International Journal of Agriculture and Food Science 2026; 8(8): 195-201

ISSN Print: 2664-844X
ISSN Online: 2664-8458
NAAS Rating (2026): 4.97
IJAFS 2026; 8(8): 195-201
www.agriculturaljournals.com
Received: 11-06-2026
Accepted: 14-07-2026

Kaushambi Goswami
Food & Nutrition, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India

Sunita Mishra
Professor, Department of Food and Nutrition, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India

Corresponding Author:
Kaushambi Goswami
Food & Nutrition, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India

Development and evaluation of functional bao buns enriched with bottle gourd peel powder and essential garlic oil

Kaushambi Goswami and Sunita Mishra

DOI: https://www.doi.org/10.33545/2664844X.2026.v8.i8c.1771

Abstract

Bao buns are most popular and readily available dumplings, providing a variety of cuisines across Asia with a simple steamed bread, they too have their share of nutrients-sparse foods because the basic ingredients are low in both dietary fibre and micronutrients. The current study investigated the possibility of incorporating a bioactive-rich agro-industrial by-product, bottle gourd peel (BGP) powder, into bao bun formulations in combination with essential garlic oil at two substitution levels, 3%(T_1) and 10% (T_2), as functional fortifying agent. The formulated forms were extensively evaluated for sensory attributes, proximate composition, physicochemical properties such as water holding capacity (WHC), oil holding capacity (OHC) and pH as well as microstructure using scanning electron microscopy (SEM) and X-ray diffraction (XRD). All the formulations were subjected to sensory analysis, and T_1 performed best among various texture parameters with panel scores of 8.53 (taste), 8.57 (aroma) 8.50 (texture), 8.53(color) by preference in a 9-point hedonic scale. A substantial enrichment of dietary fibre and mineral profile in T_1 was demonstrated by the nutritional assessment, which yielded a significantly higher crude fibre (2.46% vs 1.10%) and ash content (1.18% vs 0.66%) as compared to control group This was confirmed with functional property analysis, which showed a significant improvement in WHC (2.8 g/g) and OHC (1.9 g/g) for T_1 as compared to control (1.9 g/g and 1.4 g/g, respectively). SEM evaluation of microstructure revealed a well-developed open crumb structure, more porous in T_1 and XRD results showed that degree of crystallinity was reduced due to the disrupting effect on gluten-starch network mediated by fibre. Taken together, these results indicate that 3% BGP powder is the optimal enrichment level for producing boa's with better nutritional value, techno functional properties and consumer acceptability.

Keywords: Bottle gourd peel, essential garlic oil, steamed bao bun, proximate analysis, microstructural analysis

