JOURNAL OF FOOD AND BIOTECHNOLOGY

Original Research Article ISSN 3041- 6299 Open Access

Development and Nutritional Evaluation of Wheatgrass-Enriched Bholi: A Functional Food for Health Promotion

Mohaneswari. S[1], Yvon Ambrose. P[2], Priya. S. K[*2], Vidhya C. S.[3]

[1]*Department of Hotel Management, Bharath college of science and Management, Thanjavur, Tamil Nadu 613005, India*
[2]*Department of Biotechnology, Bharath College of Science and Management, Tamil Nadu, India*
[3]*Department of Primary Processing Storage and Handling, NIFTEM-Thanjavur, Thanjavur-613005, Tamil Nadu, India*

Corresponding author: **Priya. S. K** | E-mail: **priya.santhi88@gmail.com**

Citation: Mohaneswari. S, Yvon Ambrose. P, Priya. S. K, Vidhya C. S. (2025). Development and Nutritional Evaluation of Wheatgrass-Enriched Bholi: A Functional Food for Health Promotion. *Journal of Food and Biotechnology.* **01 to 05. DOI: https://doi.org/10.51470/FAB.2025.6.1.01**

06 December 2024: Received | 03 January 2025: Revised | 25 January 2025: Accepted | 11 February 2025: Available Online

Abstract

Wheatgrass (Triticum aestivum) has emerged as a "superfood," rich in essential nutrients and therapeutic benefits. The incorporation of wheatgrass powder into traditional recipes like bholi, a popular Indian sweet flatbread, offers a unique opportunity to enhance its nutritional profile. This study aimed to develop a wheatgrass-enriched bholi, assess its consumer acceptability, and evaluate its nutrient content. Ingredients such as wheatgrass powder, wheat flour, Bengal gram dal, jaggery, and oil were combined to create the product. Consumer acceptability was assessed using sensory evaluation, while nutrient content was analyzed using standard biochemical methods. Results indicated that the wheatgrass bholi was highly acceptable and rich in protein, carbohydrates, iron, and vitamin C, making it a nutritious addition to diets.

Keywords: *wheatgrass powder, wheat flour, Bengal gram dal, jaggery*

1. Introduction

Wheatgrass: A Nutritional Powerhouse

Wheatgrass, derived from the tender shoots of *Triticum aestivum*, is widely recognized for its exceptional nutritional profile, which includes chlorophyll, essential amino acids, vitamins, and minerals [1]. Often referred to as green blood due to its structural resemblance to hemoglobin, wheatgrass offers various health benefits, including detoxification, enhanced digestion, and immune system support [2]. While its taste often deters direct consumption, incorporating wheatgrass powder into culinary applications provides an innovative solution. This study explores the integration of wheatgrass powder into traditional recipes like bholi, offering a palatable means to include this nutrient-dense ingredient in everyday diets.

Bholi: A Traditional Sweet Bread Reimagined

Bholi, also known as puranpoli, is a beloved Indian sweet flatbread traditionally prepared with wheat flour, Bengal gram dal, jaggery, and oil. The known for its cultural significance and rich flavors, this dish provides a balanced nutritional value rooted in regional culinary practices [3]. By fortifying the traditional bholi recipe with wheatgrass powder, this research aims to create a nutritionally superior version that aligns with modern dietary trends. Such an adaptation not only enhances the functional properties of bholi but also makes it a suitable choice for health-conscious individuals seeking nutrient-enriched alternatives to traditional foods.

Wheatgrass as a Functional Food Ingredient

The rise of functional foods, which provide health benefits beyond basic nutrition, has driven interest in incorporating natural ingredients such as wheatgrass into daily diets. Wheatgrass, often heralded as a superfood, boasts antioxidant and anti-inflammatory properties that support immune health, detoxification, and overall well-being [5]. Its potent nutrient profile, rich in bioactive compounds, makes it an ideal candidate for functional food applications. The combining wheatgrass with a culturally significant dish like bholi, this study presents a unique approach to creating a product that appeals to diverse consumer preferences while addressing modern health challenges.

Development and Sensory Evaluation of Wheatgrass Bholi

The research focuses on developing a wheat grass-enriched bholi recipe and evaluating its sensory characteristics, including taste, texture, and overall acceptability. The incorporating wheatgrass powder into the dough and filling, the resulting product demonstrates enhanced nutritional benefits without compromising its traditional appeal. Sensory evaluation plays a crucial role in ensuring the acceptance of functional foods, particularly among diverse age groups [6], the study examines the aesthetic appeal of wheat grass bholi, emphasizing its potential to gain consumer interest in the competitive functional food market.

