EVALUATION OF *IN VITRO* ANTIOXIDANT PROPERTIES OF TWO GARDEN EGG FRUIT CULTIVARS (*Solanum aethiopicum F.* and *Solanum melongena F.*)

BY

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ABSTRACT

Garden egg (*Solanum melongena F. and Solanum aethiopicum F*) is a plant native in india and Africa, and many cultivars exhibiting different size, shape and colour (white and green) are cultivated in tropical, subtropical, and temperate zones. This is ranked as one of the ten vegetables in term of oxygen radical scavenging capacity due to the presence of phenol, flavonoid, ascorbic acid and Beta carotene. 30g of the dried samples of garden egg (*S. melongena and S.aethiopicum*) were extracted with 20 volumes of 70% ethanol. The dried 70% ethanol samples were redissolved in methanol at different concentration. Samples B (*S. melongena*) is significantly higher in flavonoide content (72.97+10.75%), ascorbic acid content (72.97+1.4%) and b-carotene (5.388+0.6%) when compared with that of sample A(*S. aethiopicum*). the presence of these antioxidative parameters that were determined in garden egg extract proved its ability to inhibit free radicals which causes aging and damage to living tissues. The result of this research work revealed that extract of garden egg cultivars (*S. melongena)* is significantly higher in antioxidant properties than *S. aethiopicum.* Though both Garden egg can be utilizes as an effective and safe antioxidant source and ethanomedicine. So the cultivation and the eating of this fruit should be encouraged.

Keywords: *Solanum melongena* F. and *Solanum aethiopicum* F, Antioxidant, free radicals, scavenging capacity.

INTRODUCTION

Free radical (FR) has great contribution to cell damage; they are chemical species possessing an unpaired electron. They can be positively charged, negatively charged or electrically neutral. When generation of reacting oxygen species (ROS) overtakes the antioxidant defense of the cells, the free radicals start attacking the cell proteins, lipids and carbohydrates and this leads to a number of physiological disorders (Cotran *et al.*, 1999).

Antioxidant has been shown to be useful in cellular function. They are chemical substances that donate an electron to the free radical and convert it to a harmless molecule. They may reduce the energy of the free radical or suppress radical formation or break chain propagation or repair damage and reconstitute membranes (Yerra *et al.*, 2009).

Garden egg (*Solanum melongena F*. and *Solanum aethiopicum F*.) are plant native of India and Africa. Many cutivars exhibiting different size, shape and coluor (white and green) are cultivated in tropical and temperate zones (Cao et al., 1996).

This garden egg is commonly known as Dauta in Hausa, Afufa or Anara in Igbo and Igba or itan in Yoruba regions of Nigeria (Chioma, 2012). No matter the name, shape or colour of the two species of garden egg, it contain many beneficial

nutrients and photochemical compound such as steroids, alkaloids, flavonoid that benefit human health (Igwe *et al.*, 2003).

This garden egg has been reported to support weight control, and lower cholesterol (Stommel and Whitaker, 2003), therefore the objective of the present study was designed to compare the antioxidant potential of *Solanummelongena F. and Solanumaethiopicum F* through total phenolic content, total flavonoid content, hydroxyl radical assay, hydrogen peroxide potential assay and reducing power method.

MATERIAL AND METHODS

Sample Collection and preparation

The freshly harvested two garden egg fruit cultivars were purchased from a local farmer at the Ekeonunwa market in Owerri, Imo State.The samples were washed and freeze dried for 2days with a lyophilizer. The dried sample were crushed and 30g of the sample were extracted with 20ml 70% ethanol. The extract was the stored in freeze. Ethanol extract were used for the antioxidant analysis.

Determination of Total Flavonoidby Harborne (1973)

5g of each sample was weighed and were dissolved in 50ml of 80% methanol and were left for 3hrs.

After three hours they were filtered with filter paper. The residue in each sample was washed with 10ml of 80% methanol. The filtrates were subjected to dryness in each sample.

$$\% \text{ flavonoid} = \frac{\text{Weight of Sample}}{\text{Weight of Initial Sample1}} \times \frac{100}{}$$

Determination of Total Phenol

The concentration of phenols in the fruit of the Garden eggplants were determined sing a folinciocaltean calorimetric method described by Pearson (1976).

