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A Comparative Assessment of the Proximate Composition, Ascorbic Acid and Heavy Metal Content of Two Species of Garden Egg (*Solanum gilo* and *Solanum aubergine*)

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Abstract: The proximate composition ,ascorbic acid and Heavy metal contents of two species of Garden egg, *Solanum gilo* and *Solanum aubergine* were evaluated using chemical analysis. The result of the proximate composition analysis showed that *solanum gilo* fruits had the following composition:moisture (74.80%), carbohydrate (52.13%), crude protein (14.87%), crude fibre (16%), crude fat (7%) and ash (10%). It also contained (93.7%) of ascorbic acid. The *Solanum aubergine* fruits on the other hand contained moisture (94.6%), carbohydrate (58.5%), crude protein (15.75%), crude fat (4%), crude fibre (11.75%) and ash (10%). It also contained (75.9%) ascorbic acid. The Heavy metal concentrations of *Solanum gilo* fruits are Zn (3.81ppm), Cr (1.74ppm), Cd (0.16ppm), Cu (1.48ppm), Co (0.12ppm) and Hg (0.01ppm). The *solanum aubergine* fruits on the other hand contained Zn (1.58ppm), Cr (2.45ppm), Cd (0.77ppm), Cu (0.04ppm), Co (0.10ppm) and Hg (0.01ppm). The concentrations of As and Pb in the fruits of both species were not detected. The result Shows that the values of moisture, ascorbic acid, crude fibre and crude fat were higher in *S. gilo* fruits, while the values of carbohydrate and crude protein were higher in *S. aubergine* fruits. The result also showed that the fruits of both species have same ash content. The result revealed that the concentrations of Zn, Cu and Co were higher *in S. gilo* fruits, while *S. aubergine* fruits has higher values of Cr and Cd. The results also revealed that the concentrations of Cr and Cd in both species of the plant were all above WHO permissible limits of 0.05ppm and 0.005ppm, respectively.

Key words: Garden egg, proximate composition, ascorbic acid, heavy metal

INTRODUCTION

Solanum gilo and *Solanum aubergine* are two species of garden egg widely consumed in Nigeria in general and in Calabar the capital of Cross River state in particular. Both species of garden egg are native in Africa, they have bitter taste and belong to the family of solanaceae. They are herbaceous perennials, closely related and are cultivated in the same way. *Solanum gilo* has a round greenish fruits while *solanum aubergine* has a white elongated shape. *Solanum aubergine* has an upright or bushy nature which is woody and a branching stem which may attain the height of 1.2m when matured and leaves covered with heirs. It also has a white mesocarp (flesh) which contain small whitish smooth seeds (Reamaeker, 2001). *Solanum gilo* on the other hand has a stocky nature with branching stem which may attain the height of 1.2m when natured with simple alternate leaves covered with heirs. It has a yellowish round seeds. The seeds make up 0.8-4% of the total weight of the fruit (mayhew and penny, 1988). The fruits from both species can be stored for up to 10 days in cool moist condition, but could be easily damaged if kept in temperature below 10°C (Mayhew and Penny, 1988). They fruits of these two species of garden egg are always eaten fresh while those of other species are cooked. They can be cooked and used as garnish, salad, etc. Most often they are used in mixed dishes, stews and soups. Their flavour combine well with onions, tomatoes and meats and they can also be fried or grilled (MAFF, 1997).

Although Dosunmu and Eka (1989) reported on the nutritive value of *cola rostrata*, Kester (1997) reported on the cultivation of Garden Egg, Oyenuga (1968) reported on feeding stuffs and nutritive value of some Nigerian foods, Edem *et al*. (2008) reported on the proximate composition of *Averrhoa Carambolam* and Tanksley (1986) reported on biochemistry of fruits and their product, Not much have been reported on the proximate composition of these two species of garden Egg. Considering the fact that *S. gilo* and S. *aubergine* are two species of garden egg used as food by many people in the study area in different forms. We consider it necessary to assess the heavy metal content of these fruits knowing the health hazards associated with the consumption of fruits with high concentration of heavy metals (Beavington, 1975). The main aim of this study is to assess the proximate composition and ascorbic acid content of the two species of garden egg with the view of knowing their chemical composition. The heavy metal content of both species will also be determined in order to ascertain the health effect associated with their consumption.