Implications and Future Perspectives

The fusion of wheatgrass with bholi not only reinvents a traditional delicacy but also contributes to the growing portfolio of functional foods aimed at promoting health and well-being.

This novel product addresses the increasing demand for nutrient-rich, palatable options that cater to modern dietary preferences [7]. The findings of this research underscore the potential of wheatgrass-enriched bholi as a versatile and health-promoting food choice. Future studies may explore variations in formulation to further enhance the sensory and nutritional attributes of wheatgrass bholi, paving the way for its broader acceptance and commercialization.

2. Materials and Methods

2.1 Selection and Procurement of Ingredients

Wheatgrass was cultivated in a home garden using organic methods, ensuring fresh and nutrient-rich produce. Wheat flour, Bengal gram dal, jaggery, and cooking oil were procured from local markets in Thanjavur. The wheatgrass was harvested after 10 days, dried, and powdered for use.

2.2 Development of Wheat grass Bholi

The recipe for wheat grass bholi was standardized is depicted in the figure1 through multiple trials.

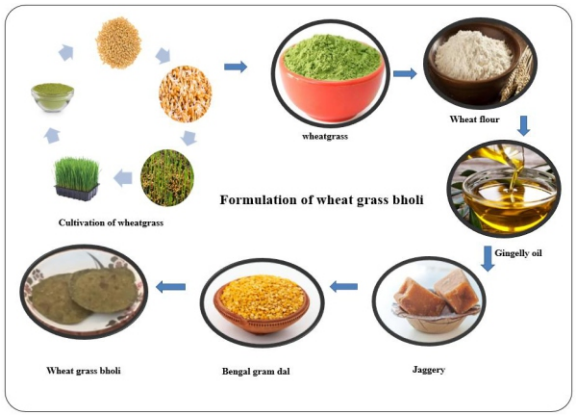

Figure 1: Graphical abstract of wheat grass bholi ingredients

2.2 Development of Wheatgrass Bholi

The recipe for wheatgrass bholi was standardized through multiple trials. The preparation process involved:

1. Mixing wheatgrass powder with wheat flour.
2. Adding oil and water to form a soft dough, leaveto rest for an hour.
3. Preparing the stuffing by boiling Bengal gram dal and mashing it.
4. Mixing the mashed dal with jaggery syrup to form a sweet filling.
5. Rolling out the dough, stuffing it with the dal mixture, and shaping it into flat discs.
6. Cooking on a hot tawa until golden brown on both sides.

2.3 Sensory Evaluation

Ten panelists evaluated the wheatgrass bholi for appearance, color, flavor, texture, and taste using a 5-point hedonic scale, where 5 indicated "excellent" and 1 indicated "poor." The scores were averaged, and the standard deviation was calculated.

2.4 Nutrient Analysis

Nutritional parameters were analyzed using standard methods [7-9]

- **Carbohydrates**: Anthrone method.
- **Proteins**: Lowry's method.
- **Fat**: Soxhlet extraction method.
- **Iron**: AOAC method (2020).
- **Vitamin C**: Titrimetric method.

2.5 Statistical Analysis

The data were analyzed for mean and standard deviation to evaluate consistency and variability among samples.

3. Results and Discussion

3.1 Development of Wheatgrass Bholi

The standardized recipe for wheatgrass bholi ensured consistent quality across trials. The incorporation of wheatgrass powder did not significantly alter the traditional preparation process, maintaining the integrity of the original recipe while enhancing its nutritional profile.

Table 1 Ingredients used for wheatgrass bholi

S.no	Ingredients	Quantity Used
1	Wheatgrass Powder	25g
2	Wheat flour	20g
3	Bengal gram dal	30g
4	Jaggery	20g
5	Oil	5g

Preparation of wheatgrass bholi protocol.

The cooking procedure to prepare wheatgrass bholiwasshown with the protocol in figure 2.