Introduction

A useful member of the Cucurbitaceae family, the bottle gourd *(Lagenaria siceraria)* is popular for its therapeutic and nutritional qualities. In addition, because of their high level of antioxidants, minerals, and bioactive substances, its leaves and seeds provide substantial health benefits. There is a gap in the investigation of novel culinary applications since, despite the bottle gourd's and its by-products' great potential, little research has been done on their usage in drinks, confections, dairy products, and baked goods (Bhutani *et al*. 2025) [4]. A large proportion of processing fruits and vegetables constitutes the waste or by-products which can be higher than 25 to 30% of animal carcasses group. The most important components of this trash are seeds, skins, rinds and pomace that may contain potential bioactive compounds including carotenoids, polyphenols, dietary fibres, vitamins and enzymes as well as lipids. These phytochemicals can be used in various industries, including the food industry (for example, functional or enriched foods), the health sector (drugs and pharmaceuticals), textiles etc (Sagar *et al*. 2018) [9]. Nowadays, steamed bread is well known, and popular breakfast item consumed in China, Japan, Korea and Southeast Asian countries (Lin *et al*. 2012) [6]. Steam buns are eaten regularly by over 1.3 billion of people around Asia. They are made with steam bun, commercial yeast, water and wheat flour. They are characterized by their round shape, white colour and translucent/very thin skin-thin as parchment which distinguishes them from baked bread. Unlike baked, they too are steamed and not baked. A steam bun provides 123 calories, but with 51 grams that contains 1.5 grams of fat and is made up of 21 grams of carbohydrates. Eating foods that are high in fats and refined carbohydrates on a long-term basis generates surplus calories and provides little nutritious value in a balanced diet. This also means that it is limited with another nutrient or an interesting bioactive molecule which can be supplemented along with a biological product like banana flour, spirulina, fruit and vegetable peel (Oupathumpanont *et al*. 2022) [8]. Bottle gourd peels are hypothesised to be rich in triterpenoids, flavone C-glycosides and cucurbitacin B, D, G, and H. (Devi *et al*. 2023) [5]. An unexpected revelation was that the antioxidant activity of the bottle gourd peel is several orders of magnitude greater than even that of the pulp and whole fruit. According to some studies, its peel, which is rich in antioxidants, might play a role in the prevention of diseases caused by oxidative damage. In addition, the mean phytochemical properties of bottle gourd peels were established to be an important biological chemicals sources with total phenolic contents and antioxidant capacity from 20-525 mg GAE/g and 15.02-75.95%, respectively (Bhutani *et al*. 2025) [4]. Thus, considerable investigations have been directed towards the use of fruit and vegetable pomaces for improving the quality of baked and roasted food. Bottle gourd peel is one of the potential functional foods for food fortification and it is a promising source of dietary fibre, phenolic compounds, antioxidants and many vitamins and minerals which are nutrient-rich agro-industrial by-product. Since vegetable by-products are used generally in cereal based foods, there are limited studies on using bottle gourd peel in steamed buns and its effect on quality and sensory quality. Steamed buns are more moisture-rich than baked bread and therefore have a shorter shelf life (Zhu *et al*. 2014) [16]. Essential garlic oil, in its undiluted form, is 200 times more antibacterial than garlic powder and 900 times more antibacterial than raw garlic. Fresh Go is used in the food business as antimicrobial, flavouring and natural antioxidant (Yasin *et al*. 2022) [15]. Natural chemicals such as rosemary and essential garlic oil are natural preservatives, as they inhibit the growth of aerobic microbes, molds, yeasts, lactic acid bacteria and coliform (Verma *et al*. 2023) [13]. Therefore, the aim of this study was to investigate the effect of bottle gourd peel supplementation on the nutritional, physicochemical and sensory characteristics of steamed buns (Sunasara & Battalwar 2025) [10].

Materials and methods

Materials

Fresh bottle gourd, refined wheat flour, baking powder, yeast, refined oil, sugar, table salt, essential garlic oil & water are acquired from the locale market of Lucknow.

Bottle gourd peel (BGP) powder Preparation

The vegetables were washed and peeled manually using a stainless- steel peeler and the peels were collected. Peels are blanched at 60 °C and kept under the sun for drying for 3 to 5 days. Dried peels were milled and sieved and stored in plastic container at room temperature.

Standardization and Development of Enriched Bao Bun

The basic formulation of dough of steamed Bao Bun consists of refined wheat flour, yeast, sugar, salt and water (i.e. control). Refined wheat flour was replaced with BGP at 3% and 10% and mixed thoroughly to get uniform mixture. The total weight of flour base was maintained at 150g in all formulations to ensure uniformity. The dry yeast was activated using milk at 37 ◦C for 3 min. In dough preparation, all dry ingredients were sieved and mixed thoroughly followed by addition of yeast slurry and addition of essential garlic oil according to formulation. Then dough was allowed to proof for 1 hr until doubled in volume before shaping. After that dough was divided into equal portion and again second proofing was done for 30 minutes. Then buns were steamed in steamer for 8 to 10 min and allowed to cool to room temperature, resulting in the final product—enriched bao bu

Fig 1: Three samples of bao bun

Sensory Evaluation of Bao bun

Bao buns sensory characterisation was made through 20 semi-trained panellists with age ranging between 20 and 35. The sensory properties of sample were assessed through a 9-point hedonic scale where 1 denotes "dislike extremely" and 9 indicates "like extremely." The panellists ranked the flavour, taste, texture, crust and crumb colour, aftertaste feeling and overall acceptability. Data were analysed using ANOVA followed by Duncan's multiple range test ($p<0.05$) in SPSS software.

Proximate analysis of bao bun

Moisture content

All bao bun samples moisture content was analyzed by using AOAC method.

Crude protein

The Kjeldahl method, as specified by the AOAC, was used to calculate the protein content of the samples.