0.2g of powdered sample (each) were measured in triplicate into a test-tube and of methanol was added to each of the samples and was thoroughly shaken, mixtures were left to stand for 15minutes before being filtered using whatman (No.1) filter paper. 1ml of the extract was placed in each test-tube and 1ml folincio-caltean reagent in 5ml of distilled water was added to each test-tube and a colourwas allowed to develop for 2hrs at room temperature (Yellow colour). The absorbance of the developed colour in each tube of the different samples were measured at 760nm wavelength. And the phenolic content of esch sample was calculated thus;

$$\% \text{ phenol} = \frac{100}{W} \times \frac{AU}{AS} \times \frac{C}{100} \times \frac{VF}{VA} \times D$$

Determination of Ascorbic acid by Voogt and Osbong (1978)

25ml of 0.5% oxalic acid was poured in a crushed sample of garden egg fruit and 100ml of water was added in each sample. After that 2.5ml ofacetone was added to

the different samples. The mixture was titratedagainst 2,6dichlorophenol indophenols of each sample, which broughtabout a faint pink colour on titration. Amount of ascorbic acid 20 X V X C

Determination of total beta-carotenoid(vitamin A) by modified Hapenget al., (2005)

Each extract of the two samples were diluted in acetone. The absorbance of each extract of the garden egg samples were read at a wavelength of 470nm. The analysis was done in triplicate for each extract of the samples in a concentration of 30rng/ml, 50nig/ml and 70mg/ml. Standard solutions of beta carotene with concentrations of l-5g/ml were used to obtain a standard curve. The total carotenoid determination was reported as % of total quarcetin equivalent per 100g extract (Bet/100g).

$$\frac{AO\text{-}AS}{AO} \quad X \quad \frac{100}{1}$$

DETERMINATION OF THE REDUCING POWER BY SAHU ET AL. (2009).

The reducing power of the extracts was determined according to the method of Sahu et al. (2009). Concentrations of the extracts in 1.0 mL of distilled water were mixed with phosphate buffer (2.5 mL, 0.2M, pH 6.6) and 1% potassium ferricyanide (2.5 mL). The mixture was incubated at 500C for 20 minutes; aliquots

of trichloroacetic acid (2.5 mL, 10%) were added to the mixture, which was then centrifuged at 3000 rpm for 10 min. The upper layer of solution (2.5 mL) was mixed with distilled water (2.5 mL) and a freshly prepared FeCl3 solution (0.5 mL, 1%). The absorbance was measured at 700 nm. Increased absorbance of the reaction mixture indicated increased reducing power. Reducing power is given in ascorbic acid equivalent (ASE mL-1) that shows the amount of ascorbic acid expressed in mM.

Statistical analysis

The works were carried out in triplicate. The two samples were compared and with the standard using student t-test.

RESULT

Table 1: Antioxidant parameters of the two garden egg cultivars

Bioactives	**Sample A(%)**	**Sample B(%)**
Flavonoid	9.66 ± 4.04^{a}	19.66 ± 10.7^{b}
Phenol	0.61 ± 0.18^{a}	1.30 ± 0.69^{b}
Ascorbic acid	55.39 ± 0.47^{a}	72.97 ± 1.4^{b}
β –carotene	3.74 ± 0.20^{a}	5.38 ± 0.46^{b}

Values are triplicate of the analysis and are represented as mean±SD. Superscript in the same row with different letters are significantly ($p<0.05$) different to each other.

Table 2: hydroxyl Radical contraction of the samples and Ascorbic acid standard

Concentration (µg/ml)	**Sample A**	**Sample B**	**Ascorbic acid Std**
300	3.68 ± 0.01^{a}	15.50 ± 0.50^{b}	78.97 ± 12^{c}
500	8.47 ± 001^{a}	36.26 ± 0.02^{b}	$82\pm88\pm0.33^{c}$
700	35.82 ± 10.4^{a}	46.82 ± 0.04^{a}	89.87 ± 0.13^{b}

Values are triplicate of the analysis and are represented as mean±SD. Superscript in the same row with different letters are significantly ($p<0.05$) different to each other.

