WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 17, 767-771. Research Article ISSN 2277–7105

COMPARATIVE NUTRITIONAL AND MINERAL PROFILING OF COMMERCIAL FINGER MILLET (RAGI) FLOUR BRANDS: FOCUS ON MOISTURE, ASH CONTENT, ALKALINITY, AND CALCIUM LEVELS

Astha Jain BSc IV Year Honors, *Dr. Manju Gupta, Professor and Dr. Manisha Jain

Department of Chemistry, Govt. M.H. College of Home Science and Science for Women, Jabalpur, M.P., India.

Article Received on
11 July 2025,

Revised on 31 July 2025,
Accepted on 21 August 2025

DOI: 10.20959/wjpr202517-37948

***Corresponding Author**
Dr. Manju Gupta
Department of Chemistry, Govt. M.H. College of Home Science and Science for Women, Jabalpur, M.P., India.

ABSTRACT

This study evaluates the nutritional and mineral composition of three commercial finger Millet (Eleusine coracana) flour brands—Smita Grah Udhyog, Patanjali, and Manan. Analytical methods were used to determine moisture, ash content (total, water-soluble, and acid-insoluble), alkalinity of water-soluble ash, and calcium concentration. Analytical methods followed AOAC protocols. Hibiscus rosa-sinensis extract was used as a natural pH indicator for alkalinity titration. Results revealed significant variations in mineral content and bioavailability indicators across the brands. Smita Grah Udhyog showed the highest calcium concentration, while Patanjali demonstrated superior mineral bioavailability. These findings highlight the importance of brand selection based on targeted nutritional needs.

KEYWORDS: Finger Millet, calcium, ragi, ash content, nutritional composition, commercial brands.

INTRODUCTION

Finger millet (Eleusine coracana) is an important cereal crop known for its rich nutritional profile, particularly high calcium content, which plays a vital role in bone health and metabolic functions (Shobana et al., 2013). Given the increasing commercial availability of ready-to-use finger millet flours, it is essential to evaluate their nutritional quality to ensure consumer benefits (Antony Ceasar et al., 2018). This study compares moisture, mineral

fractions, alkalinity, and calcium content in three commercial brands, employing environmentally friendly analytical methods.

OBJECTIVES

1. To compare the moisture, ash, alkalinity, and calcium levels in selected finger millet flour brands.
2. To evaluate their relative nutritional suitability for dietary and therapeutic applications.

MATERIALS AND METHODS

Finger millet Flour samples from Smita Grah Udhyog, Patanjali, and Manan were analyzed. Moisture content was measured by oven drying 5 g of sample at 105°C to constant weight following AOAC (2019) guidelines.

1. Moisture Content: Determined by oven drying 2g of flour for two hours.
2. Total Ash: Measured by incinerating 5g of flour in silica crucibles.
3. Water-Soluble and Insoluble Ash: Ash was boiled in water, filtered, and residues weighed.
4. Acid-Insoluble Ash: Ash boiled in dilute H_2SO_4 and filtered; the residue weighed.
5. Alkalinity of Water-Soluble Ash: Titrated against N/10 H_2SO_4 using China rose as a natural indicator (Lee, K., & McKinney, A. 2018.; Johnson, M., & Patel, A. 2017; Nair, R. & Sriram, P. 2015).
6. Calcium Content: Determined by oxalate precipitation followed by $KMnO_4$ titration at 80°C (Pearson, 1962).

Total ash, water-soluble ash, acid-insoluble ash, and alkalinity of water-soluble ash were determined using standard gravimetric and titrimetric techniques. Calcium was quantified via precipitation and titration using potassium permanganate (Pearson, 1962).

Minerals and ash content of Finger Millet flour (Ragi) (g/100g) under investigation

Seed (Ragi millet)	Sample No.	Moisture content	Ash	Water insoluble Ash	Water soluble Ash	Alkalinity of water soluble Ash (meqn)	Calcium (mg)
Smita Grah Udhyog	1	7.5	2.7	1.42	1.28	2.4	225.6
	2	7.5	2.92	2.08	0.84	2.6	286.4
	3	8	2.28	1.8	0.48	2.8	300
Patanjali brand	1	8.5	2.6	1.82	1.78	2.4	240
	2	8	2.52	1.78	0.74	2.4	244
	3	10.5	2.54	1.7	0.84	2.0	236
Manan brand	1	8.5	2.6	1.84	0.76	1.6	262.4
	2	11	2.56	1.94	1.02	1.6	264
	3	6	2.42	0.097	0.48	2.6	264

RESULTS

Based on the data presented in the final table, a comparative analysis of three commercial finger millet (Ragi) flour brands—Smita Grah Udhyog, Patanjali, and Manan—was conducted with a focus on total ash content, water-soluble and insoluble ash, alkalinity of water-soluble ash, and calcium concentration. The findings indicate that Smita Grah Udhyog samples exhibited the highest range of total ash content (2.28–2.92 g/100g), reflecting a greater overall mineral presence. This brand also recorded the highest calcium content among all three, ranging from 225.6 to 300mg/100g, making it the most suitable for calcium supplementation and bone health. Additionally, the alkalinity of water-soluble ash was highest in Smita Grah Udhyog (2.4–2.8 meq), suggesting the presence of more alkaline mineral salts, which may contribute to better buffering capacity and mineral retention.

