Compositional Attributes of the Calyces of Roselle *(Hibiscus sabdariffa* L.)

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Abstract

In this study, chemical and mineral composition of the calyces of green, red and dark red roselle were evaluated. There was no significant difference in crude protein of green (17.9%) and red (17.4%) coloured roselle calyces. Crude fibre (11.2%), ascorbic acid (86.5mg/100g) and sodium (9.5mg/100g) contents of green coloured calyx were significantly higher than other calyx samples. However, dark red calyx was significantly higher in ash (6.8%) and potassium (2320mg/100g) contents than the other two calyces. Also, there was no significant differences in calcium, magnesium and zinc contents of red and dark red coloured roselle calyces at P<O.05.

Roselle calyces appeared to be cheap source of vegetable protein, fat and minerals therefore its consumption should be encouraged.

Key words: Roselle calyces, chemical analysis.

Introduction

The per capita consumption of vegetables in sub-saharan Africa is far below the recommended daily intake of 2OOgms of which two-third should be green leafy vegetable (Mnzava, 1997). Traditional African vegetables are extremely important for nutrition and farm income throughout Africa. For example, they often supply most of the daily requirements of proteins minerals and vitamins of poor rural people (Okafor 1995)

Nutrient deficiency diseases such as night blindness, scurvy and rickets common among Africans can be avoided by greater consumption of nutritious vegetables. African traditional vegetable have been relatively neglected by the scientific and development communities. Their consumption and utilization is further limited due to lack of information on their nutritive values.

Roselle, (*Hibiscus sabdariffa L.*) is a tropical subshrub with red or green inflated edible calyces (Purseglove 1977, Seck, 1997). The types can be distinguished by three different colour groups: green, red and dark red. (Schippers, 2000). Calyces of the red and dark red coloured type are extracted and sweetened to produce a refreshing drink while calyces and leaves of the green type are used for making vegetable stew (Babalola 2000).

The present study was designed to evaluate the compositional attributes of the calyces of roselle.

Materials and Methods

Mature calyces (130 days after planting) of green red and dark red types were obtained from experimental farm of the National Horticultural Research Institute - Ibadan, Nigeria. The calyces were picked randomly early in the morning and transferred immediately to the laboratory. They were then separated, cut into smaller bits, dried using forced air oven at 60°C and milled (AOAC, 1990).

Chemical analysis: Total crude fat (method 920.85), ash (923.03) and protein (method 920.87) were performed according to the standard methods described in (AOAC, 1990). Protein was calculated using a nitrogen to protein conversion factor of 6.25. Ascorbic acid was determined by indophenol method described by Ruck, (1969). All analysis were done on dry matter basis except moisture and ascorbic acid determination that were done on fresh weight basis.

Mineral composition: For determination of elements (Na, K, Ca, Mg, Zn and Fe) samples were digested in $HN0_3/HC10_4$ (9:1) as described by Harris (1970). They were then measured by atomic absorption specrophotometer (AAS) using as acetylene air flame. All determinations were carried out in four replicates.

Table 1. Chemical composition of roselle calyces

Element	Calyx types		
	Green	Red	Dark red
Crude protein (%)	17.9[a]	17.4[a]	8.6[b]
Ether extract 9%)	3.2[a]	2.1[b]	2.9[a]
Crude fibre (%)	11.2[a]	8.5[c]	9.8[b]
Ash (%)	6.6[b]	6.5[b]	6.8[a]
Ascorbic acid (mg/100g)	86.5[a]	63.5[b]	54.8[c]
Moisture (FW) %	88.3[a]	86.5[b]	85.3[c]

Means in the same row having the same letter are note significantly different from each other at P<0.05.
Data are means of four replicates.

Table 2. Mineral Composition of roselle calyces

Element (mg/100g)	Calyx types		
	Green	Red	Dark red
Calcium	1209[b]	1583[a]	1602[a]
Magnesium	235[b]	316[a]	340[a]
Potassium	1850[b]	2060[b]	2320[a]
Sodium	9.5[a]	5.5[c]	6.5[b]
Iron	32.8[c]	37.8[a]	34.6[b]
Zinc	5.8[b]	6.5[a]	6.3[a]

Means in the same row having the same letter are not significantly different from each other at P<0.05
Data are means of four replicates

Statistical analysis: Statistical analysis was conducted by analysis of variance using completely randomised block design and their means were separated by Duncan Multiple Range test (Duncan, 1955).