Crude fat
The Soxhlet apparatus (AOAC method) was used to measure the amount of fat of bread samples.

Crude fiber
Crude fibre of the bread samples was evaluated by using standard official method of AOAC.

Ash
The total ash percentage of the bread samples was assessed by using standard official method of AOAC.

Carbohydrates
The total carbohydrate content was analyzed using the A.O.A.C. technique applying the difference method.

Physiochemical Analysis
Water Holding Capacity and Oil Holding Capacity (WHC/OHC)
The water holding capacity (WHC) and oil holding capacity (OHC) of the control and bottle gourd peel powder incorporated bao buns were assessed following standard procedures with slight modifications. To carry out the analysis, approximately 1 g of dried bao bun sample was taken and mixed with 5 mL of either distilled water or edible oil. The mixture was then vortexed for about 10 seconds to ensure uniformity. Once a consistent suspension was formed, it was left undisturbed at room temperature (25°C) for 30 minutes, allowing adequate time for absorption. The suspension was then centrifuged at 3000 rpm for 15 minutes, after which the supernatant was carefully removed and discarded. The weight of the remaining sediment was recorded, and the WHC and OHC values were expressed as grams of water or oil retained per gram of sample (g/g).

Water Holding Capacity (WHC)

$$WHC\ (g/g) = \frac{Weight\ of\ hydrated\ sample - Initial\ sample\ weight}{Initial\ sample\ weight}$$

Oil Holding Capacity (OHC)

$$OHC\ (g/g) = \frac{Weight\ of\ oil\ absorbed\ sample - Initial\ sample\ weight}{Initial\ sample\ weight}$$

pH measurement
The method was used for pH measurement of the control and for addition of bao buns. The sample extract was prepared by homogenizing 5g of the fresh bao bun sample with 10ml of distilled water. The filtrate was filtered through a filter paper. pH was measured using a calibrated digital pH meter.

Microstructural Analysis
Scanning Electron Microscopy (SEM)
Scanning Electron Microscopy (SEM) was used to examine the surface morphology and microstructural features of a freeze-dried sample of control and bottle gourd peel powder included bao buns with particle sizes ranging from 2 to 4 mm. Carbon adhesive tape was used to mount the dried samples onto aluminium stubs, and then a sputter coater was used to increase conductivity. A high-resolution field emission scanning electron microscope (JSM 6490) running at 10 kV was then used to analyse the produced samples.
XRD Analysis
The X-ray diffraction (XRD) investigation of the powdered sample was performed using a X-ray diffractometer with Cu-Kα radiation (λ = 1.5406 Å). In order to characterize the crystallinity of the sample, diffraction patterns were recorded for a 2θ range of 10°-80°. The obtained diffraction peaks were analysed to check if the material was crystalline or amorphous.

Results
Sensory Evaluation
The sensory evaluation results revealed significant differences ($p < 0.05$) among the control (C), T_1, and T_2 formulations across all assessed attributes, including taste, colour, texture, aroma, and overall acceptability. The addition of bottle gourd peel powder notably influenced the sensory characteristics of the bao buns. Among all formulations, T_1 containing 3% bottle gourd peel powder achieved the highest scores and was most preferred by the sensory panel, recording superior values for taste (8.53±0.51), colour (8.53±0.51), texture (8.50±0.51), aroma (8.57±0.50), and overall acceptability (8.50±0.28).
The superior performance of T_1 can be attributed to the well-balanced incorporation level, which enhanced flavour, appearance, and texture without compromising palatability. The subtle greenish-brown colour from natural pigments and dietary fibre likely reinforced its perception as nutritious, while Maillard reaction products formed during fermentation and steaming may have further improved aroma and taste.
Conversely, T_2 showed a decline in sensory scores, likely due to its more pronounced flavour, denser texture, and deeper colour at higher powder concentrations, which reduced consumer appeal. These findings align with previous studies on fibre-enriched steamed bakery products, confirming that 3% bottle gourd peel powder is the optimal level for achieving both enhanced nutritional quality and maximum sensory acceptability in bao bun.