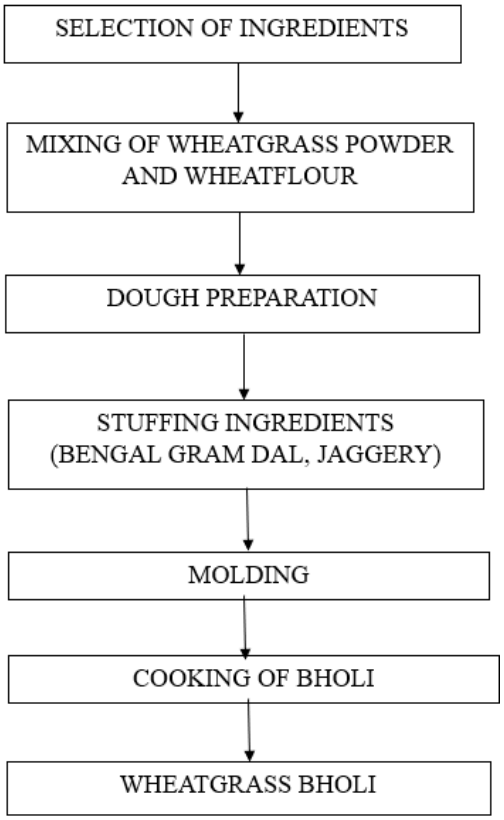

Figure 2: Preparation of wheatgrass bholi protocol

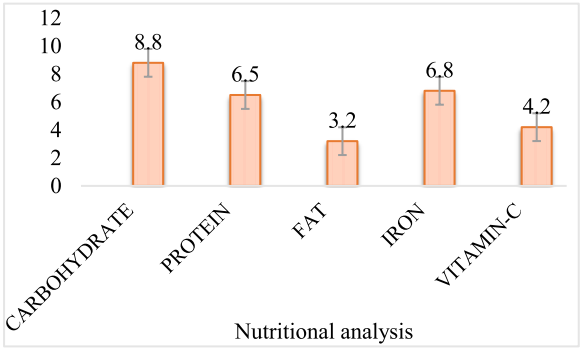

Figure 3: Nutritional analysis of wheat grass bholi

Carbohydrate present in wheat grass bholi

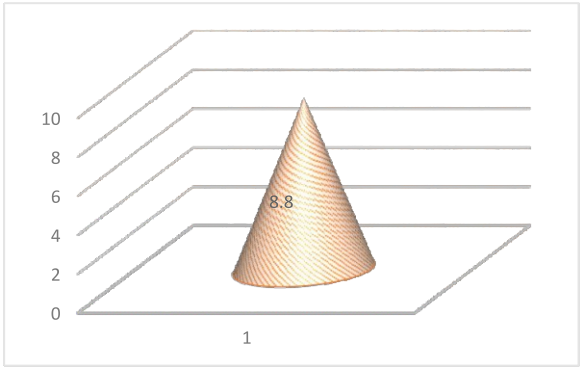

Figure 4: Carbohydrate content in wheat grass bholi

Protein present in wheatgrass bholi

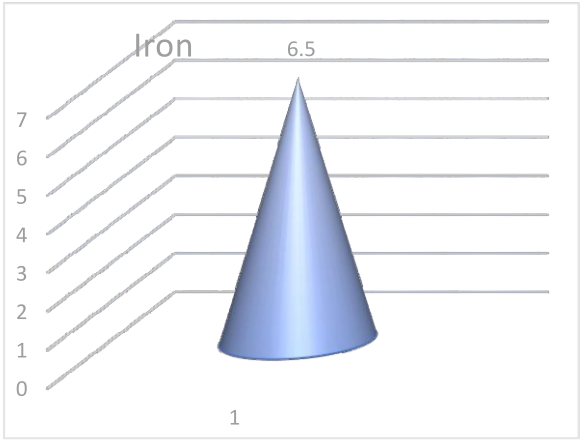

Figure 5: Protein content in wheat grass bholi

Iron present in wheatgrass bholi

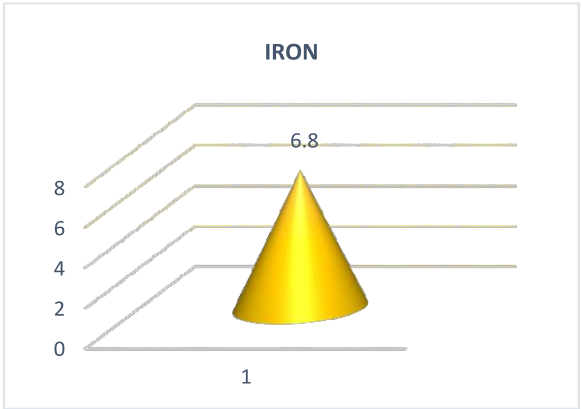

Figure 6: Iron content in wheat grass bholi

3.2 Consumer Acceptability Sensory evaluation scores indicated high acceptability [9]. Panelists rated flavor (4.1 ± 0.87) and taste (4.2 ± 0.63) as the most favorable attributes, followed by appearance (3.9 ± 0.88), color (4.0 ± 0.82), and texture (3.7 ± 0.82). The overall acceptability score was 19.9 ± 4.02, highlighting the product's suitability for widespread consumption.