MATERIALS AND METHODS

Sample collection: Garden egg fruits (unripe) samples (*Solanum gilo* and *Solanum aubergine*) where collected during the month of September, 2007 fresh from two markets namely Watt market in Calabar south local government area and Ika-Ika Oqua market in Calabar Municipality ,both in Cross River State of Nigeria. About 300 fruits (150 fruits of each species) were put in clean polyethylene bags and taken immediately to the laboratory and were stored in a refrigerator, from where they were later taken for chemical analysis. They samples were analyzed compositely.

Sample preparation: Each sample was washed with deionized distilled water and wiped with kitchen tissue. They were separated, chopped into smaller pieces using a knife with steel blades.

Portions were taken for the determination of moisture and ascorbic acid contents. The rest of the samples were dried in hot air circulating oven (Gallenkamp DV330) at 65°C to a constant weight for (18-24h).The dried samples were ground using an electric blender with steel blades and stored in screw capped containers at 4-6°C. Moisture content was determined by drying about 3g of the fresh sample to a constant weight in a hot air circulating oven at 100°C. Crude fat ,crude protein, crude fibre and ash contents were determined according to the standard method of the AOAC (1984) using dry samples.

Ascorbic acid was determined by titrating ascorbic acid extract prepared from 30g of the fresh sample against N-bromosuccunmide by the method of Haddad (1977). The carbohydrate content of the samples were determined by the difference obtained after subtracting the crude protein, ash, crude fat and fibre contents from the total dry mass. The determination of Cr, Hg, Cd, Cu, Co, Zn, As and Pb was done using an atomic absorption spectrophotometer (AAS) (Pye Unicam 2900), according to the procedure of the AOAC (1984) on dry samples.

RESULTS AND DISCUSSION

Table 1 shows the proximate composition and ascorbic acid content of *S. gilo and S. aubergine* fruits. From the results in Table 1 The S. *gilo* fruits has the following composition: moisture (94.8%), crude fat (7%) crude protein (14.87%) and crude fibre (16%) ash (10%) carbohydrate (52.13%), while Ascorbic acid content was (93.7%). The *S. aubergine* has the following composition: moisture (94.6%) crude fat (4%) crude protein (15.75%) crude fibre (11.75%) ash (10%) carbohydrate (58.5%) and the ascorbic acid value of (75.9%). The study revealed that the *S. gilo* fruits have higher concentrations of moisture, ascorbic acid, crude fibre and crude fat. While the *S. aubergine* fruit have higher concentrations of carbohydrate and crude protein. The result also revealed the trend in the composition in *S. gilo* to be moisture > Ascorbic acid > carbohydrate > crude fibre > crude protein > ash > crude fat while for *s.gilo* we have moisture > Ascorbic acid > carbohydrate > crude protein> crude fiber > ash > crude fat. The results show that both *S. gilo* and *S. aubergrine* have same trend in composition, by having the highest value of moisture, followed by ascorbic acid and carbohydate with modrate amount of crude protein and crude fiber and the least value of crude fat. Both species have been shown to have the same ash content. The result shows that both *S. gilo* and *S. aubergine* fruits are very nutritive and could be used to promote healthy living such as protection against scurvy and other ascorbic acid deficiency related ailments. The high moisture content of the fruits of both species shows that they need to be stored in cool condition if they are to be kept for a long period without spoilage.

Table 2 shows the heavy metal concentrations in S. *gilo* and S. *aubergine* fruits From the result (Table 2) the *S.*gilo had Cu (1.2ppm) Zn (3.81ppm), Cd (0.16ppm) Cr (1.74ppm) Co (0.12ppm) and Hg (0.01ppm). While the *S. aubergine* fruits had Cu (0.04ppm) Zn (1.58ppm) Cd (0.77ppm) Cr (2.45ppm) Co (0.01ppm) and Hg (0.01ppm). The concentrations of As and Pb were not detected in the fruits of both S. *gilo* and *S. aubergine*. The result revealed that the S. *gilo* fruits had higher concentrations of Cr and Cd. The results also revealed the trend in the concentrations of heavy metal in *S.* gilo fruits to be Zn > Cr > Cu > Cd > Co > Hg. While that of *S. aubergine* was Cr > Zn > Cd > Cu > Hg = Co.

