Nutritional Potential of the Leaves and Seeds of Black Nightshade-
Solanum nigrum L. Var virginicum from Afikpo-Nigeria

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Abstract: The nutritional potential of the leaves and seeds of Solanum nigrum L. Var virginicum was assessed by determining proximate and phytochemical composition. Results indicate protein content of the leaves and seed as 24.90% and 17.63% respectively. Other findings are ash 10.18% and 8.05%, crude fibre, 6.81% and 6.29 and carbohydrate, 53.51 and 55.89% for the leaves and seed respectively. Mineral analysis revealed the order Mg>K>Ca>Fe>Na>Mn>Zn in the leaves and Mg>Ca>Fe>Na>Mn in the seeds. Phosphorus and sulphur levels were 75.22 and 8.55 mg/100g in the leaves and 62.50 and 14.48, g/100g in the seeds. Vitamin content indicate the order vit C>vit B1>vit B2>Folic acid>vit E>vit A in both the leaves and seeds. Phytochemical analysis revealed high oxalate, phenol but low sterol content in the studied plant materials. Cyanide levels were higher in the leaves compared to the seeds. These results suggest that S. nigrum L. Var virginicum to be nutritive despite the presence of some anti-nutritive components like oxalate.

Key words: Solanum nigrum, proximate and photochemical composition

Introduction
Traditional societies have always exploited edible wild plants to provide adequate nutrition, food security and income generation (Omoti and Okyi, 1987; Antia et al., 2006; Dhillon et al., 2006a). These wild plants serve as an indispensable constituent of human diet supplying the body with minerals, vitamins and certain hormone precursors, in addition to protein and energy (Onyenuga and Detuga, 1985; Fleuret, 1979; Edmonds and Chewaya, 1997). However, many of these inexpensive nutritive wild plants are yet to be adequately studied and utilized. Among these leafy vegetables are the leaves and seed (fruits) of Black nightshade.

Black nightshade (Solanum nigrum L. Var virginicum) is an annual herbaceous plant (and may sometimes be perennial) which can reach up to 100cm in height. The stem may be smooth or bear small hairs (trichomes). The flowers usually white in colour, have five regular parts and are up to 0.8cm wide. The leaves are alternate and some what ovate with irregularly toothed wavy margin and can reach 10cm in length and 5cm in width. The fruit is a round fleshy berry up to 2cm in diameter and yellowish when ripe. The seeds are brown and numerous. It is a common species in arable lands, near rivers and old walls, grows everywhere in Africa and America (Edmonds and Chewaya, 1997).

Occasionally, the leaves and seeds (berries) are used as vegetable in soup, Yam and coco yam porridges and as spinach in some parts of Nigeria particularly among the Igbos and Efik-Ibio people of South-Eastern Nigeria. Besides being used for human consumption, the leaves serve as fodder and browse for domestic herbivorous animals.

According to (Perez et al., 1996) and (Son et al., 2003), the extract of its fruits have anti-tumour and neuropharmacological properties and can be used as an antioxidant and cancer chemo preventive matter. Though information on the pharmacological properties seems to abound in literature, there is little information on the chemical compositions of Solanum nigrum L. Var virginicum leaves and seeds. The present study therefore aimed at assisting in closing this gap in knowledge on Black nightshade leaves and seeds especially from the Eastern part of Nigeria. This information will highlight the usefulness or otherwise of this under-utilized plant.

Materials and Methods
The leaves and seeds (berries) of Solanum nigrum L. Var virginicum were obtained from Eke main market, Afikpo North Local Government Area, Ebonyi State, Nigeria and identified by a taxonomist in the Department of Plant Science and Bicotechnology, of Abia State University, Uturu. The leaves were cleaned destalked, weighed and oven dried at 60°C for 24hrs.

After drying, the leaves and seeds were ground separately into a fine powder using a mortar and pestle, sieved and stored in an air-tight contained, kept in a desiccators until analyzed.

Proximate composition, mineral elements and the vitamins (A, B, C, folic acid and E ) were determined by the method of (AOAC, 1984).

Moisture content determination involved drying a known weight of sample to a constant weight at 60°C in an oven (Gallen kamp hot box).

Determination of ash content involved incineration in a muffle furnace (Gallen kamp hot box) at 550°C for 8hrs. Crude fat determination involved Soxhlet extraction of a known weight of sample with petroleum ether (b, p 40-
leaves and seeds were analyzed separately, using atomic absorption spectrophotometer (Hitachi 26100 model) after acid digestion of the samples.

For the phytochemicals, Alkaloids, Saponins, Flavonoids Anthocyanin, and sterols were determined by the methods of (Harborne, 1973). Tannins, Phytic acid and Hydrogen cyanide were determined by alkaline titration methods (A.O.A.C, 1984) and total Polyphenol was determined by the method of (Swain, 1979). This method involves extraction of polyphenol with methanol at 80°C for one hour and then quantifying the bluish extract spectrophotometrically at 780nm. Total oxalate was determined by the permanganate titration method of (Dye, 1956).

### Results and Discussion

Proximate composition of leaves and seeds of *Solanum nigrum* L. Var *virginicum* is as presented in Table 1. Ash, fibre, crude protein and moisture contents were higher in the leaves compared to the seeds.

The ash content of the leaves (10.18%) is similar to the values reported for some commonly consumed leafy vegetable in Nigeria, including *Ocinum gratissimum*, *Hibiscus esculenta* and *Ipomea batata*. It is however, lower than the reported value of 20.05% for *Talinum triangulare* (Akindahunsi and Salawu, 2005; Antia et al., 2006). Ash content of the seeds obtained in the present study is 8.05%. This value compares favourably with a reported value of 7.18% for *S. nigrum* from Congo Brazzavile (Dhellot et al., 2006b).

