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## Nutritive Value of the Two Varieties of Roselle (*Hibiscus sabdariffa*) Calyces Soaked with Wood Ash

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**Abstract:** The effect of soaking in wood ash on two varieties of Roselle (*Hibiscus sabdariffa*) red and green calyces was evaluated for their nutrient and toxic substances. The result showed a decrease in ash content (3.15%), crude lipid (10.89%) and moisture content (1.16%) in the roselle (red) calyx of the sample soaked in ash, while the crude fibre content (8.12%), carbohydrate content (79.68%) and protein content (6.64%) were high. The roselle (green) calyx soaked in wood ash also showed a decrease in the ash content (4.45%), crude lipid (0.85%), moisture content (78.91%). All the varieties soaked in wood ash were low in antinutritional content. Both the varieties soaked in wood ash showed increase in the potassium content, and when consumed will assist haemostatic control of the body.

**Key words:** Wood ash, roselle, crude fibre

### Introduction

Roselle (*Hibiscus sabdariffa*) belongs to the family Malvaceae and is a popular vegetable in Indonesia, India, West Africa and many tropical regions (Tindal, 1986). The vegetable is widely grown in the North-Eastern and middle belt regions of Nigeria (Akanya *et al.*, 1997). The plant has been found to thrive on a wide range of soil conditions. It can perform satisfactorily on relatively infertile soils but for economic purposes, a soil well supplied with organic materials and essential nutrients is essential (Tindal, 1986). It can tolerate relatively high temperature throughout the growing and fruiting periods. The plant requires an optimum rainfall of approximately 45-50cm distributed over a 90-120day growing period (Tindal, 1986).

In Nigeria, two botanical varieties are recognized, the calyx of the red variety are used for the preparation of "Sobo" drink and soup, while the calyx of the green variety are used to cook soup, stew and sauces. The calyx of roselle (green) is very rich in vitamin C and riboflavin with some major mineral present (Babalola, 2000). Roselle calyces are used as a digestive and purgative agent and a folk remedy for abscesses, billows, cancer, hypertension etc (Duke, 1985). In western Nigeria, roselle calyx are used in cooking vegetable soup. It is usually prepared by steeping it with wood ash overnight or parboiled with wood ash and washed thoroughly prior to it used for the preparation of soup. The present study was designed to know the nutritional quality of roselle calyces when soaked in wood ash.

### Materials and Methods

**Collection of plant samples:** Both the red and green species of *Hibiscus sabdariffa* were purchased from

Ado-Ekiti main market. The identify of *Hibiscus sabdariffa* Lam was confirmed by Mr Omotayo Oluwafemi of plant science Department, University of Ado-Ekiti. A voucher specimen is deposited in the herbarium of the department. Each of the sample was divided into two parts, one part was soaked in wood ash overnight after which it was washed thoroughly with tap water and dried at 60°C (Joslyn, 1990) and while the other part was not soaked in wood ash.

### Chemical analysis

**Proximate analysis:** Crude protein, ash, crude fibre, crude fat and moisture contents were determined using the method of (AOAC, 1990), carbohydrate was determined by difference (AOAC, 1990).

**Mineral analysis:** Sodium and potassium estimations were made using corning flame photometer, model No 410 (HITACH1Z-8000) Atomic Spectrophotometer with zeeman background corrector and microprocessor control was used in the flame version for other elemental analysis using standard addition technique (Price, 1978).

### Antinutritional Content And Ascorbic Acid

**Determination:** Phytic acid was determined as phytic phosphate by the modified method of McCance and Widdowson (1935). Oxalate was determined by the method of Abeza *et al.* (1968) and tannic acid and hydrocyanic acid was determined by the AOAC (1990) Procedure.

### Results and Discussion

The proximate composition of Roselle (Red and green) calyces and the part soaked with wood ash overnight is

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Table 1: Proximate analysis of Roselle calyces (g/100g) dry mater

	R <sub>1</sub>	R <sub>2</sub>	G <sub>1</sub>	G <sub>2</sub>
Ash Content	12.24	3.51	6.83	4.45
Fat Content	2.01	0.89	2.17	0.85
Crude Fibre	4.69	8.12	6.75	9.06
Protein Content	4.71	6.64	6.45	5.57
Moisture Content	7.60	1.16	6.24	1.16
Carbohydrate Content	68.75	79.68	71.56	78.91

R<sub>1</sub> = Red Calyces of roselle, R<sub>2</sub> = Red Calyces of roselle soaked in wood ash. G<sub>1</sub> = Green calyces roselle, G<sub>2</sub> = Green calyces of roselle soaked in wood ash. Values are means of two determinations.

