

VOLUME 11 ISSUE 2 2025

ISSN 2454 – 3055



**INTERNATIONAL
JOURNAL OF
ZOOLOGICAL
INVESTIGATIONS**

***Forum for Biological and
Environmental Sciences***

Published by Saran Publications, India



International Journal of Zoological Investigations

Contents available at Journals Home Page: www.ijzi.net

Editor-in-Chief: Prof. Ajai Kumar Srivastav

Published by: Saran Publications, Gorakhpur, India



ISSN: 2454-3055

Nutritional Evaluation of Low Sodium and High Potassium Fortified Product for Liver Cirrhosis Patients

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Received: 2nd September, 2025; **Accepted:** 28th October, 2025; **Published online:** 5th November, 2025

<https://doi.org/10.33745/ijzi.2025.v11i02.085>

Abstract: The permanent functional deficits in cirrhosis result in nutritional deficiencies with systemic impacts. Low Sodium and High Potassium Fortified Product was prepared as four samples (A, B, C and D) by using the different ratio of ingredients to main ingredient raggi. The organoleptic evaluation of the products was done by a panel of judges to select the most acceptable sample of product. The sample B containing 70% raggi and 30% rest ingredients was finalized and this sample had 0.83 g sodium/100 g which comes under the range that is recommended by World Health Organization; and potassium 0.49 g/100 g which also comes under recommended range of potassium by National Academy of Medicine. Therefore final recipe of fortified raggi laddu can be recommended for liver cirrhotic patients.

Keywords: Cirrhosis, Sodium, Potassium, Nutritional, Raggi

Citation: Chahal Manparvesh Singh and Singh Sukriti: Nutritional evaluation of low sodium and high potassium fortified product for liver cirrhosis patients. Intern. J. Zool. Invest. 11(2): 874-877, 2025.

<https://doi.org/10.33745/ijzi.2025.v11i02.085>



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Introduction

Liver is a major organ of human body which plays vital role such as metabolism of protein, carbohydrates and fat, which are essential source of nutrition for the body. When there is damage in the liver, the healthy cells are replaced by scar tissue then it is called liver cirrhosis which may be compensated or decompensated cirrhosis (Premkumar *et al.*, 2025). At this stage liver is unable to perform its vital functions of metabolism, production of proteins, including

blood clotting factors, and filtering of drugs and toxins. Patients with liver cirrhosis are advised to limit their sodium consumption to control excessive fluid accumulation and it has been suggested that patients with severely impaired liver function may be unable to retain potassium supplements (Aikawa *et al.*, 1953; Heinemann and Emirgil, 1960; Casey *et al.*, 1965). Sodium is essential for fluid balance and cellular homeostasis (Bernal *et al.*, 2023). But progressive

increase in sodium intake activates natriuretic systems while suppressing the sodium retaining systems to maintain an effective sodium balance. Therefore, limiting sodium intake is suggested for the treatment of ascites in such patients (Haberl *et al.*, 2018). Severe salt restriction could potentially result in hypernatremia and cause volume contraction, which might adversely affect kidney function in a cirrhotic patient. The recommended limits of salt consumption for cirrhotic patients with ascites vary from 4.6 g to 6.9 g/d, although most guidelines recommend around 5 g of salt, which corresponds to a teaspoon of cooking salt. Therefore, the World Health Organization has recommended a daily salt intake of less than 5 g/d, which is approximately 2 g of sodium, for the general population. Several factors including diet, gastrointestinal losses, and diuretic treatment may affect adversely the potassium status of cirrhotic patients. Casey *et al.* (1961) reported that the more severe the liver disease the lower the body potassium stores. They also suggested that patients with severely impaired liver function may be unable to retain potassium supplements (Aikawa *et al.*, 1953; Heinemann and Emirgil, 1960; Casey *et al.*, 1965).

In the present study, Low Sodium and High Potassium Fortified Product was prepared as four samples (A, B, C and D) by using the different ratio of ingredients to main ingredient raggi. The organoleptic evaluation of the products was done by a panel of judges to select the most acceptable sample of product. The selected sample (B) was further processed for nutritional evaluation.

Materials and Methods

Fortified Raggi Laddu:

Fortified raggi laddu was prepared by conventional manner. Each ingredients were separately ground and a mixture of roasted raggi flour was added. Then jaggery powder and skimmed powder milk was added to it. All ingredients were added in the quantity shown in Table 1 for various samples (A, B, C, and D) and mixed well. Take small proportion of this mixture

and roll them to prepare laddu.

Organoleptic Evaluation:

The organoleptic evaluation is done to select the most acceptable product. The panel of judges including 20 faculty members of department of MMICT and BM (Hotel Management) at Maharishi Markandeshwar University), Mullana, Ambala (Haryana) were provided with score card of Hedonic Rating Scale to score the test samples for their colour, flavor, texture, mouth feel, taste and overall acceptability.

Nutritional Evaluation:

The selected sample of Fortified Raggi Laddu by panelist was chemically analyzed for their proximate composition of crude fat, crude protein, crude fiber, moisture, carbohydrate, calcium, potassium and sodium by the standard procedures (AOAC, 1990).