The lipid content observed for *S. nigrum* leaves is similar to those reported for *Calchorus africana*, *Amaranthus hybridus* L. *triangulare* but about half the value for *Bacilla alba* leaves (Ifon and Basir, 1979; Akindahunsi and Salawu, 2005) lipid content of the seed of *S. nigrum* observed in this study is similar to that of a number of tropical plant seeds chrysophyllum albidum and *Dracarytes edulis* (Akubugwo and Ugbo, 2007), but much lower than the values for *Canarium schweinfurthii*, *Balanties ausgregica*.

Pulp and Cotton (Kapwae et al., 1997; Kapseu and Permantier, 1997; Kapseu et al., 1999; Dzondo et al., 2005). Therefore, *S. nigrum* seed contains moderate lipid content.

The fibre, carbohydrate and crude protein content of both the leaves and seeds of *S. nigrum* observed in this study are similar to reported values for a number of tropical plants (Afolabi et al., 1986; Dhellot, 2006 a, b).

Compared to the energy content value of 304.99Kcal for *Xanthosoma sagittiferum* and 355.19 kcal for colocosia esculenta leaves, (Davidson et al., 1975), *S. nigrum* is a good source of energy.

Mineral element analysis as shown in Table 2 indicates that *S. nigrum* contains high levels of magnesium and phosphorus but relatively low level of zinc. This study also indicates the vit C content to be high while vit A is
Table 3: Vitamin Composition of *Solanum nigrum* L. Var Vinigicum leaves and seeds

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>Composition (Mg-/100g) of Leaves</th>
<th>Composition (Mg-/100g) of Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>4.6±1.02</td>
<td>1.71±0.03</td>
</tr>
<tr>
<td>Vitamin B1</td>
<td>17.14±1.01</td>
<td>10.91±0.11</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>35.18±0.22</td>
<td>23.38±0.01</td>
</tr>
<tr>
<td>Folic acid</td>
<td>11.61±0.01</td>
<td>8.13±0.02</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>9.72±0.02</td>
<td>5.71±0.01</td>
</tr>
</tbody>
</table>

Values are mean ± S.D of triplicate determinations.

Table 4: Phytochemical Composition of *Solanum nigrum* L. Var. vinigicum leaves and seeds

<table>
<thead>
<tr>
<th>Phytochemicals</th>
<th>Composition (Mg-/100g) of Leaves</th>
<th>Composition (Mg-/100g) of Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>1.6±0.02</td>
<td>1.07±0.05</td>
</tr>
<tr>
<td>Saponins</td>
<td>0.25±0.01</td>
<td>0.16±0.01</td>
</tr>
<tr>
<td>Falconoids</td>
<td>0.81±0.01</td>
<td>1.01±0.01</td>
</tr>
<tr>
<td>Anthocyanins</td>
<td>0.13±0.01</td>
<td>0.08±0.01</td>
</tr>
<tr>
<td>Sterols</td>
<td>0.05±0.00</td>
<td>0.00±0.00</td>
</tr>
<tr>
<td>Tannins</td>
<td>0.19±0.01</td>
<td>0.00±0.00</td>
</tr>
<tr>
<td>Total Oxalate</td>
<td>78.6±0.04</td>
<td>58.8±0.01</td>
</tr>
<tr>
<td>Phytic acid</td>
<td>0.82±0.01</td>
<td>0.48±0.02</td>
</tr>
<tr>
<td>Total Polyphenol</td>
<td>13.17±0.02</td>
<td>14.89±0.01</td>
</tr>
<tr>
<td>Cynicide</td>
<td>10.6±0.02</td>
<td>1.53±0.02</td>
</tr>
</tbody>
</table>

Values are mean±S.D of triplicate determinations.

low. In deed, as shown in Table 3, the order of magnitude of the studied vitamins is vit C>vit B> Folic acid>vit E=vit A. Though the vitamins content of the samples are low, consumption of this plant material will contribute in meeting the daily vitamin requirement as stipulated for healthy adults (National Academy of Science, 2004).

Results of phytochemical evaluation are as presented in Table 4. The result indicates that oxalate levels were high in both leaves and seed of *S. nigrum*, and that sterols and tannins were below detectable levels in the seed. Apart from total phenols and flavonoids, the level of other studied phytochemical was higher in the leaves relative to the seed. The oxalate level is similar to that reported for *Telfaira occidentalis* and *Vanonia amygdalina* (Mc-Graw, 1987). Oxalate is an anti-nutrient. Consumption of *S. nigrum* may though elicit adverse physiological responses. However, initial processing such as cooking is known to significantly reduce total oxalate content of vegetables (Akwaowo et al., 2000). This may therefore mitigate the potent adverse effect of consuming the plant that Phytochemicals have potential beneficial effects such as polyphenols which reduce blood pressure while saponins may prevent cancer. (Richelle et al., 2001; Sharp, 1997).

Conclusion: This study showed that *S. nigrum* L. Var vinigicum leaf and seed from Ebonyi state, Nigeria contain appreciable levels of protein, fibre and carbohydrate. The study further revealed that it is a good source of magnesium phosphorus and the water soluble vitamins such as vit C, B and folic acid.

Though the leaves in particular contain relatively high levels of oxalate and cyanide, the processing methods prior to consumption which may include cooking reduce their final consumed amount. In summary therefore, the plant has high nutritional value and is recommended as a cheap source of plant protein, energy and mineral elements such as magnesium and phosphorus.

References


Akubugo et al.: Nutritive Value of S. nigrum Seed and Leaves