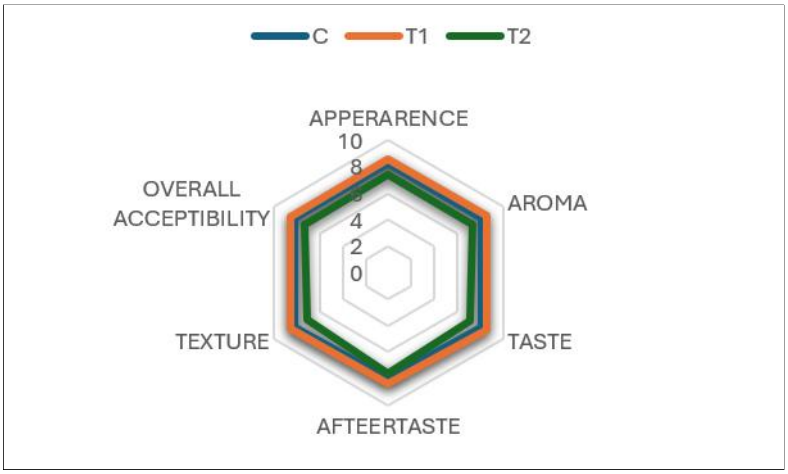

Fig 2: Radar chart of sensory evaluation of three samples

Proximate analysis

The proximate composition of the control and T_1 bao buns showed notable differences upon bottle gourd peel powder incorporation. The moisture content of T_1 (29.71%) was lower than the control (38.67%), likely due to the hygroscopic nature of bottle gourd peel fibre altering water distribution during steaming. Fat content slightly decreased in T_1 (8.59%) compared to the control (9.89%), attributable to the partial replacement of wheat flour with a low-fat ingredient.

Protein content was marginally higher in T_1 (12%) than the control (11%), possibly due to the natural protein fraction present in bottle gourd peel supplementing the wheat gluten matrix. Notably, crude fibre content significantly increased in T_1 (2.46%) compared to the control (1.10%), consistent with the fibrous nature of bottle gourd peel, highlighting its potential to improve the dietary fibre profile of bao buns. Although T_1 does not yet meet the threshold of 3 g fibre per 100 g for a good fibre source, the substantial increase suggests that higher incorporation levels could achieve this target.

Ash content in T_1 (1.18%) was approximately 1.8 times greater than the control (0.66%), reflecting the higher mineral content contributed by bottle gourd peel, particularly calcium, potassium, and magnesium. Carbohydrate content was higher in T_1 (46.06%) than the control (38.68%), which is largely a mathematical consequence of the lower moisture content, though the complex carbohydrates and non-starch polysaccharides from bottle gourd peel may also have contributed to this increase.

Physiochemical Analysis

WHC & OHC

The graph indicates the Water Holding Capacity (WHC) and Oil Holding Capacity (OHC) of two bao bun samples i.e. control and bottle gourd peel powder incorporated sample (T_1) which showed increasing trend in these functional parameters on incorporation of the peel powder.

The WHC and OHC of the control bao bun were 1.9 g/g and 1.4 g/g, respectively, whereas the WHC and OHC of T_1 were significantly higher at 2.8 g/g and 1.9 g/g, respectively. The observed improvement in both water and oil binding capacities in T_1 was due to the high dietary fibre content of bottle gourd peel powder, which is well-known for its excellent water and oil absorption properties.

An increase in WHC indicates an increased ability to hold moisture within the product matrix that could be translated into a softer crumb texture and longer freshness of the bao buns. The increased OHC also implies a better entrapment of flavour and a richer mouthfeel in the final product. Overall, the results indicated that the incorporation of bottle gourd peel powder had a positive impact on the functional properties of the developed bao buns and thus, improved their overall quality profile.

