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# Proximate and sensory analysis of cooked Red Rice (*Raktashali)* at room temperature

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## Abstract

The study aimed to develop and standardize a wholesome and traditional Indian preparation using red rice (*Raktashali*), focusing on its proximate and sensory analysis at room temperature. The objective was to create a nutritious and innovative food product rooted in Ayurvedic literature (*Bhojankutuhalam*). The recipe was developed using Indrayani red rice and water, followed by sensory evaluation conducted by a panel of 10 semi-trained judges using a 10-point hedonic scale. The results revealed excellent acceptability in terms of aroma, taste, and overall appeal, while mouthfeel and appearance were rated as fair. The product demonstrated good cooking characteristics, though *Raktashali* showed less cooking time, higher solid loss in gruel, and a lower elongation ratio. In comparison, Indrayani red rice yielded a medium grain size and favorable appearance. Overall, the study concludes that a therapeutic and palatable red rice product can be successfully developed and accepted at room temperature, offering a promising nutritional option based on ancient Indian dietary practices.

## 1. Introduction

Rice (Oryza sativa L.) is a staple food for a large part of the global population, especially in Asia.[1] While it primarily serves as a source of carbohydrates, it also provides essential nutrients like protein, fats, B vitamins, and minerals.[1] In recent years, there's been increasing interest in pigmented rice varieties, including red rice, due to their potential health benefits arising from bioactive compounds.[1] These compounds, such as phenolic acids, anthocyanins, and proanthocyanidins, are known for their antioxidant, antidiabetic, and anti-inflammatory properties.[1]

Red rice is characterized by its reddish color, which comes from anthocyanin pigments in its bran layer. Red rice is often consumed unpolished or partially polished, allowing it to retain its nutrient-rich bran which contributes to a higher nutritional value

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compared to white rice. Red rice is also known to be a good source of antioxidants and magnesium. It may help in controlling diabetes by regulating insulin levels and offers pulmonary benefits. Additionally, red rice is a great source of fiber, aiding in digestive functions and potentially fighting against asthma. It is also considered good for bone health, promotes weight loss, and may reduce the risk of cardiovascular diseases.

### 1.1 Ayurvedic Perspective on Red Rice

*Ayurveda*, an ancient Indian healing science, defines its principles based on the understanding of '*Ayus'* (life or longevity) and '*Veda'* (knowledge), thus translating to the 'Knowledge of longevity' or 'Knowledge of life'. This healing science, rooted in keen observations of Indian intellectual visionaries, focuses on maintaining health, promoting a healthy lifestyle, and treating diseases

In Ayurvedic philosophy, the entire universe, including the human body, is composed of five basic elements: *Vayu* (Air), *Jala* (Water), *Aakash* (Space or ether), *Prithvi* (Earth), and *Teja* (Fire). These five elements, known as *Pancha Mahabhuta*, combine in different proportions to form the three fundamental humors of the human body: *Vata*, *Pitta*, and *Kapha*.

Among various types of rice, *Ayurveda* highly praises red rice, particularly the *Raktashali* variety. Ancient texts like *Charaka Samhita* consider *Raktashali* as the best among the *Shali* (rice) varieties.[2] *Raktashali* is believed to balance the three *doshas* (*Vata*, *Pitta*, and *Kapha*) and is attributed with several medicinal properties. It is said to aid in blood cell production, improve circulation, and benefit conditions like anemia and skin disorders.

General Ayurvedic properties of rice include a sweet taste (*Rasa*), cooling potency (*Virya*), and a sweet post-digestive effect (*Vipaka*). Rice is considered unctuous, nourishing, and strength-promoting, with red rice being light to digest compared to white polished rice [3]. In terms of its effect on doshas (Dosha Karma), rice generally balances Vata and Pitta but can increase Kapha, although old rice (matured for a year after harvest) is less likely to do so. Raktashali, specifically, is also described as slightly sweet and astringent in taste, easy to digest, and capable of increasing appetite, reducing inflammation, improving the digestive system, vision, and voice [2].

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This research focuses on the proximate and sensory analysis of Red Rice (Raktashali) at room temperature to further understand its nutritional and sensory attributes in the context of both modern science and traditional Ayurvedic knowledge.

## 2. Aim

The aim of the study was to analyze the proximate and sensory attributes of Red Rice (*Raktashali*) at room temperature to further understand its nutritional and sensory characteristics within the frameworks of both modern science and traditional *Ayurvedic* knowledge.

## 3. Objectives

The objectives of this study were-

- To prepare the food product *Raktashali* as described in classical *Ayurvedic* literature.
- To conduct sensory evaluation using a structured hedonic scale.
- To carry out proximate analysis including carbohydrates, proteins, fats, starch, and crude fibre.
- To study the properties of ingredients used in the product as per *Ayurveda* and Modern Nutrition Science.
- To conduct the products trials in order to ensure its wide public acceptability.
- To analyze standardization of food product.

