>	C	E
Cassipourea Congoensis_(Tunti)	69.00 ± 4.10	0.86 ± 0.02	0.94 ± 0.03	410.50 ± 0.32 (400.00 ± 0.12) <sup>a</sup>	1.12 ± 0.05
<i>Nuclea latifolia</i> (Luzzi)	18.00 ± 0.29	0.72 ± 0.06	0.72 ± 0.09	309.00 ± 0.22(299.50 ± 0.10) <sup>a</sup>	1.18 ± 0.49

\* values in µg/100 g.

<sup>a</sup>values in unripe fruits.

Values are means ± SD of 3 determinations.

**Table 3.** Oxalate, phytate, saponin and tannin content (%) of fruits.

Fruits	Oxalate	Pyhtate	Saponin	Tannin
Cassipourea Congoensis (tunti)	11.40 ± 1.50	2.57 ± 0.41	8.16 ± 0.21	3.48 ± 0.04
<i>Nuclea latifolia</i> (Luzzi)	10.50 ± 1.12	0.85 ± 0.01	6.03 ± 0.15	4.62 ± 0.14

All values are means ± SD for 3 determinations

level.

In conclusion, both fruits examined contain substantial levels of vitamins and it is evident that they are important sources of essential mineral element. The mineral element content of the fruits also makes them compete with some of the conventional fruits like banana, orange, pineapple etc as source of these elements.

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## REFERENCES

- AOAC (1980). Official Methods of Analysis Washington DC. Association of Analytical Chemist.
- AOAC (1990). Official Methods of Analysis Washington DC. Association of Analytical Chemist.
- Birk, Y, Bondi, A, Gestetner, B, Ishaya IA (1963). Thermostable hemolytic factor in soyabeans. *Natural* 197:1089-1090.
- Carlowitz PG (1985). ICRADS "multi-purpose tree and shrub information system" *Agro-Forestry system* 5:312-338
- Day RA, Underwood AL (1986). *Quantitative analysis*. 5<sup>th</sup> ed. pp 701. Prentice- Hall publication.
- Dollman PR (1986). Biochemical basis of the manifestation of iron deficiency. *Rev. Nutr.* 6:13.
- Eromosele IC, Eromosele CO, DM, Kuzhkuha (1991). Evaluation of mineral elements and ascorbic acid contents in fruits of some wild plants. *Plants foods Hum. Nutri.* 41:151- 154.
- Eromosele IC, Eromosele CO (1993). Studies on Chemical Composition and Physico-chemical Properties of Seeds of Some Wild Plants. *Plants foods Hum Nutri* 43:251-258.
- Hatton DC, Mc Carron DA (1994). Dietary calcium and blood pressurer in experimental models of hypertension. *Hypertension* 23: 513- 514
- Hemila, H. (1994). Does vitamin C alleviate the symptoms of the common cold? A review of current evidence. *Scand. J. Infect. Dis.* 26: 1-2
- Hudson, B J, El-Difrawi EA (1979). The saponin of the seeds of four Lupin species. *J. plant food Hum. Nutri.* (3):181-186

- Kar A, Mital HC (1981). The study of shea butter VI: the extraction of shea butter. *Qual plant. Plant foods Hum. Nutri*, 31:67-69.
- Ladojei O, Akin CU, Umaru HA (2004). Level of antinutritional factors in vegetables commonly eaten in Nigeria.. *Africa J. Nat. Sci.*7:71-73.
- Madusolumuo MA, Akogun OB (1988). Socio- Cultural factors of malnutrition among under fives in Adamawa state, Nigeria. *J. Nutri Health* 12:257-262.
- Nadro MS, Umaru HA (2004). Comparative chemical evaluation of locust bean (*parkia biglobosa*) fruits pulp harvested during the dry and wet seasons. *Nig. J. Biotech.*15(4):42-47.
- Pual G (1967). *The vitamins*. 2<sup>nd</sup> edn.(7): 31-32
- Reddy MB, Love M (1999). The impacts of food processing on the nutritional quality of vitamins and mineral. *Adv. Exp. Med. Bio.* 459: 99-106
- Simon J A (1992). Vitamin C and cardiovascular diseases. A review. *J. Am. Coll. Nutri.* 11: 107-108.
- Stampfer MJ, Rimm EB (1995). Epidemiologic evidence of vitamin E in prevention of cardiovascular disease. *Am. J. Chn. Nutri.*62: 13655
- Trease G E, Evans W C (1978). *A text book of pharmacognosy*. 11<sup>th</sup> ed. Bailliere- Tindall, London. pp. 76.
- Vanpuppel G, Goldbohm RA (1995). Epidemiologic evidence for β-carotene and cancer prevention. *Am. J. Chn. Nutri.* 62: 13935.
- Wolf G (1984) Multiple functions of vitamin A. *Physiol. Rev.* 64: 873-935.