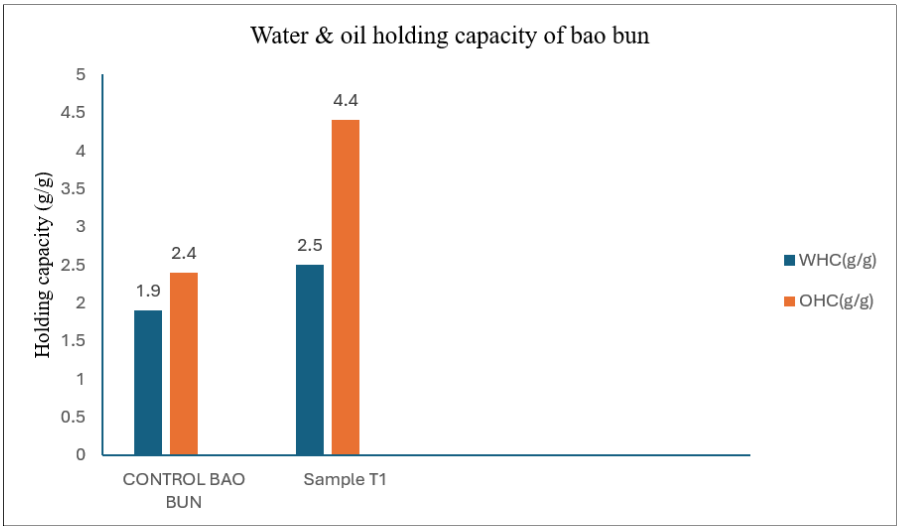

Fig 3: Graphical representation of WHC & OHC of two sample

pH measurement

The pH analysis of control and T_1 bao bun samples showed significant changes with addition of bottle gourd peel powder. The control sample exhibited a relatively higher pH value of 5.8 while T_1 sample exhibited a lower pH value of 5.4.

Microstructural analysis

Scanning electron microscopy (SEM) analysis revealed distinct microstructural differences between the control and T_1 bao bun samples. The control exhibited a smooth, compact, and uniform structure with smaller air cells, indicative of a well-developed gluten network. In contrast, T_1 supplemented with bottle gourd peel powder displayed a more porous and irregular structure with larger gas cells and rougher surface morphology.

These structural changes can be attributed to the high dietary fibre content of bottle gourd peel powder, which interferes with gluten-starch matrix formation, thereby reducing dough cohesiveness and elasticity. The partial replacement of wheat flour weakened the gluten network, resulting in decreased compactness and smoothness. Additionally, the water-absorbing capacity of dietary fibre disrupted the viscoelastic properties of the dough, further altering its rheological behaviour.