Table 2: Mineral Composition of Roselle Calyces (mg/100g)

	R <sub>1</sub>	R <sub>2</sub>	G <sub>1</sub>	G <sub>2</sub>
Sodium	96.66	87.43	48.19	32.70
Potassium	49.35	118.30	49.59	77.78
Calcium	12.65	16.12	21.58	49.54
Magnesium	38.65	47.54	47.54	71.76
Iron	3.22	2.41	3.37	1.94
CU	ND	ND	ND	ND
Zinc	12.22	16.61	16.28	26.76
Manganese	2.39	2.86	5.61	9.86
Nickel	1.78	2.09	3.57	28.33
Phosphorus	36.30	ND	15.05	ND

ND = Not determined, values are means of two determinations

Table 3: Anti-nutritional content and ascorbic acid composition of Roselle Calyces

	R <sub>1</sub>	R <sub>2</sub>	G <sub>1</sub>	G <sub>2</sub>
Phytic acid (%)	0.32	0.09	1.13	0.31
Oxalate (%)	6.15	5.80	6.05	5.40
Tannic acid (mg/100g)	2.00	1.53	2.33	1.40
Hydrocyanic (mg/100g)	0.16	0.10	0.13	0.10
Ascorbic acid (mg/100g)	16.67	12.50	12.50	10.42

Values are means of two determinations

shown in Table 1. The ash content of Roselle (Red) calyces (12.24%) was reduced to (3.51%) when soaked in wood ash and that of Roselle (green) calyces (8.82%) reduced to (6.23%) when treated with wood ash. The ash content is within the range reported for better cress and spinach (Oyenuga, 1968), edible mushrooms (Ogundana *et al.*, 1992) and fluted pumpkin (Ladeji *et al.*, 1995).

The moisture contents of the roselle (red and green) calyces ranges between 6.24 - 7.60% and 1.16% for the part soaked in wood ash. The values of the moisture contents compares favorably well with that observed for roselle calyces neutralized with trona (Ojokoh *et al.*, 2003) and for fluted pumpkin seed (Akintayo, 1997). The carbohydrate contents of the varieties soaked in wood ash are high. The high carbohydrate contents obtained for the two varieties lend further support to the assertion of Babalola (2000) and Ojokoh (2003) that the Roselle calyces contain high carbohydrate contents.

Data for the mineral contents are presented in Table 2. Potassium was found to be the most abundant mineral present in both roselle (red) and Roselle (green), calyces that were soaked with wood ash. The increase in the amount of potassium may be due to the addition

of potassium from wood ash which also contain potassium as one of its constituents. Potassium is not only for the chief electrolytes but also essential for the nervous systems, maintenance of fluid volume in the body, contractile mechanism of muscles, maintenance of correct rhythm of heart beat, clothing of blood (Shahnaz *et al.*, 2003). The consumption of the samples soaked in wood ash may assist the physiological balance of the body.

The oxalic acid content has been used as an index of toxicity in vegetables since large amounts would lower the nutritive value (Oke, 1966a). It is interesting to note that oxalate contents of the samples soaked in wood were low and even lower than the one reported for fluted pumpkin (Ladeji *et al.*, 1995). Also both samples Roselle (Red and green) calyces soaked in wood ash showed low values of hydrocyanide and compared favorably with those recorded for edible mushrooms, (Ogundana *et al.*, 1992) and well below the toxic dose of 60mg for man (Nicholls, 1951). The level of phytic acid recorded was also far below the level reported in adult meal to avoid negative effects on zinc and Iron absorption (Sandberg, 1990). The levels of these antinutrient factors may further be reduced by thorough washing prior to cooking (personal observation).

Finally, the ascorbic acid obtained for the Roselle (Red and green) calyces soaked in wood ash compares favourably with some edible mushrooms and to some of animal organs. For example, Ogundana *et al.*, (1992) found that *Termitomyces robustness* contained 10.0mg/100g, *Termitomyces clypeatus* 14.3mg / 100g, and Oke (1966b) reported the ascorbic acid in cooked beef kidney as 15mg/100g, pig spleen, 11.0mg/100g; uncooked goat lung 9.0mg/100g and heart 10.0mg/100g respectively.

From the results obtained in this study, Roselle (Red and green) calyces soaked in wood ash, have been shown to contain high content of potassium and the low levels of antinutritional factors recorded seem to support that the consumption of the calyces will have no adverse effect on the body systems.

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