The result shows that both S.*gilo* and S. *aubergine* fruits have the same concentration of Co and Hg .The results also show that chromium and cadmium in the fruits of both S. *gilo* and S. *aubergrine* were above the WHO (1991) permissible limits in fruits of 0.05ppm and

Table 1: Proximate composition and ascorbic acid content of *S. gilo* and *S. aubergine*

sample	Moisture (%)	Crude fat (%)	Crude fibre (%)	Crude protein (%)	Ash (%)	Carbohydrate (%)	Ascorbic acid (%)
S. gilo	94.8	7	16	14.87	10	52.13	93.7
S. aubergine	94.6	4	11.75	15.75	10	58.5	75.9

Table 2: Heavy metal concentration (ppm) in *S .gilo* and *S.aubergine*

Sample	Cu	Zn	Cd	Hg	Cr	As	Co	Pb
S.gilo	1.48	3.81	0.16	0.01	1.74	ND	0.12	ND
S. aubergine	0.04	1.58	0.77	0.01	2.45	ND	0.01	ND
WHO permissible limit	10	5.0	0.005	-	0.05	-	-	-

0.005ppm, respectively. The high values of chromium and cadmium in the fruit of both S. *gilo* and S. *aubergrine* used in this study may be attributed to the locality in which they were cultivated and may not necessarily make all fruits of these two species of garden egg unfit for consumption. It may be necessary to study fruits of these two species from other localities to find out if there is source nearby where the high concentrations of chromium and cadmium could be traced to, since the cumulative effect of these metals in human health are generally disastrous as they are known to cause nephropathy, agitation, confusion, constipation and slight anemia (Ademorot, 1996; Tahoven 1998; Mannino 1996; MAFF, 1997).

Conclusion: The fruits of S. *gilo* and S. *aubergine* species of garden egg have been shown to have very high amount of ascorbic acid and a reasonably good amount of carbohydrate and moderate amount of crude fiber and crude proteins. This make them good source of raw material for food packing industries.

REFERENCES

Ademorot, C.M.A., 1996. Environmental Chemistry and Toxicology. Ibandan, Foludex Press Ltd.

AOAC, 1984. Official Methods of analysis. 14th Edition Association of Official Analytical Chemist. Washington, D.C., U.S.A.

Beavington, F., 1975. Heavy metal contamination of vegetable and soil in domestic garden around a smelting complex. Environmental Pollutin, 9: 211-221.

Dosunmu, M.I. and O.U. Eka, 1989. Chemical evaluation of Nutritive value of Cola rostrata. Nig. J. Sci., 223: 85-87.

Edem, C.A., M.I. Dosunmu, A.C. Ebong and M. Jones, 2008. Determination of the proximate composition, Ascorbic acid and Heavy metals contents of star fruits (Avesrhoa Carambola). Global J. Pure and Appl. Sci., 14: 193-195.

Haddad, P., 1977. Vitamin C content of commercial orange juices. J. Chem. Edu., 54: 192-193.

Kester, Fred, 1997. Cultivation of garden egg: 4th Edition Prentice-Hall; Career and Technology, India.

Mannino, S., 1996. Determination of heavy metals in fruit juices and vegetable by potentiometric stripping analysis. The Analyst, 107: 1466-1470.

Mayhew, S. and A. Penny, 1988. Tropical and Subtropical Foods: London: Macmillian Education Ltd.

Ministry of Agriculture Food and Fisheries (MAFF), 1997. Total Diet study in plants. 1st Edition, London Ellis Horword Prentice Hall.

Oyenuga, V.A., 1968. Nigeria Food and Feeding Stuffs, their Chemistry and Nutrient Values. 3rd Edition Ibandan university Press, Ibandan.

Reamaeker, R.H., 2001. Crop Production in Tropical Africa. Belgium, Gockint Graphics N.V.

Tahoven, L., 1998. Lead and cadmium in Food Additives and contaminants, 15: 446-450.

Tanksley, A.S., 1986. Biochemistry of fruits and their Products: New York Academic Press.

World Health Organization, 1991. International program on chemical safety (I.P.C.S): Environmental Health Criteria, Geneva, 134: 321-342.