ANTI-NUTIRENT COMPOSITIONS OF FOUR DIFFERENT 
CULTIVARS OF AUBERGINE

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ABSTRACT 
Aubergine or Eggplant or Garden egg is a vegetable commonly chewed as such and served as 
kolanut within the southeast part of Nigeria. Four cultivars of garden egg, namely Solanum anguivi 
- A, Solanum aethiopicum (gilo group) – B, Solanum macrocarpon -C, Solanum aethiopicum 
(kumba group) – D, were purchased from the Eke-ukwu market in Owerri, Nigeria and properly 
identified. The anti-nutrients phytate and tannins were determined by colorimetric methods while 
oxalate was determined by titration with potassium permanganate. The results showed that tannins 
ranged from 3.24mg/100g (sample D) to 12.18 (sample A); phytate: 12.76 – 28.26 (D – A); 
Oxalates: 16.53 – 40.96 (D– A). There were no significant differences (P≤ 0.05) among the anti-
utrients.

Keywords: Aubergine, Egg plant, cultivars, anti-nutrients, compositions
1. **INTRODUCTION**

Aubergine (*Solanum melongena*) also known as eggplant or garden egg is called guat a in Hausa, afufa or anara in Igbo and Igbagba in Yoruba parts of Nigeria. It belongs to the family of Solanaceae. The Eggplant is an annual herb that produces a large shaped berry varying in colour from dark purple to red with yellow, green or sometimes white stripes (Onimawo, 2002). This fruit is full of wonders; it can be eaten as fresh whole vegetable and also as salads or may even be used to prepare stews, soups and sauces or it could be eaten with yam or plantain. It turns out to be a very good source of dietary fibre, manganese, copper, vitamin B6, folate, magnesium and niacin (Sanchez-Mata *et al.*, 2010). Aubergine also contains phytochemical nutrients such as nasunin and chlorogenic acid which are antioxidants that protect neutral cell membranes and enhances the brain to function (Safowora, 1993). Garden egg supplements starch food in addition to being a good source of protein, minerals and vitamins but is low in fat and carbohydrate (Hui, 2006).

Eggplants have indigenous medicinal uses which range from weight reduction to treatment of several ailments including asthma, skin infection and constipation. They are very beneficial in control of hypertension and diabetes, and enhancement of antioxidant and anticancer activities in the body. Aubergine fruits consumed fresh and served to visitors as kola in homes (Tindal, 1965). There are about 1,500 species of genus *Solanum*. Eggplant leaves are vegetables that are useful in traditional medicine.

In spite of these uses, some anti-nutrient factors have been implicated in aubergine (Osagie and Eka, 1998). However, none of these factors have been quantified.

The aim of this study, therefore, is to determine the anti-nutrient contents of fruits of four different cultivars of the egg plant, namely, *Solanum anguivi*, *S. aethiopicum* (gilo group), *S. macrocarpon* and *S. aethiopicum* (kumba group).

2. **MATERIALS AND METHODS**

2.1 **Sample Procurement, Identification and preparation**

The fruits of the four cultivars of egg plant (*Solanum melongena*) (i) Solanum anguivi, (ii) *S. aethiopicum* (gilo group), (iii) *S. macrocarpon* and (iv) *S. aethiopicum* (kumba group) – were purchased from Eke-ukwu market in Owerri, Imo State, Nigeria and identified in the Department of Plant Science and Biotechnology of Imo State University, Owerri. The fruits were then sorted, trimmed, washed and allowed to drain dry. They were then sliced into 1cm thick with a sharp knife. The slices were then put in forced draughed oven and dried to constant weight and the moisture content determined. After the moisture content determination, the dry slices were then ground in a blender and stored for further analysis.

2.2 **Analysis of the Anti-Nutrients**

2.2.1 **Determination of Phytate Content.**

The bipyridine colorimetric method was used. A measured weight of the sample (5g) was mixed with 50mls of 0.2N HCl solution and shaken well. The mixture was allowed to stand at room temperature for 30 minutes. It was filtered to obtain the filtrate. An Aliquote of the filtrate (0.5ml) was mixed with 1ml of ferric solution (solution of ammonium iron II sulphate .12H₂O) in a test-tube and heated in a water bath for 30minutes. It was allowed to cool to room temperature. Then 2mls of bipyridine solution (solution of 2,2¹ – bipyridine + thioglycollic acid) was added to
it, mixed well and absorbance read in a spectrophotometer at 510nm. Meanwhile, a standard phytate solution (sodium phytate) was prepared and heated as described above. Its absorbance was also read at the same wavelength. The formula below was used to calculate the phytate content.

\[
\text{% phytate} = \frac{100 \times A_u \times C \times V_t}{W \times A_s \times 100 \times V_a}
\]

where \(W\) = volume of extract used, \(A_s\) = Absorbance of the standard solution, \(C\) = concentration of the standard solution \(V_t\) = total volume of extract, \(V_a\) = volume of extract used, Absorbance of extract.