## 4. Materials & Methods

### 4.1 Materials

- Red Rice (*Raktashali*) – 250 g (procured from an authentic source)
- Water – 650 ml (added gradually during cooking)
- Cooking Apparatus – Heavy bottom vessel, stove

➢ **Property of Red Rice as per *Ayurveda***

The *Ayurvedic* treatise *Bhojanakutuhalam* highlights the therapeutic and nutritional superiority of the red rice variety known as *Raktashali*.

रक्तशालिस्तुमधुरोलघुः स्निग्धोबलावहः |

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रुचिकृद्दीपन: पथ्य: पित्तदाहानिलास्त्रजित||

[भोजनकुतूहलम् Ch-1 Pg- 6, 2012]

This verse describes *Raktashali* as being sweet in taste (*madhura*), light to digest (*laghu*), mildly unctuous (*snigdha*), and strength-promoting (*balāvahaḥ*). It enhances taste and appetite (*ruchikṛd*, *dīpanaḥ*), is considered wholesome (*pathyaḥ*), and is particularly effective in alleviating imbalances of *pitta*, internal burning sensations, disorders of *vata*, and blood-related conditions[4].

रक्तशालिर्वरस्तेषूबल्योवर्ण्यस्त्रिदोषजित|
चक्षुष्योमूत्रल: स्वर्य: शुक्रलस्तृडज्वारपह: ||

[भोजनकुतूहलम् Ch- 1 Pg -7, 2012]

According to this verse, *Raktashali* is regarded as the superior among all rice varieties. It enhances bodily strength (*balya*), improves complexion (*varṇya*), and balances all three *doshas—vata*, *pitta*, and *kapha* (*tridoṣajit*). Additionally, it benefits the eyes (*cakṣuṣyaḥ*), acts as a diuretic (*mūtralaḥ*), improves vocal clarity (*svaryaḥ*), supports reproductive health by increasing semen production (*śukralaḥ*), and helps in alleviating thirst and fever (*tṛḍ-jvarāpahaḥ*) [4].

- **Nutritional Value of Red Rice**

**Table 1: Nutritional Value of Red Rice per 100g**[5]

| **Nutrient** | **Nutritional Value** |
|---|---|
| Carbohydrates | 9.1 g |
| Fat | 2.6 g |
| Ash | 1.1 g |
| Sucrose | 0.74 g |
| Mono-unsaturated Fatty Acids | 40.7% |
| Poly- unsaturated Fatty Acids | 31% |

**4.2 Methodology**

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As per the aim and objectives of the study, the methodology was designed as follows:

The rice was cooked using the *Ayurvedic* standard method as outlined in classical texts, *Bhojankutuhalam* [4]:

1. 100 g of red rice was washed thoroughly.
2. It was placed in a heavy-bottom vessel and 400 ml of water (4 times that of rice) was initially added.
3. The vessel was kept uncovered and placed over a medium flame.
4. Additional water (in increments of 100 ml) was added as needed until the rice was perfectly cooked.
5. The rice was allowed to cool to room temperature before analysis.

**Table 2: Quantity of ingredients**

| **Ingredients** | **Quantity (g/ml)** |
|---|---|
| Red Rice (g) | 250 |
| Water (ml) | 650 |

- **Sensory Analysis-** The cooked and cooled red rice (*Raktashali*) was evaluated for key sensory attributes including appearance, aroma, taste, texture (mouthfeel), and overall acceptability by a panel of five semi-trained judges. A structured five-point hedonic scale was used for the sensory analysis, with each attribute being rated individually. The scale used for scoring was as follows:
  - 5 – Like very much
  - 4 – Like a little
  - 3 – Not sure
  - 2 – Dislike a little
  - 1 – Dislike very much

Each score reflected the panelists' degree of liking or disliking for the specified characteristic, enabling a comprehensive sensory evaluation of the product.

- **Proximate Analysis-** The proximate analysis was conducted on a 100 g sample of cooked red rice (*Raktashali*), which was preserved at room temperature prior to testing.

