Effects of Incorporating Dragon Fruit Peel Powder into Cookies on Their Nutritional Composition, Microbial Quality, And Sensory Properties

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Abstract

This study investigates the effects of incorporating dragon fruit peel powder (DPP) into cookies on their nutritional composition, microbial quality, and sensory properties. Two formulations were prepared: a control (DPP0) and a formulation with 5% DPP (DPP5). Nutritional analysis revealed significant improvements in ash (2.42±0.03% in DPP5 and 2.15±0.02% in DPP0), crude protein (7.69±0.14% in DPP5 and 6.75±0.02% in DPP0), crude fiber (0.82±0.08% in DPP5 and 0.09±0.02% in DPP0), and crude fat (27.63±0.04% in DPP5 and 26.63±0.02% in DPP0). Moisture content slightly decreased (4.50±0.14% in DPP5 and 4.78±0.21% in DPP0), and carbohydrate content was lower in DPP5 (56.94±0.03%) compared to DPP0 (59.60±0.19%). Over a 30-day storage period, the DPP5 cookies consistently showed lower microbial loads, starting from 0.5×10^2 CFU/g at day 5 to 1.9×10^3 CFU/g at day 30, compared to DPP0, which ranged from 0.8×10^2 CFU/g to 2.2×10^3 CFU/g over the same period. Sensory evaluation indicated a significant preference for DPP5 cookies, with mean scores for color (8.40±0.67), texture (8.28±0.55), odor (8.50±0.82), flavor (8.50±0.75), and overall acceptance (8.03±0.70), all surpassing those of the DPP0 cookies, which scored 7.25±0.63, 7.13±0.46, 7.05±0.68, 7.20±0.69, and 6.90±0.78, respectively. These results suggest that Dragon fruit peel powder enhances the nutritional composition, microbial stability, and sensory appeal of cookies, making it a valuable ingredient for functional food development.

Keywords: Dragon fruit, Peel, Powder, Cookies, Development.

1. Introduction

Dragon fruit (*Hylocereus undatus*), a vibrant cactus fruit gaining popularity in Bangladesh, is rich in fiber, vitamin C, antioxidants, and phytonutrients. While the pulp is widely used, the peel is often discarded during processing, which contains potent antioxidants, polyphenols, and dietary fiber, and offers health benefits like glycemic control and anti-aging effects (Chatterjee et al., 2024).

1.1. Problem Statement

Despite the nutritional potential of dragon fruit peel, it is largely discarded during fruit processing which contributes to food waste and underutilization of a valuable by-product. Meanwhile, cookies, though popular and widely consumed, are typically made from refined ingredients with limited health benefits. There is a growing need to develop functional snack products that are not only appealing and shelf-stable but also enriched with natural sources of fiber, antioxidants, and bioactive compounds. Incorporating dragon fruit peel powder into cookies presents a sustainable and innovative solution to enhance nutritional value and minimize food industry waste.

1.2. Objectives

- To formulate cookies by incorporating dragon fruit peel powder (DFPP).
- To evaluate the nutritional composition of DFPP-enriched cookies.
- To assess the microbial quality of the cookies over time.
- To examine the sensory attributes (taste, texture, aroma, color) and consumer acceptance of the developed cookies.

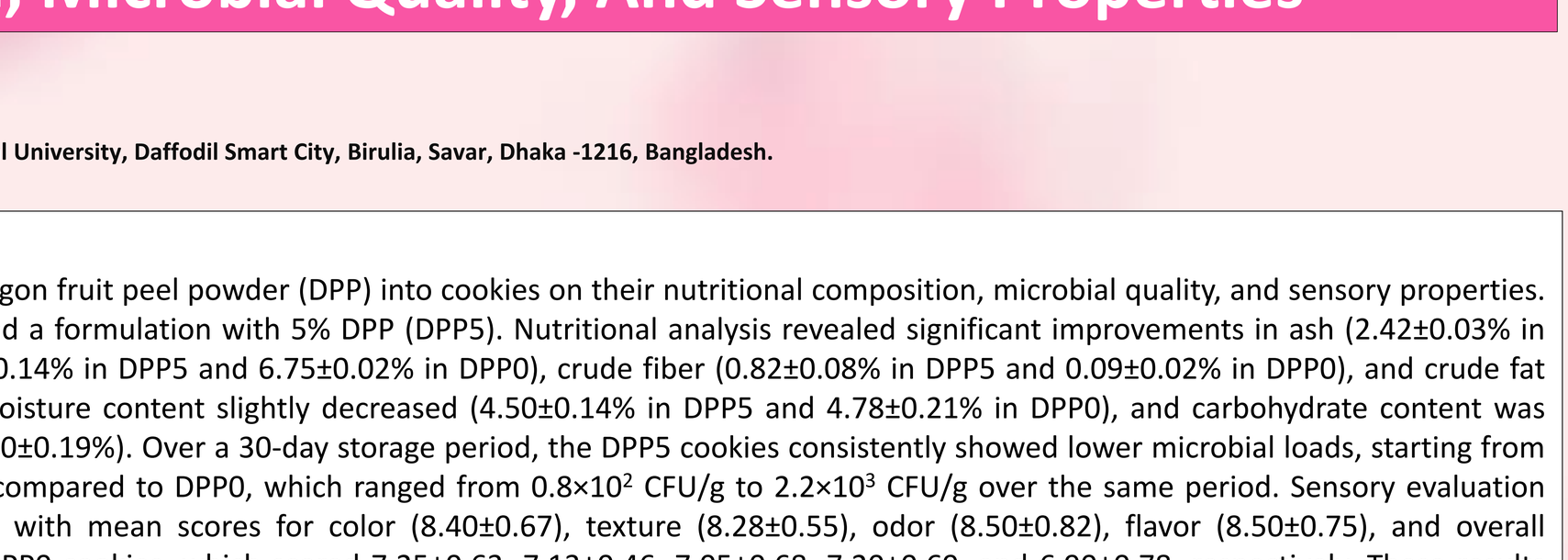

Figure 1. Production flowchart of Dragon fruit peel powder cookies.

