Nutritional Composition of Aduwa Fruit (Balanites aegytiaca) from Semi-Arid Region, North-Western Nigeria

I.S. Sadiq; S.M. Dangoggo; L.G. Hassan; S.B Manga, I. Thompson and A.U. Itodo

Abstract—The pulp, seed and coat of Balanites aegytiaca were analyzed and the proximate analysis and mineral compositio evaluated. The pulp contained 0.513±0.03g/100g moisture content, 2.04±0.05g/100g crude protein, 0.52±0.07g/100g crude lipid and below detection limit for crude fiber, 7.40 ±0.17g/100g ash content, 90.0±0.18g/100g available carbohydrate and 340.2±9.70kj/100g calorific value. These parameters were also analyzed for the seed and coat respectively. Mineral composition and Vitamin C content for the samples were investigated. Results compare well with those of other edible fruits. The values of potassium is obviously high as compare to the daily required intake.

Index Terms—Aduwa, Balanites aegytiaca, Fruits, Nigeria, Nutritional Composition

I. INTRODUCTION

Fruits constitute an important part of a balanced diet as they are natural source of food nutrients namely protein, carbohydrate, minerals and dietary fiber, needed by man and animals. With the global focus on increased food production and emphasis on provision of nutritive food for the worlds teeming population [12], it is very important to consider our locally available fruits and to determine their nutrient composition for the purpose of increasing the production of such fruits[2,3,4].

In Nigeria, Balanites aegytiaca belongs to the family Balanitaceae. The plant is a tree and is a native of Jordan brought into Africa. Has an height of about 1600m and grows in a sandy soil of semi-arid region. They are used as good fire wood and charcoal. The edible fruits are eaten by goats, camel and sheep. They are used as soap substitutes because of high saponin contents. The plant is thorny while the extracts of the fruits and bark are lethal to schistosomiasis and water fleas, (host for guinea worms) and contains sapogenins e.g diosgramin and Yamgenin [5]. This study investigates the nutritive potential of balanites aegytiaca (Aduwa as it is known in Hausa) commonly found in Sokoto, Zamfara, Kebbi and Kaduna state in the North-western Nigeria, by examining the proximate composition, mineral content of the pulp, seeds and coat also to determine the Ascorbic acid contents of the fruits.

II. MATERIALS AND METHODS

Balanites aegytiaca fruit (fresh and matured) were collected from Sokoto and Zamfara States of Nigeria. The fruits were identified as Balanites aegytiaca (locally called Aduwa in Hausa) in Botany department of Biological sciences, Usmanu Danfodiyo University, Sokoto. The fruits were further divided into 3 parts and labelled as sample: C for Coat, S for Seed and P for pulp.

The fruits were oven dried at 55°C for 24 hours. The dried sample were grounded into powder using pestle and mortar, then sieved through 20-mesh sieve. The powder (pulp, coat, and seed) were used further analyses except for the moisture content which was determined using the fresh fruits the methods of Association of Official Analytical Chemist [1,2]. Ash contents, crude lipid, crude fiber, nitrogen content and crude protein was also estimated by multiplying the value obtained for percentage nitrogen content by a factor of 6.35. To determine moisture content, 2g of fresh fruits were weighed in Petri dishes and dried in an oven at 105°C for 24 hours, cooled in a desiccator and then weighed. The percentage loss in weight was expressed as percentage moisture content [1]. Residual moisture content was determined on 2g of the seed, pulp and coat. Ash content was determined by the incineration of two grams of each powder sample in a muffle furnace (Lenton furnaces, England) at 600°C for 2 hours and the residual weight expressed as percentage ash content.

Available carbohydrate was estimated as difference by subtracting the total sum of percent crude protein, crude lipid, crude protein, crude fibre and ash content from 100% dry weight of each sample [1]. The energy value was determined using formula below;

\[ \text{Energy} = (g \text{ protein} \times 2.44) + (g \text{ lipid} \times \text{carbohydrate} \times 8.37 \times 3.57) \]

All analyses were carried out in triplicates and reported as mean ± standard deviation on dry weight (DW).

Mineral analysis was carried out after wet digestion of two grams of each powder sample (coat, seed, pulp) with nitric/perchloric/sulphric acid in the ratio (9:2:1) mixture, while phosphorus was determined colorimetrically with a Jenway 6100 spectrophotometer using phosphorus vanadomolybdate method [8]. Calcium and Magnesium was
determined by EDTA methods [8]. Sodium and potassium was analysed with a Corning 400 Flame photometer.

Vitamin C was determined by dissolving 3g of each sample in 2cm³ of 10% glacial acetic acid and blended for 10minutes and filtered. The residue was further washed with 5cm³ portion of 10% glacial acetic acid. 60cm³ of 0.3m H₂SO₄ was added and followed by the addition of 2g solid potassium iodide and 25cm³ of 0.01m potassium iodate with 25cm³ of the filterate was titrated with 0.07M sodium Thiosulphate solution [9].