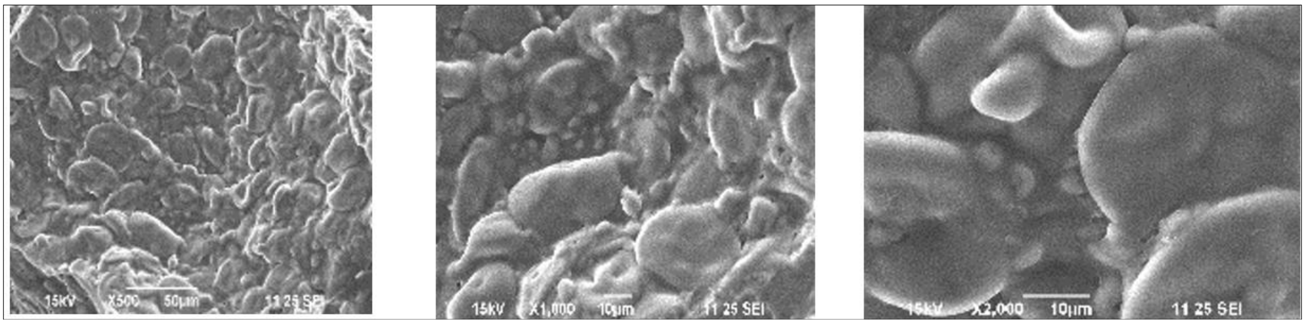

Fig 4: SEM image of control bun

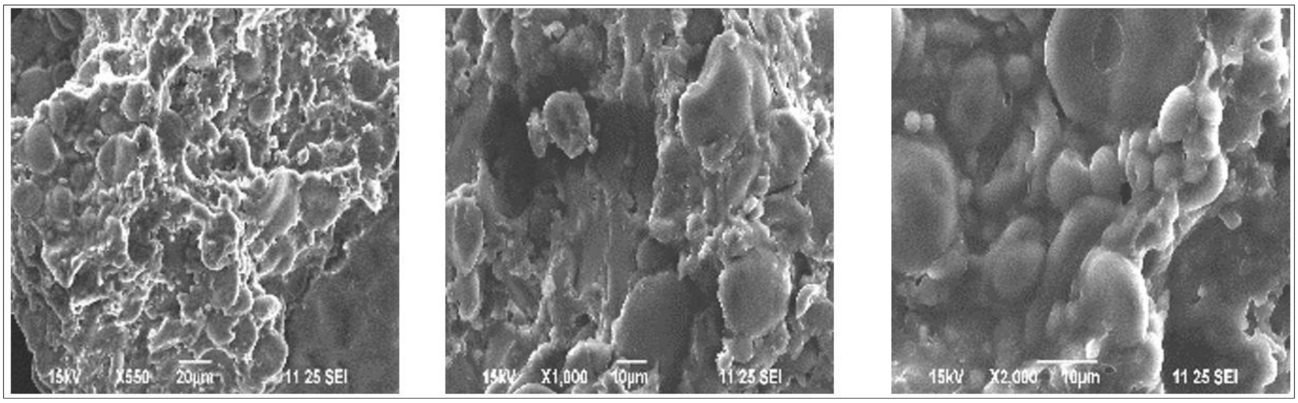

Fig 5: SEM picture of T_1 sample

Xrd analysis

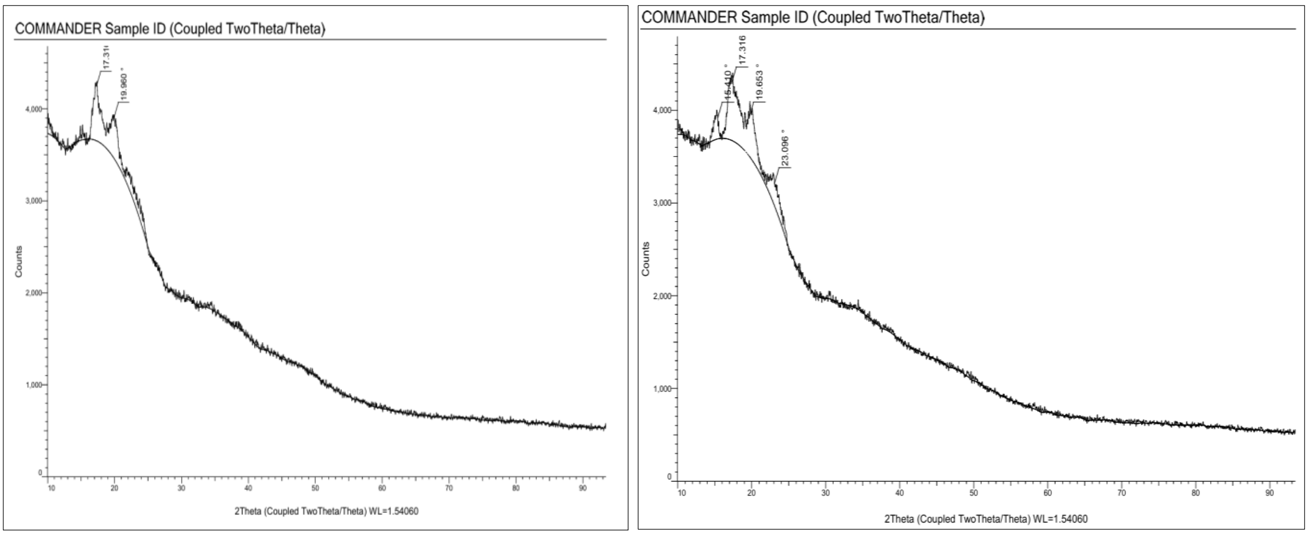

Fig 4: XRD image of control bao bun and T_1 sample

Analysis of X-ray Diffraction (XRD) for the analysis of crystalline or amorphous structure in all samples of bao bun containing bottle gourd peel powder control bao bun the diffraction pattern of the control bao bun exhibited several characteristic peaks associated with gluten structure and starch crystallinity inherent in wheat flour. The peak intensity and peak broadening were slightly different for the bottle gourd peel included bao bun than the control sample. The reduction in the peak intensity of the supplemented sample showed a decrease in crystallinity due to dietary fibre from bottle gourd peel powder as well. This caused the fibrous components to disrupt the orderly structure of gluten matrix and starch granules, resulting in more amorphous structure. The large and broad diffraction peaks in the XRD pattern of enriched sample show that bottle gourd peel contains cellulose, hemicellulose, non-crystalline polysaccharides (other plant fiber components). The incorporation of bottle gourd peel powder may also have altered the interactions between starch and protein molecules thus affecting the structure of a dough matrix. The relatively lower crystallinity of the supplemented bao bun may imply greater hydration state and structural changes due to fibre incorporation.