3.3 Nutritional Analysis The nutrient content of wheatgrass bholi was evaluated, revealing its rich composition expressed in figure 3,4,5 and 6 (9):

Nutrient	Content (per 100g)
Carbohydrates	8.8 g
Proteins	6.5 g
Fat	3.2 g
Iron	6.8 mg
Vitamin C	4.2 mg

Wheatgrass powder significantly enhanced the iron and vitamin C content, aligning with its known health benefits [10]. The high protein and carbohydrate levels make it an energy-dense food, suitable for children, adolescents, and individuals requiring high-nutrient diets.

3.4 Health Implications Wheatgrass bholi offers numerous health benefits:
1. Iron Content: Supports hemoglobin synthesis, reducing anemia risk.
2. Vitamin C: Acts as an antioxidant, promoting immune health and skin vitality.
3. Detoxification: Chlorophyll in wheatgrass aids liver detoxification.
4. Energy Boost: High carbohydrate and protein levels provide sustained energy.
These attributes make wheatgrass bholi particularly beneficial for school-going children, adolescents, and individuals with iron deficiency or chronic fatigue [11]. The development of wheatgrass bholi involved standardizing the recipe to ensure consistent quality and sensory appeal. The formulation included wheatgrass powder, wheat flour, Bengal gram dal, jaggery, and oil in specific proportions shown in the [12]. The dough preparation, stuffing with Bengal gram and jaggery mixture, and cooking resulted in a product with appealing color, texture, and flavor [13-14]. The inclusion of wheatgrass powder imparted a subtle green hue and enhanced the nutritional value without compromising taste [15]. The sensory evaluation revealed high acceptability among the panelists. Parameters such as appearance, flavor, and taste scored significantly, indicating that the incorporation of wheatgrass was well-received [16]. The mean scores for sensory attributes such as texture and flavor were within an acceptable range, highlighting the success of the recipe in retaining traditional qualities while introducing a functional ingredient [17-19]. The findings align with the objectives of functional food development, showcasing wheatgrass bholi as a balanced, nutrient-rich product suitable for various consumer groups, including children and individuals with specific health concerns

4. Conclusion
The integration of wheatgrass powder into bholi has proven to be an effective way to develop a nutritious, appealing, and health-oriented food product. Sensory evaluations confirmed its acceptability, while the nutritional analysis highlighted its enriched composition,

including significant levels of iron, protein, and carbohydrates. Importantly, the inclusion of wheatgrass powder did not compromise key quality attributes such as appearance, color, flavor, texture, or taste, the product's potential for promoting health, including its role in cancer prevention, enhances its appeal as a functional food. This innovative approach not only preserves the cultural essence of traditional bholi but also introduces a modern, health-conscious dimension, making it a suitable choice for consumers seeking nutrient-rich dietary options.

Recommendations

1. Target Populations: Wheatgrass bholi is recommended for children, adolescents, pregnant women, and individuals with nutritional deficiencies.

2. Health Promotion: Its anticancer properties and detoxifying effects make it suitable for health-conscious individuals.

3. Future Research: Studies on the long-term health impacts of wheatgrass-enriched diets could further substantiate its benefits.

References

1. Kulkarni, S. D., Tilak, J. C., Acharya, R., Rajurkar, N. S., Devasagayam, T. P. A., & Reddy, A. V. R. (2006). Evaluation of the antioxidant activity of wheatgrass (Triticum aestivum L.) as a function of growth under different conditions. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*, *20*(3), 218-227.

2. Kulkarni, S. D., Acharya, R., Rajurkar, N. S., & Reddy, A. V. R. (2007). Evaluation of bioaccessibility of some essential elements from wheatgrass (Triticum aestivum L.) by in vitro digestion method. *Food chemistry*, *103*(2), 681-688.

3. Savic, I. M., & Savic Gajic, I. M. (2020). Optimization of ultrasound-assisted extraction of polyphenols from wheatgrass (Triticum aestivum L.). *Journal of food science and technology*, *57*, 2809-2818.

4. Kulkarni, S. D., Acharya, R., Nair, A. G. C., Rajurkar, N. S., & Reddy, A. V. R. (2006). Determination of elemental concentration profiles in tender wheatgrass (Triticum aestivum L.) using instrumental neutron activation analysis. *Food Chemistry*, *95*(4), 699-707.