II. RESULTS AND DISCUSSION.

The result of the proximate composition of the pulp, seed and coat of *Balanites aegytiaca* are shown in Table 1.0. The moisture contents are relatively low and are compared with edible fruits reported for *Chrysophyllum albiumdum* pulp/seed (18.3-25g %) [13]. The crude protein content are correspondingly low and are comparable with values of pulp of *Dialium guineense* (52.9g/kg [6] and seed of *Deterium microcarpum* (7.2a±0.14g/100g) [11]. The crude lipid for the pulp and coat is low but the seed has value (28.17±1.04g/100g) which is within the range of values of edible seed as reported for wild plant (10.00±0.61-12.91±0.07g/100g)]11]. The ash content which is an index of mineral content in most edible fruits, is higher in the pulp (7.46±0.17g/100g) while the seed and coat values ranged between (4.10±0.10 and 2.0±0.00g/100g) which is within the range of values of edible fruits, *dialium guineense* (20g/kg), [6]. The available carbohydrate is very high (63.4±1.19 and 28.17±1.04g/100g) which is within the range of values of edible fruits reported for wild plant (25.00±0.13-66.01±0.31g/100g) [11,12]. The Vitamin C content ranged between 0.19±0.08 to 1.32±1.01mg/100ml and the calorific value ranged between 340.0±9.70 to 529.5±66.2 kj/100g.

Table 1 :Proximate composition of *Balanites Aegytiaca*

<table>
<thead>
<tr>
<th>Parameter g/100g</th>
<th>Pulp</th>
<th>Seed</th>
<th>Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture content</td>
<td>0.51±0.03</td>
<td>2.03±0.06</td>
<td>11.4±0.05</td>
</tr>
<tr>
<td>Crude protein</td>
<td>2.04±0.05a</td>
<td>2.66±0.05b</td>
<td>1.4±0.1b</td>
</tr>
<tr>
<td>Crude lipid</td>
<td>0.52±0.07a</td>
<td>28.17±1.04b</td>
<td>1.9±0.00a</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>ND</td>
<td>1.50±0.00c</td>
<td>1.50±0.00c</td>
</tr>
<tr>
<td>Ash content</td>
<td>7.40±0.17a</td>
<td>4.10±0.10a</td>
<td>2.0±0.00a</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>90.0±0.18a</td>
<td>63.4±1.19a</td>
<td>93.13±0.17a</td>
</tr>
<tr>
<td>Energy kj/100g</td>
<td>360.8±8.82a</td>
<td>529.5±66.2c</td>
<td>340.0±9.70b</td>
</tr>
<tr>
<td>Vitamin C mg/100g</td>
<td>1.26±0.12a</td>
<td>1.32±1.01b</td>
<td>0.19±0.08c</td>
</tr>
</tbody>
</table>

Table 2 : Some Elemental composition of *Balanites Aegytiaca*

<table>
<thead>
<tr>
<th>Element (mg/l)</th>
<th>Pulp</th>
<th>Seed</th>
<th>Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>88.9±3.00a</td>
<td>77.23±1.91b</td>
<td>72.9±1.90b</td>
</tr>
<tr>
<td>K</td>
<td>10.267±402a</td>
<td>8.400±352a</td>
<td>2.000±100f</td>
</tr>
<tr>
<td>Ca</td>
<td>54.67±2.52c</td>
<td>54.67±2.52c</td>
<td>80.0±1.00f</td>
</tr>
<tr>
<td>Mg</td>
<td>85.00±4.00a</td>
<td>9.36±0.55a</td>
<td>64.16±1.44a</td>
</tr>
<tr>
<td>P</td>
<td>0.87±0.11a</td>
<td>8.23±0.28b</td>
<td>7.22±0.34a</td>
</tr>
</tbody>
</table>

The results showed that the pulp, seed and coat of *Balanites aegytiaca* is rich in Na, K, Cu, Mg and P since they are significantly different at P< 0.05.. but not sufficient to meet the diety requirement of humans except K (Table 2).
IV. CONCLUSION

Man’s quest for a balanced diet demands the search for local food materials that could be genetically mass produced to meet up with human nutritional needs. From the result of this analysis, it can be concluded that the fruit of the proximate and mineral composition of the seeds, pulp and coat indicates that they could be alternative source of human food and find immediate application in mixed animal feed. The pulp and seeds can also be a source of Vitamin C (ascorbic acid) which could prevent scurvy in both children and adult.

References


All Correspondence to;
I.S. Sadiq.
College of Science and Technology, Sokoto State Polytechnic,Sokoto
Email: shinasharon@yahoo.co.uk