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A Study on the Nutritional Analysis of Petals of *Salmalia malabarica* (Semal)

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KEYWORDS

Salmalia malabarica, Nutritional Analysis, Petals Crude Powder

ABSTRACT:

Introduction: *Salmalia malabarica* is a spectacular flowering tree which is particularly used in traditional medicine particularly in Ayurveda for its therapeutic purposes. The petals of the plant contain good amount of micro and macronutrients

Objectives: The principal objective of the study was to examine the nutritional composition, including macronutrients and micronutrients, of the crude powder derived from the petals of *Salmalia malabarica*. .

Methods: The petals of the plant were plucked from the campus of Era University, Lucknow and were shade dried for a period of 6-7 days and then grounded into a fine powder. Proximate analysis was done by standard AOAC method. For macronutrient analysis the Moisture Content was done by Moisture Analyzer, Protein Content was done by Kjeldahl Method, Fat was done by Soxhlet Apparatus. For micronutrient analysis, the UV Spectrometer method was used for Iron and Phosphorus, the titration method for Calcium, and the gravimetric method for Magnesium estimation.

Results: The nutritional profiling of *Salmalia malabarica* petals revealed a Moisture content of 9.87 ± 0.36%, Protein 6.23 ± 0.36%, Fat 0.52 ± 0.30%, Crude Fiber 23.87 ± 3.04%, Ash 14.35 ± 0.34%, and Carbohydrate 69.03 ± 2.72%. Among the micronutrients, the petals contained Iron (94.81 ± 4.28 mg/kg), Calcium (537.66 ± 2.51 mg/kg), Magnesium (580.89 ± 3.21 mg/kg), and Phosphorus (348.66 ± 1.52 mg/kg). The findings confirm the petals' nutritional and therapeutic significance by showing that they are a rich source of fiber, carbohydrates and vital minerals.

Conclusions: *Salmalia malabarica* petals were shown to be a rich source of micronutrients, including Iron, Calcium, Magnesium, and Phosphorus, according to a nutritional analysis. In addition to highlighting the petals' potential use in functional foods and nutraceuticals to promote health and avoid nutrient deficiencies, these findings justify the petals' traditional use as food and medicine.

1. Introduction

Salmalia malabarica often known locally as Semal and Red Silk Cotton Tree, is a member of the *malvaceae* family. It has a good amount of macro and micronutrients, including phosphorus, calcium, iron, and magnesium. Scopoletin, Quercetin, Scopolin, Quinines, Beta amyron, Hentriacontanol, Amyrin, Quinines, Lyoniresinol 2-a-beta-D-glycopyranoside, Beta amyron, Esculetin, Scopoletin, Quercetin, Hentriacontanol, Chlorogenic acid, Lyoniresinol 2-a-beta-D-glycopyranoside, Fraxetin, Quinines, Blumenol C glucopyranoside, and Hentriacontanol are among the phytoconstituents that are present in good amounts. The plant can be found in Sumatra, India, Java, Malaysia, Northern Australia, Bangladesh, Myanmar and Sri Lanka (Rameshwar et al., 2014). The tree is known by a variety of names like Indian kapok tree, shalmali, Red

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Silk Cotton Tree, Semal, Shimul, Kondabruga, M Mullilavu in different languages. The tree is 40 meters in height and 6 meters in diameter. The petals of the plant contain important phytoconstituents like free β-sitosterol, traces of an essential oil, hentriacontanol, quercetin kaempferol, β-Dglucoside of β-sitosterol and hentriacontane (H and RK 1972). Cardiac glycosides, carbohydrates, flavonoids, Alkaloids, phenols, phlobatannins, proteins, tannins, terpenoids, saponins and quinones are also found in *Salmalia malabarica* flowers (Hait and Goswami., 2017). According to Rani et al. (2016), the flowers provide a number of health advantages, including blood cleansing, leucorrhea, analgesia, diuretics, and laxatives. Because of its nutritional and therapeutic qualities, the inhabitants of North Central Nigeria use this wild plant's edible flower parts as a vegetable and medicine (Barnabas et al., 2022). In Uttar Pradesh, the immature calyx, known as semargulla, is traditionally consumed as a vegetable. According to Panwar et al. (2020), the flowers of *Salmalia malabarica* contain 92.25 mg of calcium, 54.24 mg of magnesium, and 49.00 mg of phosphorus per 100 g.