Results and Discussion

Organoleptic Evaluation:

The scores for sample B as provided by the panel ranged from 8.52 ± 0.13 to 7.82 ± 0.13 and score for overall acceptability was 8.42 ± 0.12 (Table 2). These scores are highest as compared to other recipes of sample (A, C and D). The lowest score was given to sample D with 6.23 ± 0.10 to 5.53 ± 0.14 and overall acceptability score is 5.75 ± 0.13 . So on the basis of these scores recipe of sample B was finalized which contain 70% of base material raggi and 30% of rest ingredients. So recipe of sample B was selected by the panelist for the final product.

Nutritional Evaluation:

World Health Organization has recommended a daily salt intake of less than 5 g/d, which is approximately 2 g of sodium, for the general population. Fortified raggi laddu contains 0.83 g/100 g sodium which comes under the range recommended by World Health Organization (Table 3). It contains potassium 0.49 g/100 g which also comes under recommended range of potassium by National Academy of Medicine

Table 1: Preparation of Fortified Raggi Laddu

Ingredients	Quantity				
	Control (product) (100%)	Sample A (80:20)	Sample B (70:30)	Sample C (60:40)	Sample D (50:50).
Raggi flour	1 kg	800 g	700 g	600 g	500 g
Jaggery powder	100 g	100 g	100 g	100 g	100 g
Desi ghee	50 ml	50 ml	50 ml	50 ml	50 ml
Soyabean		28.57 g	42.85 g	57.14 g	71.42 g
Green gram dhal		28.57 g	42.85 g	57.14 g	71.42 g
Milk powder		28.57 g	42.85 g	57.14 g	71.42 g
Rice bean		28.57 g	42.85 g	57.14 g	71.42 g
Ground nut		28.57 g	42.85 g	57.14 g	71.42 g
Pistachio nut		28.57 g	42.85 g	57.14 g	71.42 g

Table 2: Acceptance Recorded By Mean of Fortified Raggi Laddu

Sample Code	Colour Score	Taste Score	Texture Score	Flavour Score	Mouth Feel Score	Overall Acceptability
A	6.43±0.16	7.04±0.12	6.33±0.10	70.05±0.14	6.97± 0.12	6.95±0.13
B	7.82±0.13	8.12 ±0.15	8.52 ±0.13	8.51 ±0.12	8.43 ±0.12	8.42 ±0.12
C	6.02 ±0.12	6.53±0.13	5.95 ±0.14	6.87 ±0.01	6.54 ±0.14	6.76 ±0.10
D	6.23 ±0.10	5.97±0.12	5.75 ±0.15	5.86 ±0.13	5.53 ±0.14	5.75 ±0.13

Table 3: Results of nutritional evaluation of Fortified Raggi Laddu (sample B)

Product	Ash (% by wt)	Crude fat (% by wt)	Crude protein (% by wt)	Crude fiber (% by wt)	Moisture (%)	Carbohydrates (g/100 g)	Calcium (g/100 g)	Potassium (g/100 g)	Sodium (g/100 g)
Fortified Raggi Laddu (sample B)	2.51	11.96	13.12	1.14	24.20	46.21	2.18	0.49	0.83

Source: Fare Labs Private Limited

(2019) who has recommended an Adequate Intake for potassium as 2500 to 3400 mg daily.

Conclusion

In the present study new product was developed namely as fortified raggi laddu which contains Low Sodium and High Potassium for the liver cirrhosis patients. Sample (B) having the ratio 70:30 was finalized by panelist and report of nutritional evaluation of final product shows that it contains 0.83 g sodium/100 g which comes under

the range recommended by WHO; and potassium 0.49 g which also comes under recommended range of potassium by National Academy of Medicine. Therefore final recipe of fortified raggi laddu (sample B) can be recommended for liver cirrhotic patients.

Ethical Statement

No animal or microbes have been used or sacrificed for this study, hence Ethical Approval not required.

Author Contributions

Each author has contributed equally in designing the research, conducting thorough analysis, drafting the manuscript, and refining its content. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

References

- Aikawa JK, Felts JH and Harrell GT. (1953) Alterations in the body potassium content in cirrhosis of the liver. *Gastroenterology* 24: 437-443.
- Bernal A, Zafra MA, Simón MJ and Mahía J. (2023) Sodium homeostasis, a balance necessary for life. *Nutrients* 15(2): 395.
- Casey TH, Summerskill WHJ and Orvis AL. (1961) Disorders of potassium metabolism in liver disease. *J Clin Invest.* 40: 1028-1029.
- Casey TH, Summerskill WHJ and Orvis AL. (1965) Body and serum potassium in liver disease. I. Relationship to hepatic functions and associated factors. *Gastroenterology* 48: 198-207.
- Haberl J, Zollner G, Fickert P and Stadlbauer V. (2018) To salt or not to salt?-That is the question in cirrhosis. *Liver Int.* 38: 1148-1159.
- Heinemann HO and Emirgil C. (1960) Hypokalemia in liver disease. *Metabolism* 9: 869-879.
- National Academy of Medicine (2019) Dietary Reference Intakes for Sodium and Potassium. Washington (DC): National Academies Press (US).
- Premkumar M, Kamath PS, Reiberger T, Reddy KR. (2025) Recompensation in decompensated cirrhosis. *Lancet Gastroenterol Hepatol.* 10(11): 1028-1040,