Table 1: Total score of sensory evaluation of three sample of steamed bao bun

Bao buns	Taste	Color	Texture	Aroma	Overall Acceptability
C	8.17±0.46	8.30±0.79	8.23±0.63	8.17±0.70	8.18±0.26
T_1	8.53±0.51	8.53±0.51	8.50±0.51	8.57±0.50	8.50±0.28
T_2	7.17±0.59	7.40±0.56	7.13±0.78	7.30±0.65	7.32±0.33

Table 2: Proximate analysis of control sample and sample T_1

Proximate analysis	Bao bun (control)	Enriched bao bun(T_1)
Moisture (%)	38.67%	29.71%
Fat (%)	9.89%	8.59%
Protein (%)	11%	12%
Fiber (%)	1.10%	2.46%
Ash (%)	0.66%	1.18%
Carbohydrate (%)	38.68%	46.06%

Table 3: WHC & OHC of control sample and sample T_1

Sample	WHC(g/g)	OHC(g/g)
Control bao bun	1.9	1.4
Sample T_1	2.8	1.9

Discussion

Despite lower sensory scores of T_2, T_1 presented the best overall acceptance scores. These results were aligned with Lin & *et al*. (2012) [6] showed that steamed bread at the lowest level of fibre-rich ingredients increased sensory properties, while higher levels affected texture and consumer acceptance. Wu & Shiau (2015) [14] also found that 5-10% integration retained beneficial sensory characteristics and reduced the probability of elimination. The percentage of crude fibre of bao bun increased from 1.10% of control sample to 2.46%in T_1. The result is in accordance with the study of Upadhyay *et al*. (2023) [12] who reported that increase in dietary fibre content in bakery products and also Sunasara and Battalwar (2025) [10] stated that vegetable and fruit peels can serve as a rich source of fibre and improved nutritional quality of food products. The water and oil holding capacity of T_1 were higher than those of control sample. Afrin *et al*. (2023) [1] reported that bottle gourd peel possesses excellent water absorption due to its high fibre content. The progressive increase in WHC with increasing levels of peel powder incorporation can be attributed to the abundance of soluble and insoluble dietary fibre fractions — particularly cellulose, hemicellulose, and lignin present in the vegetable peels, which possess a strong affinity for water molecules. The little increase OHC in between reflects the hydrophilic character of the functional groups present in the peel powder, which favoured water retention over oil retention (Aljobair, 2024) [2]. The pH of the sample T_1 is less as compared to control because it contains bottle gourd peel powder it is because the presence of naturally occurring organic acid. Cakes supplemented with watermelon rind and Sharlyn melon peel powders had lower pH values which attributed to the acidic character of the peel materials (Al Sayed & Ahmed, 2013) [4].

Conclusion

An attempt was made to develop steamed bao buns enriched in nutrition by replacing refined wheat flour with bottle gourd peel (BGP) powder at 3% (T_1) and 10% (T_2) along with the addition of essential garlic oil as a supplement. T_1 was the best formulation as it provided an optimal balance between nutritional quality and sensory acceptability.

Compared with control, the contents of dietary fibre (2.46%), ash (1.18%), water holding capacity (2.8 g/g), and oil holding capacity (1.9 g/g) were higher in T_1 which served as its functional characteristics and BGP powder contained numerous minerals. Results indicated that gluten-starch matrix was altered by BGP — as observed through scanning electron microscopy (SEM) and X-ray diffraction (XRD) where a more porous, less crystalline structure was formed due to the fibre content of the peel. These microstructural alterations did not affect sensory properties since T_1 was rated with the highest scores in all attributes, confirming its consumer preference.

These findings confirm the potential of using BGP powder as a novel functional ingredient to fortify cereals, thereby supplying essential nutrients while minimizing agro-industrial wastes. Future studies should focus on the shelf-life stability, retention of antioxidants and bioavailability of phenolics in BGP and further its development as a functional food with health-promoting benefits in bao buns.