5. Devi, C. B., Bains, K., & Kaur, H. (2019). Effect of drying procedures on nutritional composition, bioactive compounds and antioxidant activity of wheatgrass (Triticum aestivum L). *Journal of food science and technology*, *56*, 491-496.

6. Kaur, N., Singh, B., Kaur, A., Yadav, M. P., Singh, N., Ahlawat, A. K., & Singh, A. M. (2021). Effect of growing conditions on proximate, mineral, amino acid, phenolic composition and antioxidant properties of wheatgrass from different wheat (Triticum aestivum L.) varieties. *Food Chemistry*, *341*, 128201.

7. Parit, S. B., Dawkar, V. V., Tanpure, R. S., Pai, S. R., & Chougale, A. D. (2018). Nutritional quality and antioxidant activity of wheatgrass (Triticum aestivum) unwrap by proteome profiling and DPPH and FRAP assays. *Journal of food science*, *83*(8), 2127-2139.

8. Martynov, S. P., Dobrotvorskaya, T. V., & Krupnov, V. A. (2016). Genealogical analysis of the use of two wheatgrass (Agropyron) species in common wheat (Triticum aestivum L.) breeding for disease resistance. *Russian Journal of Genetics*, *52*, 154-163.

9. Adhikary, M., Mukhopadhyay, K., & Sarkar, B. (2021). Flavonoid-rich wheatgrass (Triticum aestivum L.) diet attenuates diabetes by modulating antioxidant genes in streptozotocin-induced diabetic rats. *Journal of Food Biochemistry*, *45*(4), e13643.

10. Al-Awaida, W. J., Sharab, A. S., Al-Ameer, H. J., & Ayoub, N. Y. (2020). Effect of simulated microgravity on the antidiabetic properties of wheatgrass (Triticum aestivum) in streptozotocin-induced diabetic rats. *npj Microgravity*, *6*(1), 6.

11. Złotek, U., Szymanowska, U., Jakubczyk, A., Sikora, M., & Świeca, M. (2019). Effect of arachidonic and jasmonic acid elicitation on the content of phenolic compounds and antioxidant and anti-inflammatory properties of wheatgrass (Triticum aestivum L.). *Food chemistry*, *288*, 256-261.

12. Sharma, S., Shrivastav, V. K., Shrivastav, A., & Shrivastav, B. R. (2013). Therapeutic potential of wheatgrass (Triticum aestivum L.) for the treatment of chronic diseases. *South Asian Journal of Experimental Biology*, *3*(6), 308-313.

13. Kumar, N., & Iyer, U. (2017). Impact of wheatgrass (Triticum aestivum L.) supplementation on atherogenic lipoproteins and menopausal symptoms in hyperlipidemic South Asian Women–A randomized controlled study. *Journal of Dietary Supplements*, *14*(5), 503-513.

14. Kwok, H. C., & Chan, W. (2022). Wheatgrass (Triticum aestivum) as an efficient phytoremediation plant for aristolochic acid-contaminated water and arable soil. *ACS Agricultural Science & Technology*, *2*(3), 639-645.

15. Lim, T. K., & Lim, T. K. (2013). Triticum aestivum. *Edible Medicinal And Non-Medicinal Plants: Volume 5, Fruits*, 385-415.

16. Bar-Sela, G., Cohen, M., Ben-Arye, E., & Epelbaum, R. (2015). The medical use of wheatgrass: Review of the gap between basic and clinical applications. *Mini reviews in medicinal chemistry*, *15*(12), 1002-1010.

17. Xu, L., Ziethen, C. J., Appelbaum, S., Palm, H. W., & Knaus, U. (2022). Aquaponics production of wheatgrass (Triticum aestivum L.) in different horticultural substrates with African catfish (Clarias gariepinus) in northern Germany. *AgriEngineering*, *4*(4), 1076-1094.

18. Liu, Z. W., Wang, R. C., & Carman, J. G. (1994). Hybrids and backcross progenies between wheat (Triticum aestivum L.) and apomictic Australian wheatgrass [Elymus rectisetus (Nees in Lehm.) A. Löve & Connor]: karyotypic and genomic analyses. *Theoretical and applied genetics*, *89*, 599-605.

19. Benincasa, P., Galieni, A., Manetta, A. C., Pace, R., Guiducci, M., Pisante, M., & Stagnari, F. (2015). Phenolic compounds in grains, sprouts and wheatgrass of hulled and non-hulled wheat species. *Journal of the Science of Food and Agriculture*, *95*(9), 1795-1803.