Table 3: Reducing power potentials of the samples and Ascorbic acid Std

Concentration (µg/ml)	Sample A	Sample B	Ascorbic acid Std
300	1.56 ± 0.05^{a}	0.76 ± 0.01^{a}	3.91 ± 0.03^{b}
500	0.57 ± 001^{a}	4.12 ± 0.02^{b}	6.81 ± 0.01^{b}
700	2.74 ± 0.01^{a}	7.82 ± 0.01^{b}	12.50 ± 0.33^{c}

Values are triplicate of the analysis and are represented as mean±SD. Superscript in the same row with different letters are significantly ($p<0.05$) different to each other.

Table 4: Hydrogen peroxide Scavenging of the sample and Ascorbic acid Std

Concentration (µg/ml)	Sample A	Sample B	Ascorbic acid Std
300	62.23 ± 0.03^{a}	67.10 ± 0.09^{a}	41.73 ± 0.32^{b}
500	67.12 ± 003^{a}	72.30 ± 0.00^{a}	42.41 ± 0.05^{b}
700	72 ± 0.02^{a}	80.04 ± 0.03^{a}	50.31 ± 0.19^{b}

Values are triplicate of the analysis and are represented as mean±SD. Superscript in the same row with different letters are significantly ($p<0.05$) different to each other.

Hydrogen peroxide scavenging potential of sample A and Sample B at different concentration significantly increased when compared with Ascorbic acid standard.

DISCUSSION

The antioxidative effect of two garden egg cultivars (sample A; *Solarium aethiopicum F* and sample B; *Solanum melongena F)* were properly investigated The flavanoid, phenol, Ascorbic acid and beta Carotene content of two garden egg cultivars (sample A and sample B) were represented in table 1. Flavonoid, phenol, ascorbic acid and beta-carotene content of sample A significantly ($p<0.05$) reduced compared with (sample B). Sample B has highest concentration of flavonoid 19.66 ± 10.7%. In phenol, sample B has the highest yield of 1.30 ± 0.69%, while sample

A phenol content was 0.61 ± 0.18%. In ascorbic acid, sample B has the highest yield of 72.97 ±1.4%, while sample A with ascorbic acid content of 55.39 ± 0.47%. In beta - carotene, sample B has the highest concentration of 5.38 ± 0.46%, while sample A with beta- carotene of 3.74 ± 0.20%. It is well known that plant phenolic are highly effective free radical scavengers and antioxidants, and antioxidant activity of vegetables and fruits are derived from phenol, flavonoid, ascorbic acid and beta - carotene compound (Bravo, 1998)

SCAVENGING ASSAYS

Hydroxyl radical potential of sample A, sample B and ascorbic acid standard increases with increase in different concentrations (300 - 700ųg/ml). The standard yield is the highest, followed by sample B and the lowest sample A. so sample B is more involved in scavenging of hydroxyl radical than sample A.

Reducing Power

The antioxidant activity has been reported to be concomitant with reducing power (Lee *et al*., 2003). In the assay, the presence of reductants in the anti-oxidant sample of garden egg causes the reduction of the Fe^{3+}/Ferricyanide complex to the Fe^{2+}/Ferrous form (Gulcin, 2006).

The Reducing power potential of the samples increases with an increase in concentration (300ug/mg - 700ug/ml). sample B has high reducing power compared to sample A.

Hydrogen peroxide scavenging activity.

The Hydrogen peroxide scavenging potential of the samples slightly increases with an increase in concentrations of the extract (300ug/ml — 700ug/ml). Where sample B has the highest scavenging ability, followed by sample A and ascorbic acid standard being the lowest. The presence of these bioactives (flavonoid, phenol, ascorbic acid and beta- carotene) that were determined in garden egg, showed an inhibition of cancinogenous molecules which causes aging in living tissues.

CONCLUSION AND RECOMMENDATION

The results obtained in this research have considerable values with respect to the antioxidant activities of the cultivars. The presence of the bioactive such as phenol, flavanoid, beta carotene and ascorbic acid proved the antioxidant properties of garden egg. Sample A; *Solarium aethiopicum F* is low in antioxidant when compared with Sample B; *Solanum melongena F*. the two samples can be utilized as an effective and safe antioxidant source and on a commercial basis for the development of drugs.

The research encourages the cultivation of different species of garden egg especially *Solanum melongena*.

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