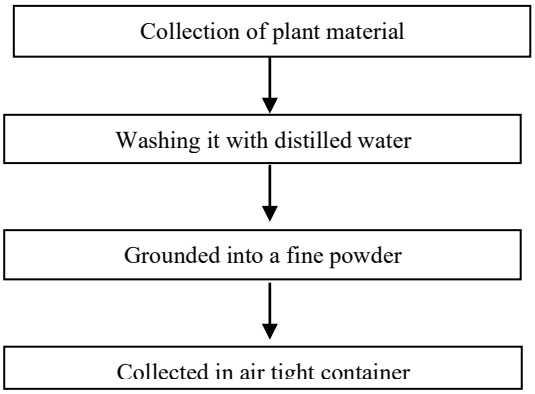
Petals of the plant possess important pharmacological activities like anti diabetic, anti oxidant and anti microbial properties (Nandan and Shukla, 2020). The flowers of the plant are acrid cooling, astringent to the bowels, dry, purify the blood, removes bile and phlegm, beneficial for leucorrhoea and the spleen. Because of its cooling and astringent properties, it is used to treat skin infections (Rani et al., 2016). Edible flowers are non-toxic, safe plant parts that are good for human health. Furthermore, edible flowers have been an important component of human diets for hundreds of years in many nations, and they are helpful to health as they contain bioactive components (Pensamiento-nino et al., 2024). Edible flowers have been utilized in cooking for a long time and are continuously evolving now. According to WHO (2009), almost 80% of people worldwide receive their primary medical treatment from herbal remedies. Edible flowers may be an excellent option for a variety of food products due to their high nutritional and biological features, as well as their flavor and aroma (Purohit et al., 2021).

2.Objectives

The Study aims to uncover the Nutritional Analysis of crude powder of petals of *Salmalia malabarica*.

3. Methods

Collection of plant material- The plant material was collected from the campus of Era University, Lucknow in the month of March-April. The petals were washed, shade dried for 6-7 days and grinded into a fine powder and then stored in air tight bottles.



Nutritional Analysis

Macronutrient estimation- For macronutrient estimation Moisture, Fat, Fiber, Ash and Protein was estimated by standard AOAC method (2005).

1. Determination of Moisture Content-

Procedure: A pre-weighed porcelain dish (W) was filled with 5.0 g of powdered root sample. For two hours, the dish containing the sample (W1) was cooked to 130°C in an oven. The sample was heated, allowed to cool in a desiccator, and then weighed again (W2) every 30 minutes until the weight remained constant.

$$\% \text{ Moisture Content} = 100 \times W1 - W(W_1 - W_2)$$

Where:

W_1= Weight of dish with sample before drying

W_2= Weight of dish with sample after drying to constant weight

W= Weight of empty dish

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2. Determination of Fat Content-

Procedure: Fat content was done by standard AOAC (2005) method. 3-5 g of powdered sample was placed in a Soxhlet extractor using petroleum ether as the solvent. The extraction continued for 14 hours at a heat rate of 150 drops/min. After extraction, the solvent was evaporated, and the residue was dried at 80-90°C until constant weight.

Calculation= % Fat Content= (W2−W1)×100/ Ws

Where: W_1 = Weight of empty flask

W_2 = Weight of flask with fat residue

Ws = Weight of the sample

3. Determination of Ash Content-

Procedure: 5.0 g of powdered root sample was placed in a pre-weighed crucible. The sample was heated gently over a Bunsen flame until smoke subsided, then transferred to a muffle furnace at 550°C for 6-8 hours until a gray ash residue was obtained. The crucible was cooled in a desiccator and reweighed.

Calculation: %Ash Content = $(W_1−W_2)×100/ Ws$

Where: W_1= Weight of crucible with sample
W_2= Weight of crucible with ash
Ws = Weight of the sample

4. Determination of Fiber Content-

Procedure: For 30 minutes, 2.0 g of the sample was heated in 200 cc of 1.25% sulfuric acid. Distilled water was used to filter and wash the residue. After another 30-minute boil in 200 milliliters of 1.25% sodium hydroxide, the residue was filtered and cleaned. After two hours of drying at 130°C in an oven, the residue was chilled in a desiccator and weighed (W1). After two hours of ashing at 550°C in a muffle furnace, it was cooled and weighed again (W_2).
% Crude Fiber = $(W_1−W_2)×100/ Ws$

