Photochemical investigation of *Abelmochus esculentus*

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ABSTRACT

Okra is an edible fruit but commonly known as a vegetable. It is available in most parts of the world generally throughout the year. Okra scientific name is ‘*Abelmochus esculentus*’ or *Hibiscus esculentus*. There are different varieties of this fruit in shapes, sizes and more importantly the taste. It is known by different local names in different countries. Since okra has very interesting nutritional properties and therefore attracted the researchers to explore more and more in a different fashions. In present study attention has been paid to investigate the nutrients which are essential for a healthy body. The flame absorption spectrophotometer has been used to investigate the nutrients such as Ca, Cr, Cu, Fe, Mg, Mn, Pb, and Zn. The amount of calcium was found highest as 4582.85 mg/kg, 1067.23 mg/kg and 1816.37 mg/kg in raw pod flesh, unripe seeds and ripe seeds respectively. Pb and Cr were not detected at all. K, N and P were also investigated where unripe seeds show the highest value of nitrogen as 4.32%.

Keywords: Okra, *Abelmochus esculentus*, Nutrients, AAS

1. INTRODUCTION

Okra is an edible green fruit but commonly known as a vegetable. Its scientific name is “*Abelmochus esculentus*” and also as “*Hibiscus esculentus*”. It is known by different local names such as Ladies Finger, Bhindi, okoro and others in different parts of the world. Different scientist have given different names on their own ideas of the family. The first part is the family name and the second part is the name of the species. Okra grows in a warm
climate. The seeds are planted directly in the ground. Most varieties will start yielding about 60 days after planting. The flowers are pale yellow and large. Each flower blooms for only one day and eventually forms one okra pod. The plant size is the maximum of 10 feet.

The length depends on the variety. Okra commonly used both as food and also as salad and curative properties showing low calories, and fibre contains bioactive compounds such as carotene, folic acid, riboflavin, niacin, thiamin, oxalic acid, vitamin c and amino acids [1].

The seeds of okra have a lower content of calcium, magnesium and potassium in comparison to leaves as reported [2]. The superior fiber found in okra helps to stabilize blood sugar as it curbs the rate at which sugar is absorbed from the intestinal tract. Okra’s mucilage not only binds cholesterol but bile acid carrying toxins dumped into it by the filtering liver

Figure 1. Flowers of Okra (Abelmochus esculentus)

Figure 2. Okra Pod and plant

Irritating hairs are sometimes present on the leaves and stems and traces of alkaloid have been reported in leaves. Leaves and fruit have been used as a medicine for relieving
moisturize skin, prevent scurvy, induce seating, treating urinary disorders in many countries. Okra mucilage has been used as a plasma replacement and blood volume expander. Okra bark yields silky fibre which is used to make rope and making papers and cardboards. Okra leaves and seed cake are used as cattle feed.

The nutritional quality and potential health benefits of edible parts of okra is reported in the review papers [3,4]. Further a review on *Abelmoschus esculentus* by Identification and quantification of polyphenolic compounds from okra seeds and skins were reported [5,6]. A study on some physico-chemical properties of Turkey okra (*Hibiscus esculentus*) seeds [7] and nutrients, antinutrients, minerals and zinc bioavailability of okra was reported [8]. Functional properties of okra has been reported [9] and antioxidant properties [10,11]. Some physicochemical properties of okra gum has been reported [12]. Nutritional, antinutritional and phytochemical status of okra leave’s (*Abelmoschus esculentus*) subjected to different processes where significant amount of calcium, magnesium and potassium were found as given below [13].

<table>
<thead>
<tr>
<th>Parameters evaluated</th>
<th>Lyophilized leaf</th>
<th>Fresh leaf</th>
<th>Bleached leaf</th>
<th>Cooked leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture (%)</td>
<td>9.13±0.19&lt;sup&gt;a&lt;/sup&gt;</td>
<td>74.83±1.17&lt;sup&gt;b&lt;/sup&gt;</td>
<td>73.31±0.38&lt;sup&gt;b&lt;/sup&gt;</td>
<td>81.53±0.11&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Lipids (%)</td>
<td>2.00 ±0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.93±0.19&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.00±0.16&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.07±0.18&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>23.62±0.23&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.10±0.61&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.22±0.23&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.06±0.39&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ashes (%)</td>
<td>15.39±0.08&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.75±0.44&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.84±0.84&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.49±0.40&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Calcium (mg/100 g)</td>
<td>691±0.22&lt;sup&gt;a&lt;/sup&gt;</td>
<td>382.50±0.71&lt;sup&gt;b&lt;/sup&gt;</td>
<td>357±0.43&lt;sup&gt;c&lt;/sup&gt;</td>
<td>366.50±0.42&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Magnesium (mg/100 g)</td>
<td>438±0.84&lt;sup&gt;a&lt;/sup&gt;</td>
<td>232.50±0.31&lt;sup&gt;b&lt;/sup&gt;</td>
<td>237.50±0.18&lt;sup&gt;c&lt;/sup&gt;</td>
<td>138.50±0.66&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Potassium (mg/100 g)</td>
<td>670.50±0.55&lt;sup&gt;a&lt;/sup&gt;</td>
<td>167.50±0.68&lt;sup&gt;b&lt;/sup&gt;</td>
<td>110.5±0.86&lt;sup&gt;c&lt;/sup&gt;</td>
<td>63±0.91&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Means followed by different letters between columns indicate significant differences with an error probability of p ≤ 5%, according to the Tukey’s test.

