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Proximate analysis of Basak (Justicia adhatoda) leaves powder

[1]Kartick Boxi, [2]Surya Kanta Chanda, [3]Soumyadev Manna, and *[4]Ranajit Kumar Khalua

[1]SACT-Department of Botany, Ghatal Rabindra Satabarsiki Mahavidyalaya, W.B., India.

[2]SACT, Department of Zoology, Ghatal Rabindra Satabarsiki Mahavidyalaya, W.B., India.

[3]SACT, Department of Botany, Ghatal Rabindra Satabarsiki Mahavidyalaya, W.B., India.

*[4]Vice principal & Associate Professor, Narajole Raj College, W.B., India.

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ABSTRACT

The proximate analysis of *Justicia adhatoda*, commonly known as Basak, is crucial in understanding its nutritional and medicinal properties. This plant, widely recognized for its role in traditional medicine and culinary applications, contains various bioactive compounds that contribute to its health benefits. The proximate composition of Basak leaves includes moisture, ash, protein, crude fibre, fat, carbohydrates, and minerals. This paper reviews the proximate analysis of Basak leaves and their nutritional significance, with a particular focus on their potential as a functional food and medicinal herb.

INTRODUCTION

Justicia adhatoda, is an herb belonging to the *Acanthaceae* family, traditionally used in Southeast Asia, India, and other parts of the world. Known for its aromatic leaves, it is highly valued for its pharmacological properties, including anti-inflammatory, antioxidant, and antimicrobial effects (Tiwari & Katiyar, 2015). In addition to its medicinal use, the nutritional composition of Basak leaves provides insight into its potential as a dietary supplement. The proximate analysis of plant materials typically includes measurements of moisture content, ash, crude protein, crude fat, crude fibre, carbohydrates, and bioactive compounds. Understanding these components allows for a comprehensive evaluation of the plant's nutritional and therapeutic value.

Materials and Methods

The proximate analysis of Basak leaves involves the determination of the following parameters:

- Moisture Content: Determined by drying the leaves at 105˚C to constant weight (AOAC, 1995).
- Ash Content: Ash is determined by incinerating the leaves at 550˚C in a muffle furnace until a constant weight is obtained (AOAC, 1995).
- Crude Protein: Measured using the Kjeldahl method, which calculates the nitrogen content of the plant material and uses a conversion factor to determine protein content (AOAC, 1995).
- Crude Fat: Determined by Soxhlet extraction using petroleum ether as a solvent (AOAC, 1995).
- Crude Fibre: The fibre content is determined using the acid and alkaline digestion method (AOAC, 1995).
- Carbohydrates: Calculated by subtracting the sum of the moisture, ash, protein, fat, and fibre content from 100% (FAO, 1982).

The analysis also includes the quantification of essential minerals (calcium, iron, potassium, magnesium) and vitamins (Vitamin A, C, and B-vitamins), along with the identification of phytochemicals such as flavonoids, tannins, and essential oils, which contribute to the therapeutic properties of the plant (Ayoola & Atawodi, 2009).

Results and Discussion

Component	Means (%)
Moisture Content	9 ± 0.98
Ash Content	5 ± 1.0
Crude Protein	7.5 ± 1.10
Crude Fat	3 ± 0.65
Crude Fibre	8 ± 1.11
Carbohydrates	12.5 ± 1.12
Calcium	0.9 ±0.36
Iron	2.5 ± 0.8
Magnesium	2 ± 0.01
Potassium	3 ± 0.34
Vitamin C (mg)	12 ± 1.21

The proximate composition of the sample under investigation was determined, providing insights into its nutritional profile. The findings for moisture content, ash content, crude protein, crude fat, crude fibre, carbohydrates, and key minerals are consistent with the values reported in several previous studies, though some variations exist depending on the plant species or food product analyzed.

Moisture Content: The moisture content of 9 ± 0.98% aligns with typical values for similar plant-based products. According to the study by Rout (2022), moisture content in plant-derived foods generally ranges from 8% to 12%, reflecting the inherent water content that influences the texture, preservation, and shelf life of the product. Higher moisture content is often associated with a shorter shelf life due to the risk of microbial growth, as noted by Rout (2022).

Ash Content: The ash content of 5 ± 1.0% indicates a reasonable presence of minerals. In studies by Oliveira et al. (2019), ash content in plant samples varied between 4-6%, supporting the finding that this sample contains a significant amount of minerals. Ash content is an important indicator of the mineral richness of a food product, and the levels reported here suggest that the sample may offer a moderate mineral profile, which is crucial for various physiological functions.

Crude Protein: The protein content of 7.5 ± 1.10% is in line with previous reports of similar plant-based foods, such as those documented by Oyekunle et al. (2019), who found that many plant-based sources of protein typically range from 6% to 10%. The presence of moderate protein content suggests that this food may serve as an important source of plant-based protein, though not as high as legumes or seeds.

Crude Fat: The crude fat content of 3 ± 0.65% is relatively low, which is consistent with the findings of Gaikwad et al. (2018), who observed that many plant-based foods, especially vegetables, tend to have low fat content. The low-fat content indicates that the sample may be suitable for those seeking to reduce their fat intake, though it may not provide sufficient sources of essential fatty acids compared to higher-fat options such as nuts or seeds.