5. Determination of Protein Content-

Procedure: Protein content was done by standard AOAC (2005) method. The Kjeldahl method was used to determine the nitrogen content. 20 ml of pure sulfuric acid and 5 g of Kjeldahl catalyst (K_2SO_4 and $CuSO_4$) were used to digest 1.0 g of the sample. After the digested sample was distilled, 0.2 N HCl was used to titrate the ammonia that was produced. The nitrogen content was multiplied by 6.25 to determine the protein content. **Calculation:** % Protein = (A−B)×N×14.007×6.25/ W

6. Determination of Carbohydrate Content-

The carbohydrate content was determined using the Arithmetic Difference Method

% Carbohydrate = 100 – (% Fat. + % Ash + % Fiber + % Protein)

Micronutrient estimation- For micronutrient estimation Iron, Calcium, Magnesium and Phosphorus was done by standard AOAC methods.

1.Determination of Iron Content

Procedure: The sample was ashed and dissolved in HNO_3. Iron content was determined using Atomic Absorption Spectrophotometry.

Calorific Value

The calorific value was calculated using the formula:

Calorific Value (kcal/100 g) = (%Protein×4)+(%Fat×9)+(%Carbohydrate×4)

2. Determination of Calcium Content-

Calcium was done by titration method. Calcium was precipitated as calcium oxalate. The precipitate was dissolved in hot diluted H2SO4 and titrated against standard potassium permanganate solution.

3.Determination of Magnesium Content-

Magnesium content was measured by the gravimetric method, which relied on the precipitation of magnesium as magnesium ammonium phosphate ($MgNH_4PO_4•6H_2O$) when the sample solution was treated with an ammonium phosphate solution. The principle was based on the fact that magnesium could form a stable, insoluble compound under specific conditions, which was then filtered, washed, dried, and weighed to determine the magnesium content in the sample. The mass of the resulting precipitate was directly related to the amount of magnesium in the sample. By measuring the mass of this precipitate, the magnesium concentration was calculated.

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4.Determination of Phosphorus Content-

Phosphorus content was done by UV Spectrometer Method. Phosphorus in the sample reacts with ammonium molybdate in the presence of concentrated sulfuric acid (H_2SO_4) to form a yellow crystalline precipitate of ammonium phosphomolybdate.

The absorbance of the yellow complex is measured using a UV spectrophotometer. According to the Beer–Lambert law: Concentration of sample is directly proportional to amount of light absorbed.

4. Result and Discussion

Salmalia malabarica petals crude powder were subjected to a triplicate proximate and micronutrient analysis using conventional AOAC (2005) procedures. With a mean of 9.87 ± 0.36% and a range of 9.52–10.24%, the moisture content indicated adequate stability for storage as dried powder. The petals offer a moderate amount of plant protein, as seen by the protein level of 6.23 ± 0.36%. The plant's appropriateness for low-fat diets was confirmed by its extremely low fat content (0.52 ± 0.30%). The comparatively high fiber content (23.87 ± 3.04%) indicated possible advantages for bowel movement control, digestion, and the avoidance of metabolic diseases. With an ash content of 5.61 ± 0.34%, there was a noticeable presence of minerals. The predominant macronutrient (75.46 ± 2.72%) was carbohydrate content, suggesting that petals can serve as a source of energy.

The average micronutrient content was 94.81 ± 4.28 mg/kg for Iron, and 502.33 ± 2.51 mg/kg for Calcium and 503.67 ± 3.21 mg/kg for Magnesium. The amount of phosphorus was 354.67 ± 1.52 mg/kg. Based on the macronutrient composition, the calorific value showed that the flowers can supply moderate amounts of energy, primarily from carbohydrates. The findings demonstrate that the petals of *Salmalia malabarica* are nutrient-rich and have potential as a functional food ingredient.

5.Conclusion

Salmalia malabarica petals are a good source of macronutrients and micronutrients, according to a nutritional analysis. The petals may be used as a nutritional supplement to preserve health and avoid nutrient shortages because they are very high in carbohydrates, crude fiber, and vital minerals like calcium, magnesium, iron, and phosphorus. Their moderate protein level and low fat content emphasize their appropriateness for inclusion in diets that are balanced. These results highlight the potential use of *Salmalia malabarica* in the creation of functional foods, nutraceuticals, and medicinal formulations targeted at enhancing nutritional security and fostering well-being, in addition to validating the plant's traditional use in food and medicine.

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