3. Results and Discussion

Table 2. Nutritional Composition of Dragon fruit peel powder cookies

Samples	DPP0(Control)	DPP5
Moisture	4.78±0.21[a]	4.50±0.14[a]
Ash	2.15±0.02[a]	2.42±0.03[b]
Crude protein	6.75±0.02[a]	7.69±0.14[b]
Crude Fiber	0.09±0.02[a]	0.82±0.08[b]
Crude Fat	26.63±0.02[a]	27.63±0.04[b]
CHO	59.60±0.19[a]	56.94±0.03[b]

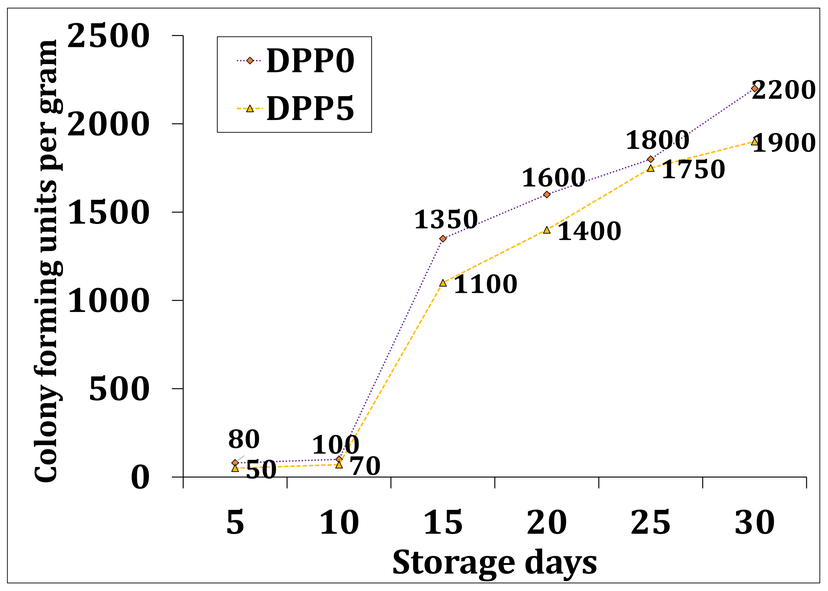

Figure 2. Microbial quality of Dragon fruit peel powder cookies

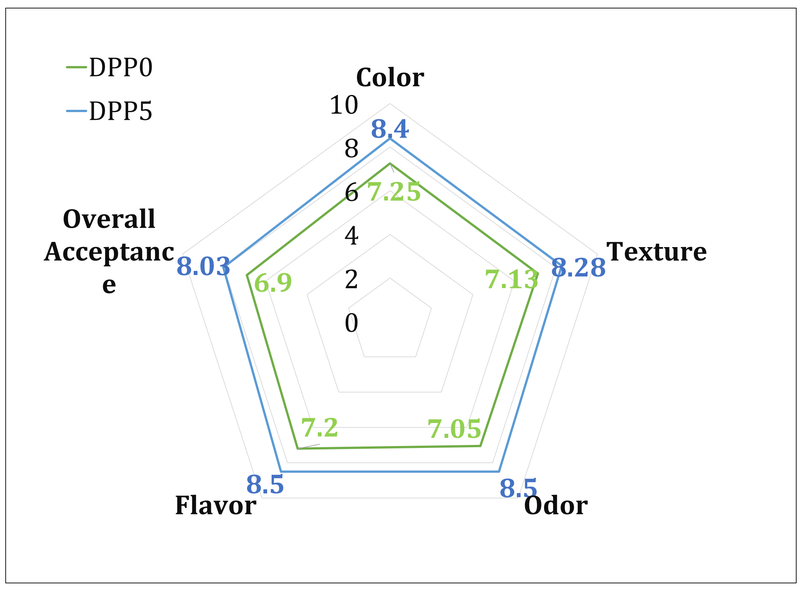

Figure 3. Sensory mean score of Dragon fruit peel powder cookies

2. Methodology

Table 1. Formulation of dragon peel powder composite cookies

Ingredients (g)	DPP0 (Control)	DPP5 (5%)
Wheat flour	300	285
Dragon fruit peel powder	--	15
Sugar	100	100
Butter	165	165
Milk powder	10	10
Vanilla essence (mL)	2.5	2.5
Salt	1.5	1.5

4. Conclusion

Incorporating dragon fruit peel powder into cookies not only enhances the nutritional quality by increasing protein, ash, and fiber content but also slightly modifies the moisture and fat content. Furthermore, DPP incorporation improves the microbial quality of the cookies, indicating lower microbial loads over a 30-day storage period. Sensory evaluations indicate that DPP-enriched cookies are generally preferred over the control samples, with significantly higher scores for color, texture, odor, flavor, and overall acceptance. Further research is recommended to optimize sensory properties and assess consumer acceptance of DPP-fortified cookies on a larger scale.

References

Chatterjee, D., Mansuri, S., Poonia, N., Kesharwani, P., Lather, V., & Pandita, D. (2024). Therapeutic potential of various functional components presents within dragon fruit: A review. *Hybrid Advances*, 100185.