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Proximate analysis and mineral characterization of *Barringtonia* species

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Abstract

The study about material contained in *Barringtonia* seeds were conducted for the first time using the standard procedure of AOAC. For present work, two species of *Barringtonia* were selected viz., *B. acutangula* and *B. racemosa,* which are distributed along the west coast of Maharashtra. The proximate composition and mineral constituents of *Barringtonia* seeds were evaluated. The *B. acutangula* seeds contained ash 4.24%, crude protein 9.23%, crude lipids 0.68%, crude fibre13.54% and carbohydrates 66.17%. While in seeds of *B. racemosa,* ash 4.02%, crude protein 12.09%, crude lipids 0.75%, crude fibre15.18% and carbohydrates: 64.67% were observed. Both the species have a high energy value on dry basis. Comparing the mineral content with recommended dietary allowances (RDA), the results indicated that seeds of *B. acutangula* fruits could be a good supplement for some nutrients such as calcium, fibre and carbohydrates, whereas the *B. racemosa* seeds could be a good supplement for some nutrients such as fibre, potassium, zinc and carbohydrates. The seeds of *Barringtonia* could be promoted as a carbohydrate supplement. Hence, this piece of work acclaims the potential of *Barringtonia* species indicating its proximate and mineral composition.

Keywords: *Barringtonia*, AOAC, carbohydrate, proximate and mineral composition

1. Introduction

Barringtonia acutangula (L.) Gaertn. and *B. racemosa* (Linn.) Blume belongs to family Barringtoniaceae. *B. acutangula* is a small to medium sized evergreen tree with simple, alternate leaves, long pendulous racemes, small, fragment, dark scarlet flowers, 2.5-3.7 cm long, quadrangular fruits. While *B. racemosa* is small to medium sized tree with bisexual flowers, axillary, pendulous raceme up to 70-100cm, fruit an ovoid-tetragonous drupe, seed also ovoid-tetragonous. In and around mangroves and plantations adjacent to coastal area, both the species grow naturally. Therefore, the species are commonly known as fresh water mangroves. The various plant parts of the species used as a folklore medicine for curing various diseases. But there are no nutritional reports on composition of fruits or seeds. Hence, the present investigation deals with evaluation and comparison of nutritional composition of *B. acutangula* and *B. racemosa.*

2. Materials and Methods

2.1 Plant collection:

Both the species of *Barringtonia* were collected from west coast of Maharashtra. Species confirmed by using Flora of Maharashtra. Seasonal fruits collections were done and seeds were collected.

2.2 Sample Preparation:

The material was air-dried and ground to a fine powder. Powder is stored in air-tight containers prior to further analysis.

2.3 Proximate analysis:

The moisture and ash content was assessed gravimetrically[1]. The crude fiber was calculated by acid-base digestion[1]. Crude protein was determined by Macro-Kjeldahl method[2]. Crude lipid content was determined gravimetrically following Soxhlet extraction with ether according to Official AOAC method[1]. The percentage of starch was also calculated by using AOAC method[1]. Available carbohydrate was estimated "by difference" using the formula, TCH (%) =100-%(CP+A+CF+M). The energy value were estimated by calculation method[1] using following formula, Energy value (g/100g) = [4 x crude protein] + [4 x carbohydrate] + [9 x crude fat].

2.4 Mineral Analysis:

Acid digestion was carried out[3]. The mineral elements like Cu, Zn, Fe, Ca, Mg, Mn etc. were analyzed by Atomic Absorption Spectrophotometer (AAS). After acid digestion, the solution is placed in AAS instrument where it is heated to vaporize and atomize the minerals. A beam of radiation is passed through the atomized sample, and the absorption of radiation is measured at specific wavelengths.

3. Result and Discussion

3.1 Proximate analysis

The results of proximate composition of seeds of *Barringtonia acutangula and B. racemosa* are shown in Table 1 and 2. The ash content, which is an index of mineral contents, for both the species observed was nearly same. Both the species showed high protein and low fat, which is more valuable. In seeds of *Barringtonia acutangula*, moisture content was found to be higher (6.14%) than the seeds of *B. racemosa* (3.29%). The total energy content was estimated to be 307.72 Kcal/100g and 313.79% Kcal/100g for the seeds of *B. acutangula* and *B. racemosa* respectively, which is an indication that it could be an important source of dietary calorie. Starch content also varies between two species. The seeds of *B. acutangula* possess 30.86% starch while seeds of *B. racemosa* are more starchy (41.23%).

