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RESEARCH ARTICLE

Assessing consumer preferences for plant-based ice cream: A conjoint analysis of soy and almond milk varieties

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Abstract

India, as the world's largest producer of milk, faces significant challenges due to the perishability of dairy products, driving demand for alternative value-added options like frozen desserts. Plant-based ice cream made from soy and almond milk offers a sustainable and healthier alternative to traditional dairy-based options. This study aims to explore consumer preferences for plant-based ice cream, addressing the growing demand for dairy-free and health-conscious dessert options. Using Choice-Based Conjoint Analysis (CBC), a survey was conducted among 120 respondents in Coimbatore, India, to evaluate preferences for plant-based ice cream across four key attributes: health benefits, taste, price and product form (cone vs. cup). Low-fat content significantly influenced purchasing decisions under the health benefits attribute. Chocolate emerged as the preferred flavour, with a utility value of 0.362, while cones were favoured over cups with a utility value of 1.612. Price was the most influential attribute, contributing 46.5% to consumer decision-making, followed by health benefits. The optimal product configuration included a cone-shaped, chocolate-flavoured, low-fat plant-based ice cream priced at Rs. 70. The findings provide crucial insights for manufacturers, highlighting the importance of competitive pricing and health-focused innovations to meet the demand for healthier, plant-based ice cream varieties in India. These results can guide product development and marketing strategies in the expanding frozen dessert market.

Keywords

almond milk; consumer acceptance; frozen dessert; low-fat ice cream; price; soy milk

Introduction

India is the world's leading milk producer, contributing approximately 25% of global milk production, with an output of 230.6 million tonnes in 2022-2023, according to the National Dairy Development Board of India. One of the primary challenges in the dairy industry is the perishability of raw materials, as milk and its derivatives require stringent storage conditions to ensure quality and food safety. According to the Indian Ice Cream Manufacturers Association, per capita ice cream consumption in India has risen significantly. In 2011, it was 400 mL per person, while by 2023, it had increased to 1.6 liters per person. In comparison, the global average is 2.3 liters (National Dairy Development Board, 2013-14) (1). In India, the dairy market is expected to be driven by fresh products, with a rising demand for value-added items such as cheese, yogurt, UHT milk, flavored milk and whey. Among these, ghee has emerged as the largest segment, accounting for about 15-18% of the overall dairy

market (CARE, 2020). Converting milk into higher shelf-life products, such as frozen desserts and ice cream, presents a viable solution to address this issue. However, the growing shift toward plant-based diets and concerns about lactose intolerance and dairy allergies have led to the increasing popularity of plant-based alternatives like soy and almond milk ice creams.

Producing value-added products offers better returns for entrepreneurs in the food industry (2). However, the processing of plant-based alternatives, especially in the ice cream sector, is still emerging in India compared to other countries. Markets in nations such as the United States, Germany and Brazil have already embraced plant-based products, including dairy alternatives, to cater to the growing demand for vegan and lactose-free options.

Plant-based frozen desserts, typically made from soy, almond, or coconut milk, are consumed in a frozen state and have rapidly gained popularity in India due to rising health awareness and environmental concerns (3). The Indian frozen dessert market, valued at USD 3.20 billion in 2023, is projected to grow at a Compound Annual Growth Rate (CAGR) of 10.5% from 2025 to 2029, with plant-based alternatives emerging as one of the fastest-growing segments in food processing. Globally, plant-based ice cream consumption is expected to rise by over 30% by 2028, reaching USD 97.85 billion (4). The plant-based ice cream market in India is experiencing rapid growth, driven by increasing health awareness and a shift toward vegan diets. In FY 2023, the market was valued at approximately USD 70.62 million and is projected to reach USD 143.8 million by FY 2031, with an expected compound annual growth rate (CAGR) of 9.3% (5). Furthermore, the Indian plant-based ice cream sector is anticipated to continue expanding, with Future Market Insights forecasting a CAGR of 8.5% from 2023 to 2033. This growth is fuelled by rising consumer demand for low-processed, low-sugar, vegan and label-free desserts.