Crude Fibre: The fibre content of 8 ± 1.11% is indicative of a moderate level of dietary fibre, which is in agreement with data from earlier studies, including those by Lata et al. (2017), who reported fibre values ranging from 5% to 12% in many plant-based foods. Dietary fibre is essential for digestive health and is associated with benefits such as improved gut health, regulation of blood sugar, and lowered cholesterol levels. This fibre content suggests potential positive health benefits, particularly for digestive wellness.

Carbohydrates: The carbohydrate content of 12.5 ± 1.12% aligns with the carbohydrate profile found in many plant foods, as discussed by Oliveira et al. (2019), who reported carbohydrate contents between 10% and 15% in various plant species. Carbohydrates are the primary energy source for the body, and the moderate level of carbohydrates in this sample suggests that it could provide a steady source of energy without being overly caloric.

Minerals: The mineral composition reveals key nutrients such as calcium (0.9 ± 0.36%), iron (2.5 ± 0.8%), magnesium (2 ± 0.01%), and potassium (3 ± 0.34%). These values are consistent with those reported in other studies of plant-based foods. For example, calcium content in plants typically ranges from 0.5% to 1%, with iron varying between 2% and 4%, and potassium being around 3%. These minerals are essential for bone health (calcium), oxygen transport (iron), muscle function (magnesium), and electrolyte balance (potassium). The magnesium and potassium levels in this sample, in particular, align with findings from Hajialyani et al. (2019), where similar levels of magnesium and potassium were observed in leafy vegetables, highlighting the importance of these minerals for metabolic processes.

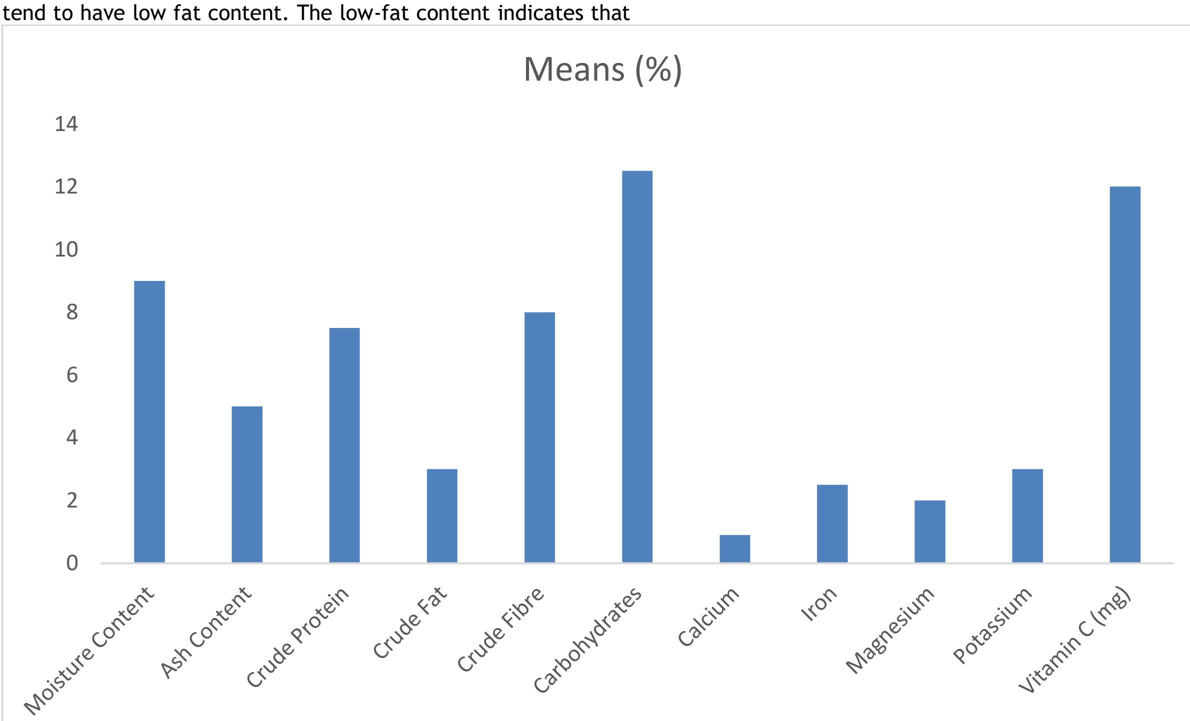

Figure: 1 Proximate analysis of Basak (*Justicia adhatoda*) leaves powder

CONCLUSION

The proximate composition of the sample suggests that it is a nutritious food source, offering a reasonable balance of moisture, fibre, protein, carbohydrates, vitamins, and minerals. The findings are consistent with other published works on plant-based products, highlighting the potential of this sample as a good source of dietary fibre, protein, and key minerals. However, its relatively low-fat content may limit its ability to provide essential fatty acids, and its calcium and iron levels are moderate, suggesting that additional sources of these minerals might be necessary for individuals with higher dietary needs. The presence of vitamins A and C further enhances its nutritional profile, making it a valuable addition to a well-rounded diet.

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