In contrast, Patanjali brand samples demonstrated the highest water-soluble ash content (up to 1.78 g/100g), indicating superior mineral bioavailability despite having a slightly lower calcium range (236–244mg/100g).The consistency in ash distribution and bioavailability makes Patanjali a balanced option for mineral uptake. Manan brand showed a moderate total ash range (2.42–2.6 g/100g) and consistent calcium content (262.4–264 mg/100g). However, one of its samples had an unusually low value for water-insoluble ash (0.097 g/100g), indicating irregularity in mineral content distribution.

DISCUSSION

The moisture content across all samples complied with recommended levels for flour storage (AOAC, 2019). The total ash content indicated the overall mineral content, with Smita Grah Udhyog having the highest mineral load. Water-soluble ash, a marker of bioavailable minerals, was highest in Patanjali flour, consistent with enhanced nutrient accessibility (Malleshi & Desikachar, 1986). The natural indicator Hibiscus rosa-sinensis proved effective for alkalinity titration, reflecting an eco-friendly alternative to synthetic indicators (Gupta & Sharma, 2017). Calcium levels in Smita Grah Udhyog flour support its potential for dietary calcium supplementation, vital for populations prone to calcium deficiency (Shobana et al., 2013).

The study revealed that while all three brands are nutritionally valuable, each has distinct strengths. Smita Grah Udhyog stands out in terms of total mineral and calcium content, ideal for individuals requiring higher calcium intake. Patanjali offers better mineral bioavailability, making it suitable for efficient nutrient absorption. Manan, although nutritionally rich,

exhibited inconsistencies that may affect uniform nutritional delivery. Therefore, brand selection should be based on specific nutritional goals, such as calcium enrichment or enhanced mineral absorption.

CONCLUSION

This study demonstrates that commercial finger millet flours vary significantly in their nutritional and mineral profiles. Smita Grah Udhyog flour is ideal for calcium enrichment, Patanjali excels in mineral bioavailability, and Manan provides consistent moderate levels. These findings underscore the importance of brand-specific nutritional assessment to guide consumer choices and improve public health outcomes. Brand selection should align with specific dietary goals, reinforcing the significance of quality assessment in commercial health foods.

REFERENCES

1. Antony Ceasar, S., Maharajan, T., Ajeesh Krishna, T. P., Ramakrishnan, M., Victor Roch, G., Satish, L., & Ignacimuthu, S. Finger millet (Eleusine coracana (L.) Gaertn.) improvement: Current status and future interventions of whole genome sequence. Frontiers in Plant Science, 2018; 9: 1054. https://doi.org/10.3389/fpls.2018.01054
2. AOAC International. (2019). Official Methods of Analysis (21st ed.). AOAC International.
3. Chandra, D., Chandra, S., Pallavi, & Sharma, A. K. Review of Finger millet (Eleusine coracana): A powerhouse of health benefiting nutrients. Food Science and Human Wellness, 2016; 5(3): 149–155. https://doi.org/10.1016/j.fshw.2016.05.004
4. Gopalan, C., Sastri, B. V. R., & BaComparative Nutritional Evaluation of Pearl Millet Flour: A Study on Moisture, Ash, Alkalinity, and Calcium Content across Selected Commercial Brands.
5. Gupta, M., & Sharma, P. Use of Hibiscus rosa-sinensis flower extract as a natural pH indicator for alkalinity titration. International Journal of Green Chemistry, 2017; 5(2): 45–51.
6. Johnson, M., & Patel, A. "Use of Natural Indicators in Educational Laboratories." Journal of Chemical Education, 2017; 94(3): 400-404.
7. Lee, K., & McKinney, A. "Sustainable Chemistry: Natural Indicators for Acid-Base Titrations." International Journal of Environmental Science, 2018; 24(1): 123-130.

8. Malleshi, N. G., & Desikachar, H. S. R. Finger millet (Eleusine coracana): A cereal grain with multiple health benefits. Food Reviews International, 1986; 2(3): 313–351.
9. Nair, R. & Sriram, P. "Evaluation of Natural Indicators for Acid-Base Titration." Environmental Chemistry Letters, 2015; 13(2): 67-72.
10. Shobana, S., Krishnaswamy, K., Sudha, V., Malleshi, N. G., Anjana, R. M., Palaniappan, L., & Mohan, V. Finger millet (Eleusine coracana) and kodo millet (Paspalum scrobiculatum) as sources of antioxidant and dietary fiber in diabetes. Journal of Food Science and Technology, 2013; 50(3): 554–560. https://doi.org/10.1007/s13197-011-0380-5