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Standardized laboratory procedures were employed to determine the levels of macronutrients including protein, fat, carbohydrates, starch, and crude fibre. Each parameter was analyzed using established national and institutional testing protocols, ensuring reliability and accuracy in the results. The methods used for each analysis are detailed in the table below:

**Table 3: Test method used for proximate analysis**

| Test Done | Test Method |
|---|---|
| Protein | IS 7219 (Modified method by FOSS Kjeltec) |
| Total Fat | IS 6287 |
| Carbohydrate | FHHL/SOP/CHEM/F/17(f) |
| Starch | FHHL/SOP/CHEM/F/78 |
| Crude Fiber | IS 10226 (Part 1) |

## 5. Result and Discussion

### 5.1 Analysis of cooked red rice (*Raktashali*):

**5.1.1 Sensory analysis of cooked red rice (*Raktashali*):** The sensory evaluation of the cooked red rice (*Raktashali*) at room temperature revealed favorable responses across all key organoleptic parameters. Based on the five-point hedonic scale, the mean scores for each characteristic were as follows:

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**Table 4: Mean scores for the sensory analysis of cooked red rice (*Raktashali*)**

| Appearance | Aroma | Taste | Texture/ mouthfeel | Overall Acceptability |
|---|---|---|---|---|
| 4 | 3.8 | 3.6 | 4 | 4.1 |

*Mean values of 5 judges using five point hedonic scale (5 Excellent – 1 Poor)

[Key Points: Liked very much: 5, Like a little: 4, Not sure: 3, Dislikd a little; 2, Disliked a very much: 1]

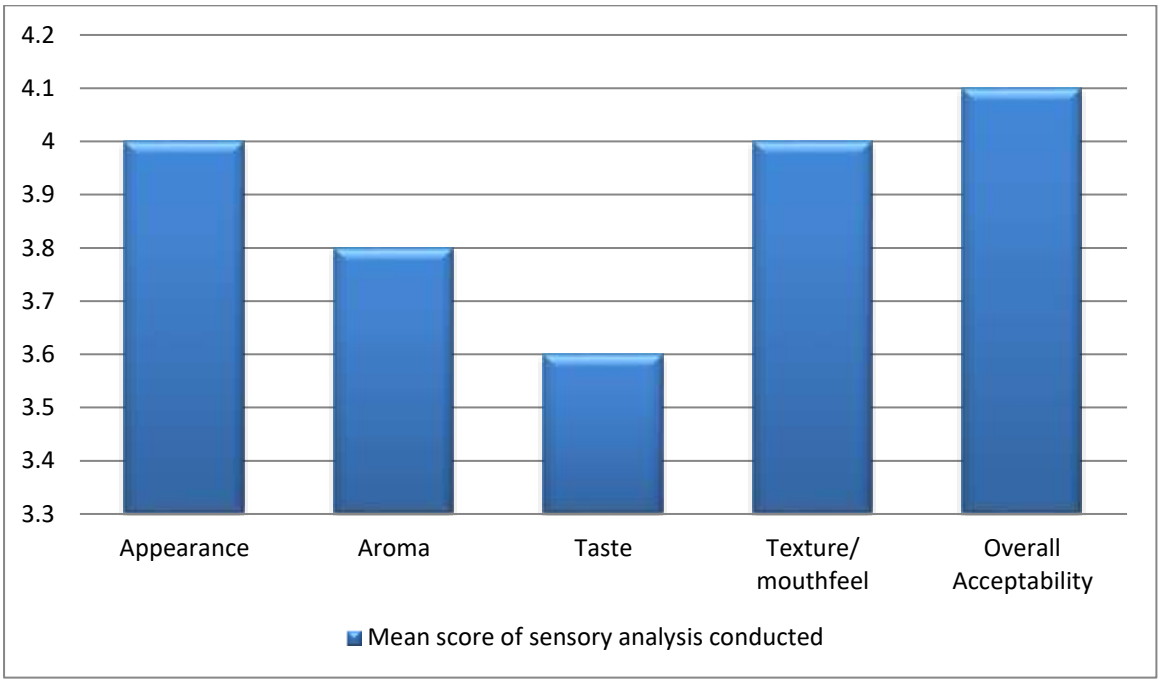


**Figure 1: Mean score of sensory analysis conducted**

These findings support the notion that cooked red rice (*Raktashal)i*, when prepared following traditional Ayurvedic methods, holds strong potential as a wholesome and acceptable dietary option, both nutritionally and sensorially.

**5.1.2 Proximate analysis of cooked red rice (*Raktashali*):** The proximate analysis was conducted on a 100 g sample of cooked red rice (*Raktashali*), which was preserved at room temperature prior to testing. The sample underwent evaluation for key macronutrients using standardized methods. The detailed results of this proximate analysis are presented in Table 5.

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**Table 5: Proximate analysis of cooked red rice (*Raktashali*)**

| Test done | Result | Unit | Test Method |
|---|---|---|---|
| Protein | 2.81 | g/100g | IS 7219 (Modified method by FOSS Kjeltec) |
| Total Fat | 0.58 | g/100g | IS 6287 |
| Carbohydrate | 25.71 | g/100g | FHHL/SOP/CHEM/F/17(f) |
| Starch | <0.1 | g/100g | FHHL/SOP/CHEM/F/78 |
| Crude Fiber | 23.04 | g/100g | IS 10226 (Part 1) |

### 5.3 Discussion

The present study was undertaken with the aim of developing, standardizing, and evaluating the quality of cooked red rice (*Raktashali*), a traditional *Ayurvedic* rice variety known for its therapeutic benefits, cooled at room temperature. The preparation of *Raktashali* followed a classical *Ayurvedic* cooking method that emphasizes the use of natural ingredients and traditional techniques to preserve its nutritional and medicinal value.