Table 1: Proximate composition of fruits of *B. acutangula*

Sr. No.	Parameters	Concentration (% dry weight)
1.	Moisture	6.14
2.	Ash	4.24
3.	Crude protein	9.23
4.	Crude lipid	0.68
5.	Crude fibre	13.54
6.	Carbohydrate	66.17
7.	Energy value	307.72*
8.	Starch	30.86

*Unit: Kcal/100g

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Table 2: Proximate composition of *B. racemosa seeds*

Sr. No.	Parameters	Concentration (% dry weight)
1.	Moisture	3.29
2.	Ash	4.02
3.	Crude protein	12.09
4.	Crude lipid	0.75
5.	Crude fibre	15.18
6.	Carbohydrate	64.67
7.	Energy value	313.79*
8.	Starch	41.23

*Unit: Kcal/100g

High crude fibre in diet is known to enhance the digestibility and promote health benefits such as decreasing the blood cholesterol and reduce the risk of large bowel cancers[4,5]. The fibre RDA values for children, adults, pregnant and breast-feeding mothers are 19 –25%, 21 – 38%, 28% and 29% respectively. Both the species have adequate amount of fibre content. Thus, *Barringtonia* species could be a valuable source of dietary fibre. In *B. acutangula* seeds, crude protein content (9.23%) was less than seeds of *B. racemosa* crude protein content (12.09%). Plant food that provides more than 12% of their calorific value from protein is a good source of protein. In that context, *Barringtonia* species are a relatively good source of protein. The crude lipid content of both the species was less than the range.

The estimated carbohydrate content (66.17%) in *B. acutangula* was found to be higher than *B. racemosa* (64.67%). The calorific value of *B. acutangula* and *B. racemosa* seeds was estimated to be 307.72 kcal/100g (DW) and 313.79 kcal/100g (DW) respectively which is an indication that it could be an important source of dietary calorie. High calorific content of the seeds could be attributed to high carbohydrates content.

3.2 Mineral content

Tables 3 showed the results of the mineral concentrations in seeds of *Barringtonia* species. Nutritional significant of elements is compared with the standard recommended dietary allowance. When compared both the species, *B. racemosa* seeds showed less adequate level of Ca, Fe, Cu, Zn, Mg, and Mn. The seeds of *B. acutangula* could be a good source of Calcium as well as Iron. The highly soluble minerals like Calcium, Magnesium, Iron etc. help in the maintenance of acid-base balance of hydrogen ion concentration of the body tissues[6].

Table 3: Mineral composition of *Barringtonia species*

Sr. No.	Minerals	Available quantity (mg/100g DW) in seeds of *B. acutangula*	Available quantity (mg/100g DW) in seeds of *B. racemosa*
1.	Calcium	16.6	9.56
2.	Iron	40.26	15.46
3.	Copper	0.76	0.34
4.	Zinc	4.16	3.86
5.	Magnesium	8.18	6.04
6.	Manganese	1.66	1.26

Fig.1: Minerals in seeds of *B. acutangula*

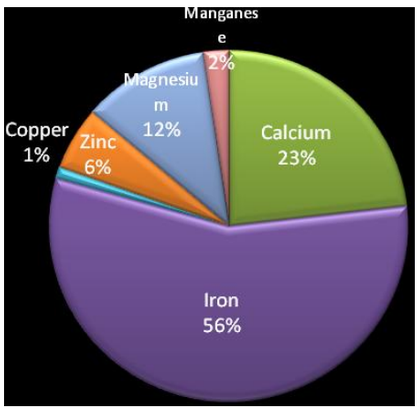
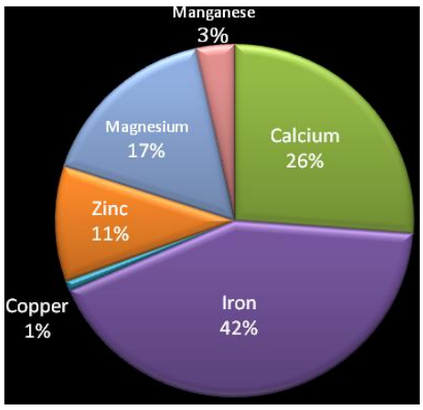


Fig. 2: Minerals in seeds of *B. racemosa*



4. Conclusion

The results of the nutritional analysis shown that *Barringtonia racemosa* seeds is good sources of plant calcium, carbohydrates where as seeds of *B. acutangula* are the good sources of plant fibre, potassium, Sodium, zinc, lipid and carbohydrates. The result suggests that the seeds, if consumed in sufficient amount could contribute greatly towards meeting the nutritional requirement for normal growth and adequate protection against diseases arising from malnutrition. Proximate analysis alone however, should not be the exclusive criteria for judging the nutritional significance of a plant parts. Thus, it becomes necessary to consider other aspects such as presence of antinutritional / toxicological factors and biological evaluation of nutrient content.

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