Results and Discussion

Table 1 shows the chemical composition of roselle calyces. There was no significant difference in crude protein and ash contents of green and red coloured types, but varied significantly from dark red type at P<0.05. This may be due to genetic differences. De la Asuncion *et al* (1995) reported a significant difference in protein content of two varieties of pejibaye palm *(Bactris gasipae)*. Green coloured calyces was significantly higher than other types in crude fibre (11.2%) and ascorbic acid (86.5mg/100g) contents. Akinlua and Bamgbose (1998) reported a significant difference in ascorbic acid content of pepper varieties. The result of ether extract and moisture of these calyces agree with those of other vegetables reported by Uddoh, (1980), West *et al* (1988) and Tomar and Kalda, (1996).

On mineral composition of roselle calyces, calcium, magnesium and zinc contents of dark red calyx were very high but did not vary significantly from red coloured type at P<0.05 (**Table 2**). This trend indicates that the consumption of the highlighted calyces will take an active role in good bone and teeth formation. Red coloured calyx was significantly higher in iron content (37.8mg/100g) than other calyces, this type could be useful in blood formation. Ladeji *et al* (1995) reported 12mg/100g iron for a popular vegetable, fluted pumpkin *(Telferia occidentalis)*.

Conclusion

In summary, roselle calyces could be good source of nutrients, therefore their consumption should be encouraged among the disadvantaged groups in developing countries.

References

Akinlua, A. and Bamgbose, A. (1998): The effects of home storage conditions on vitamin C content of cooked peppers. Proceedings of the 22nd Annual Conference of Nigeria Institute of Food Science and Technology (NIFST) pp. 86-87.

AOAC (1990). Official methods of Analysis. Association of Official Analytical Chemists, 15th edition Washington DC.

Babalola, S.O. (2000) Chemical composition of roselle *(Hibiscus sabdariffa* L.) leaf Proceeding of the 24th Annual Conference of the Nigerian Institute of Food Science and Technology 119-121.

De la Asuncion, A., Bonilla, AR. and Sancho, M.R. (1995). Chemical Composition of the edible portion of two Pejibaye Palm *(Bactris gasipaes)* varieties. Tropical Science 35, (4) 365-370.

Duncan, D.B. (1995). Multiple range and Multiple F tests. Biometrics 11(1)1-5.

Harris, L.E. (1970). Techniques in nutrition. In Nutritional Research Techniques 1. Uttah, 84321.

Ladeji, O.D., Okoye, Z.S.C., and Ojobe, T. (1995). Chemical Evaluation of the Nutritive Value ofleafoffluted pumpkin (Telferia occidentalis). Food Chemistry 53, 353-355.

Mnzava, N.A. (1997). Comparing nutritional values of exotic and indigenous vegetables. In African Indigenous Vegetables (Rudy Schippers and Leonard Budd edt). Proceedings of /IPGRI/ International Workshop on African Indigenous Vegetables pp.70-75

Okafor, J.C. (1995). Conservation anduse of traditional vegetables from woody forest species in South western Nigeria. In: Traditional African Vegetables (Guarino. L. edt.) Proceedings of(IPGRI) International Workshop 31-38.

Purseglove, J.W. (1977). Tropical Crop: Dicotyledon, Vol.1 Longman Group U.K. 370-373.

Ruck, J.A. (1969). Chemical methods for analysis of fruits and vegetable products. Canada Dept. Agric. Summerland B.C. pp.14-33

Schippers, R.R. (2000). African Indigenous Vegetable An overview of the cultivated species. Chatham U.K. Natural resources Institute/ACP - EU Technical Centre for Agricultural and Rural Cooperation. 1-214.

Seck, A. (1997). Seed Production and Storage of Indigenous Vegetables. In: African Indigenous vegetables (Ruddy Schippers and Leonard Budd edt.). Workshop Proceedings, Limbe Cameroon 16-80.

Tomar, B.S. and Kalda, T.S. (1996). Is eggplant nutritious? Tropical Vegetables Information Services (TVIS). Newsletter of Asian Vegetable Research and Development Centre. Vol.1. Nol 28-29.

Uddoh, C.O. (1980). Nutrition. Macmillan Tropical Nursing and Health Services pp. T 75--77

West, C.E., Pepping, F. and Temaluwa, C.R. (1988). The composition of foods commonly eaten in East Africa. Wageningen Agricultural University, Wageningen, The Netherlands 1-69.