Following preparation, the cooked red rice was subjected to a detailed sensory evaluation involving a panel of 5 semi-trained judges. The assessment was conducted using a structured five-point hedonic scale to evaluate key sensory attributes such as appearance, aroma, taste, texture (mouthfeel), and overall acceptability. The rice exhibited excellent scores for appearance, mouthfeel, and overall acceptability, indicating strong consumer preference. Aroma and taste, while slightly lower in comparison, were still rated as fair, suggesting acceptable palatability.

An important focus of the study was the nutritional analysis, particularly in the context of dietary recommendations for individuals with metabolic disorders such as diabetes. Since red rice is often consumed by individuals seeking healthier alternatives to polished white rice, understanding its starch and macronutrient content is crucial. High starch intake can elevate blood glucose levels, posing a risk to individuals with diabetes. Therefore, knowing the starch content of rice varieties helps consumers make informed dietary choices.

In this research, the cooked red rice was analyzed for its macronutrient content, including carbohydrates, protein, fat, crude fibre, and starch. The findings showed that cold red rice (preserved at room temperature) contained a starch level of 23.04%, which is notably higher than the starch content observed in hot red rice, which was approximately 17% at

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45°C. This suggests that the temperature at which rice is consumed can influence its starch content and possibly its glycemic impact.

The study highlights the nutritional composition of red rice and its suitability for different population groups, including individuals with diabetes, the elderly, pregnant women, and children. With its moderate protein content, low fat, and high carbohydrate and starch content, *Raktashali* proves to be a calorie-dense and energy-supplying food. However, caution is advised for diabetic individuals due to its elevated starch content at room temperature. The findings underscore the importance of not only the choice of rice variety but also the preparation and serving conditions in managing dietary health effectively.

## 6. Conclusion:

A wholesome and nutritious preparation of cooked red rice (*Raktashali*) was successfully developed and analyzed, following traditional Ayurvedic methods. The product demonstrated excellent overall acceptability in terms of sensory attributes, particularly appearance, texture, and general appeal. Rich in carbohydrates and starch, *Raktashali* proves to be a calorie-dense and highly nourishing food option. With a starch content of 23.04% at room temperature, this variety holds therapeutic value and can be recommended for growing children, adolescents, pregnant and lactating women, individuals with emaciating conditions, and even in cases of post-abortion recovery. Its vibrant appearance, nutritional richness, and potential health benefits make *Raktashali* a valuable inclusion in both clinical and daily diets.

## 7. References

1. Rahman, A. N. F., Tahir, M., Haddada, J., Bakri, R., Hambali, A., & Husnah, A. (2025, March 25). *Assessing the effects of diverse germination methods on red rice quality: A physicochemical and sensory approach*. https://www.foodandnutritionjournal.org/volume13number1/assessing-the-effects-of-diverse-germination-methods-on-red-rice-quality-a-physicochemical-and-sensory-approach/
2. Ahuja, S. C., Chaudhary Charan Singh Haryana Agricultural University, Chaudhry, N., Maharishi Markandeshwar University, Mullana, Ahuja, U., Ahuja, S., Chaudhary, N., & Thakrar, R. (2007). Red rices - past, present, and future. In *Asian Agri-History*.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 13, Iss 3, 2024

3. Patil, K. H., Wasnik, V., & Jain, S. S. (2021). CLASSICAL CONCEPT OF COOKING RICE: a SYSTEMATIC REVIEW. *International Ayurvedic Medical Journal*, *9*(8), 1728–1732. https://doi.org/10.46607/iamj2009082021
4. Suri, R. (2012). *BHOJANAKUTUHALAM* (Dr. M. . A. Alwar, Ed.; Dr. R. Shankar, Trans.; First) [English]. Institute of Ayurveda and Integrative Medicine (I-AIM), FRLHT.
5. Baptista, E., Liberal, Â., Cardoso, R. V. C., Fernandes, Â., Dias, M. I., Pires, T. C., Calhelha, R. C., García, P. A., Ferreira, I. C., & Barreira, J. C. (2024). Chemical and Bioactive Properties of Red Rice with Potential Pharmaceutical Use. *Molecules*, *29*(10), 2265. https://doi.org/10.3390/molecules29102265

## 8. Annexure

**Figure 2: Raw Red Rice (*Raktashali*)**

**Figure 3: Red Rice while cooking**

**Figure 4: Cooked Red Rice (Raktashali)**

**Figure 5: Cooked Red Rice (*Raktashali*) at room temperature**