**2.2.2 Determination of tannin content.**

Tannins were determined colorimetrically using the method described by Kirk and Sawyer (1998). Five grammes of the sample were dispersed in 50mls of distilled water and allowed to stand for 30 minutes with mixing every 10 minutes. At the end of the 30 minutes it was centrifuged and the extract (supernatant) gotten. An aliquote (2mls) of the extract was mixed with 1ml of Folin-Denis reagent followed by 2.5mls saturated \(\text{Na}_2\text{CO}_3\) solution. It was allowed to incubate for 90 minutes at room temperature before making up to 50mls with distilled water. Meanwhile, standard tannic acid solution was prepared and 1ml of it treated with Folin-Denis reagent described for the sample. The absorbance of both of the sample and standard were read in a spectrophotometer at a wavelength of 620nm. The formula below was used to calculate the tannin content.

\[
\text{% Tannin} = \frac{100 \times A_n \times C \times V_t}{W \times A_s \times 100 \times V_a}
\]

where \(W\) = weight of sample, \(A_n\) = absorbance of sample, \(A_s\) = absorbance of standard solution (mg/ml); \(V_a\) = volume of extract analysed, \(V_t\) = total volume of extract

**2.2.3 Determination of Oxalate Content.**

The method of Ukpabi and Ejidoh (1989) was used. The procedure involved weighing two grammes of the sample and putting into a clean beaker; \(5\text{N} \text{H}_2\text{SO}_4\) was added into the beaker and filtration carried out to obtain 25ml clear liquor aliquot. Titration was done with potassium permanganate (\(\text{KMnO}_4\)) to get a clear pink colouration that lasted for 1min. the calcium oxalate content (mg/100g) of the sample was calculated as:

\[
\text{Oxalate} = \frac{T \times V_{\text{me}} \times D_f \times 10^5 \times ME \times M_s}{\text{ME} \times M_s}
\]

where \(T\) = titre of \(\text{KMnO}_4\) (ml)
\(V_{\text{me}}\) = Volume: mass equivalent (i.e 1cm\(^3\) of \(0.05\text{M} \\text{KMnO}_4\)
\(\text{solution} = 0.00225\text{g anhydrous oxalic acid}\)
\(D_f\) = Dilution factor
\(\text{ME}\) = Molar equivalent of \(\text{KMnO}_4\) in oxalate
\(M_s\) = Mass of sample
3. RESULTS AND DISCUSSION
The anti-nutrient compositions are presented in Table 1.

Table 1: Anti-nutrient Composition of the four eggplant cultivars (mg/100g)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tannins</td>
<td>12.18±1.25a</td>
<td>8.34±0.29a</td>
<td>4.90±0.57a</td>
<td>3.24±0.93a</td>
</tr>
<tr>
<td>Phytate</td>
<td>28.26±1.83a</td>
<td>23.38±0.61a</td>
<td>19.35±0.39ab</td>
<td>12.76±2.04b</td>
</tr>
<tr>
<td>Oxalate</td>
<td>40.96±2.6a</td>
<td>36.26±1.4a</td>
<td>28.35±0.39b</td>
<td>16.53±3.50c</td>
</tr>
<tr>
<td>LSD</td>
<td>10.14</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Key: Sample A = Solanum anguivi  
B = S. aethiopicum (Gilo group)  
C = S. macrocarpon  
D = S. aethiopicum (Kumba group)

Values with different superscripts along the same row are significantly different from each other (P ≤ 0.05).

The anti-nutrient (tannins, phytate and oxalates) contents of the four cultivars of eggplant presented in Table 1 showed that S. anguivi and S. aethiopicum (Kumba group) had the highest and the least values respectively for the three anti-nutrient contents with values 12.18±1.25 (mg/100g) and 3.24±0.9 for tannins, 28.26±1.83% and 12.76±2.04 for phytate, and 40.96±2.6 and 16.35±3.50 (mg/100g) for oxalate. There were no significant differences (p≤0.05) in tannin content among the four cultivars of garden egg. However in phytate content, significant difference occurs (P< 0.05) only between S. aethiopicum (kumba group) and the other three. In oxalate content, significant differences also occurred (P≤ 0.05) between S. aethiopicum (kumba group) and the other three cultivars which did not differ significantly among themselves.

Tannins are known to be bitter and form high polyphenol complex with protein thereby making it unavailable in diet. Tannin may decrease protein availability by decreasing digestibility and palatability, it can also inhibit the activities of digestive enzymes, these complexes are insoluble and protein digestibility is decreased (Carnovale et.al 1991, Bello et.al 2008).

Oxalates are regarded as undesirable constituents of diets, reducing assimilation of calcium but favouring the formation of renal calcium (Faboya, 1990). The presence of phytic acid in food leads to the inhibition of some minerals such as calcium and magnesium (Kochhar, 1981). Phytate can also affect digestibility by binding the substrates of proteolytic enzymes (Oguntona, 1998). These phytochemicals act as analgesic, anti-inflammatory, anti-hypertensive and anti-microbial agents; they also exhibit cytotoxic effects and growth inhibitions making them suitable as tumor inhibition agents (Akindahunsi and Salawu, 2005; Asi and Hossein, 2008).
4. **RECOMMENDATIONS**

Further research is recommended in the area of nutrient compositions (proximate and micronutrient) of the different cultivars of aubergine (*Solanum melongena*).

5. **CONCLUSION**

From the findings in this study, the *Solanum anguivi* cultivar of aubergine has the highest content of the three anti-nutrients (tannins, phytate and oxalate) while the S. aethiopicum (kumba group) has the least indicating that it is the safest of the four as far as consumption is concerned.

**REFERENCES**