The present study has been taken to investigate the concentration of different elements in raw pod flesh, unriped seeds and riped seeds of *Abelmoschus esculentus*.

2. EXPERIMENTAL

Samples of a green okra fruit and a fully matured dried okra were collected from the same plant. The flesh and the seeds were separated carefully using plastic knife from both samples. Small pieces were made of the pod flesh. A quantity of 5.0 g of each sample was kept in separate crucibles and then placed in the oven to get fully dried at a temperature of 100 °C. The timing required for flesh was required about 60 minutes and for fresh seeds about 40 minutes. The dried seeds just needed about 20 minutes. These samples were made in the powder form using mortar and pestle. 2.0 g of each sample was collected in different conical flasks and then added 50 ml of aqua regia in each conical flask. The samples needed to warm for 30 minutes on the hot plate on a mild temperature to get a clear fully dissolved sample.
Further deionized water was added in each conical flask to make a total volume of 100ml. These samples were now ready for records of absorption spectra.

In flame absorption spectroscopy a liquid sample is aspirated and mixed with combustible gases such as acetylene and air or acetylene and nitrous oxide. The mixture was ignited at a suitable temperature of 2300 °C.

The atoms of elements of interest in each sample were reduced to the atomic state which is required for such a study. Varian AA 240 series Atomic Absorption Spectrophotometer was used to record the spectra of these samples and a standard procedure was adopted to complete the experiment. Different compatible hallow cathode lamp of the same metal for which the investigation was desired was chosen and intensity was measured which is related to the concentration of the element present after other necessary settings.

3. OBSERVATION

Table 2. Concentration of different elements in Abelmochus esculentus in different parts

<table>
<thead>
<tr>
<th>SAMPLES</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ca (mg/kg)</td>
</tr>
<tr>
<td>Okra-Raw Pod flesh</td>
<td>8582.85</td>
</tr>
<tr>
<td>Unripped Okra Seed</td>
<td>1067.23</td>
</tr>
<tr>
<td>Riped Okra Seed</td>
<td>1816.37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAMPLES</th>
<th>Pb (mg/kg)</th>
<th>Zn (mg/kg)</th>
<th>K (%)</th>
<th>N (%)</th>
<th>P (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Okra-Raw Pod flesh</td>
<td>Nd</td>
<td>45.03</td>
<td>3.62</td>
<td>1.78</td>
<td>0.26</td>
</tr>
<tr>
<td>Unripped Okra Seed</td>
<td>Nd</td>
<td>96.93</td>
<td>2.34</td>
<td>4.32</td>
<td>0.87</td>
</tr>
<tr>
<td>Riped Okra Seed</td>
<td>Nd</td>
<td>77.85</td>
<td>3.56</td>
<td>2.53</td>
<td>0.58</td>
</tr>
</tbody>
</table>
**Figure 3.** Concentration of elements in raw pod, unriped seed and riped seed of *Abelmoschus esculentus*

**Figure 4.** Concentration of elements in raw pod, unriped seed and riped seed of *Abelmoschus esculentus*
4. RESULT AND DISCUSSION

A study for combined parts of Abelmochus esculentus has been done for the first time. The data show that the presence of calcium is very high in all the parts such as pod flesh, unripe seeds and ripe seeds and the highest is observed in the raw pod flesh as 8582.85 mg/Kg where as in one of the earlier study has been reported a very small amount. This variation may be due to number of factors. It is important to note that due to high concentration of calcium in okra can be used medically for a good health and strong bones in body. The other two parts as unripe and ripe seeds are also having a sufficient amount of calcium as 1067.23 mg/Kg and 1816.37 mg/Kg respectively. The next high amount is found of the magnesium having the quantities 334.68, 342.27 and 338.58 mg/Kg for raw pod flesh, unripe seeds and ripe seeds. Another interesting finding is about non absorbing lead in all parts of okra and thus okra has quality to use safely free from dangerous lead poisoning. In general the unripe seeds showing high quantity than the ripe seeds for most of the nutrients in okra.

5. CONCLUSION

Abelmochus esulentum has many nutrients specially a very high concentration of calcium for healthy and strong bones.

Acknowledgement

The preliminary samples preparations were done in the Department of Chemistry laboratory and the spectra were recorded at the Analytical Laboratory, LBI, Guyaco. The author is grateful to the staff of this lab.

References


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