Acknowledgements
I would like to express my sincere gratitude to Dr. Sunita Mishra for her invaluable guidance, continuous encouragement, and expert supervision throughout the course of this research work. I am also thankful to the laboratory staff of the Department of Food Science and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow, for their technical assistance and support during the experimental work. I gratefully acknowledge Mr. Koushik Goswami and Mrs. Mohua Goswami for their generous financial support and unwavering encouragement, which made this research possible. I also wish to express my heartfelt appreciation to Ms. Juhi Kalwar for her constant moral support and motivation throughout this journey.

References
1. Afrin A, Khatun MK, Sakil MA, Iqbal A, Haque MR. Evaluation of quality attributes of fresh and fermented bottle gourd peels for food-waste processing industry. J Bangladesh Agric Univ. 2023;21(2):214-223.
2. Aljobair MO. Enrichment of bread with green pumpkin, watermelon and cucumber peels: physicochemical, pasting, rheological, antioxidant and organoleptic properties. J Food Qual. 2024;2024:6649325.
3. Al-Sayed HMA, Ahmed AR. Utilization of watermelon rinds and Sharlyn melon peels as a natural source of dietary fiber and antioxidants in cake. Ann Agric Sci. 2013;58(1):83-95.
4. Bhutani M, Gaur SS, Shams R, Dash KK. Sustainable utilization of bottle gourd by-products: a nutritional and functional perspective. Food Chem Adv. 2025;8:101073.
5. Devi SR, Kumari T, Deka SC. Extraction of dietary fiber and phytochemicals from bottle gourd seeds (*Lagenaria siceraria*), its physicochemical properties and application in food model. Food Chem Adv. 2023;2:100252.
6. Lin SY, Chen HH, Lu S, Wang PC. Effects of blending of wheat flour with barley flour on dough and steamed bread properties. J Texture Stud. 2012;43(6):385-392.
7. Mishra S, Mishra S, Kumari S, Bharali D. Evaluation of nutritional and microbial properties of bread developed by incorporating *Moringa oleifera* leaves and fenugreek leaves. Asian Food Sci J. 2021;20(7):93-101.
8. Oupathumpanont O, Wisnakkul S, Anunvrapong A. Improvement of the texture and prebiotic properties of steamed bun quality using cultivated banana (*Musa* ABB cv. Kluai 'Namwa') flour. Food Res. 2022;6(6):152-159.
9. Sagar NA, Pareek S, Sharma S, Yahia EM, Lobo MG. Fruit and vegetable waste: bioactive compounds, their extraction, and possible utilization. Compr Rev Food Sci Food Saf. 2018;17(3):512-531.
10. Sunasara H, Battalwar R. Peel to plate: a study on the culinary applications of fruit and vegetable peels. J Emerg Technol Innov Res. 2025;12(6)-i47.
11. Syu PC, Zhang QF, Lin SD. Physicochemical, antioxidant, sensory, and starch digestibility properties of steamed bread fortified with tamarillo powder. Foods. 2023;12(12):2306.
12. Upadhyay S, Tiwari R, Kumar S, Gupta SM, Kumar V, Rautela I, *et al*. Utilization of food waste for the development of composite bread. Sustainability. 2023;15(17):13079.
13. Verma T, Deka P, Aggarwal A, Roy S, Roychoudhury S, Chang KT, *et al*. Garlic (*Allium sativum* L.) essential oil and its biological activities in food preservation and nutritionally enriched garlic-based snack foods: a review. Front Nutr. 2023;10:1120377.
14. Wu MY, Shiau SY. Effect of the amount and particle size of pineapple peel fiber on dough rheology and steamed bread quality. J Food Process Preserv. 2015;39(6):549-558.
15. Yasin G, Jasim SA, Mahmudiono T, Al-Shawi SG, Shichiyakh RA, Shoukat S, *et al*. Investigating the effect of garlic (*Allium sativum*) essential oil on foodborne pathogenic microorganisms. Food Sci Technol. 2022;42.
16. Zhu F. Influence of ingredients and chemical components on the quality of Chinese steamed bread. Food Chem. 2014;163:154-162.