One of the key challenges for the plant-based ice cream industry is that it is still considered a niche market, with limited daily consumption compared to traditional dairy ice creams (6). However, consumer behaviour during the COVID-19 pandemic revealed a shift toward healthier and more sustainable food choices, a trend that has persisted post-lockdown (7). In today's health-conscious climate, consumers are increasingly open to trying plant-based fortified products (8). The "better-for-you" segment has expanded rapidly, driven by rising demand for plant -based and functional foods (9). Soy and almond milk-based ice creams, enriched with probiotics and other health benefits, are gaining traction among health-conscious buyers (10, 11). The Indian Institute of Soybean Research estimated that soybean production in India for the 2020-21 year was around 129 lakh tonnes, cultivated across 128 lakh hectares. The productivity of soybean in India varies widely, ranging from 400 to 2300 kg per hectare, with a median of 1000 kg per hectare in recent years. This is approximately 60% of the global average and is among the lowest productivity levels among major soybean-producing countries. Madhya Pradesh and Maharashtra together account for 88% of the country's total soybean production, with average productivity rates of 1,125 kg/ha and 946 kg/ha, respectively (National Academy of Agricultural Sciences).

India is the sixth-largest almond producer globally, with an annual output of approximately 50000 to 60000 metric tons. The key varieties cultivated include Nonpareil, Carmel and Mission. The primary almond-growing states are Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Punjab, Haryana and Rajasthan (Agri. exchange, APEDA, 2021-2022). California almonds are among the most popular and widely consumed nuts worldwide, recognized for their superior quality, flavor and nutritional benefits. According to the Almond Board of California, in the 2022/23 crop year (August-July), India was the top export market for California almonds. The cost of importing California almonds into India is affected by various factors, such as global market prices, shipping expenses and import duties. As of September 2023, India lifted the 20% retaliatory tariffs on U.S. almonds, which had been introduced in response to U.S. tariffs on imported steel and aluminium in 2018. This reduction reinstated the specific duty on U.S. almonds to ₹35 per kilogram for inshell almonds and ₹100 per kilogram for shelled almonds.

Nutritional qualities, such as low fat and low sugar, are key factors influencing consumer purchases of plant-based ice creams (12). As a result, brands offering plant-based, low-fat and dairy-free alternatives are gaining a competitive edge in the market (13, 14). Despite the clear growth in demand for plant-based frozen desserts, there is limited research on consumer preferences regarding specific attributes of plant-based ice cream. This study aims to investigate consumer preferences for plant-based ice cream by examining key attributes such as health benefits, price, taste and product form using conjoint analysis. Specifically, the objectives are to:

Evaluate health benefits: Explore the influence of factors like no artificial additives, low sugar and low fat on purchasing decisions for plant-based ice cream.

Examine price sensitivity: Analyse the role of pricing in consumer decision-making and its weight in product selection.

Identify taste preferences: Determine which flavours consumers prefer the most in the plant-based ice cream category.

Assess product form: Investigate consumer preferences for product presentation, focusing on cones versus cups.

These findings will provide actionable insights for manufacturers to create healthier plant-based ice cream products that align with consumer demand for taste, price and presentation, contributing to market growth in the frozen dessert industry. To support this study, previous research on various intrinsic and extrinsic product attributes in the food industry has been reviewed, as summarized in Table 1.

Theoretical framework

Random Utility Theory (RUT)

This study uses Random Utility Theory (RUT) as the foundation for applying conjoint analysis, which aims to elucidate consumer preferences for ice cream attributes. RUT, as described by (15) posits that the utility U_{ij} that an individual i derives from choosing alternative j comprises both a deterministic component V_{ij}, associated with the observable attributes of the product and a stochastic component ε_{ij} representing unobserved factors and error:

$$U_{ij} = V_{ij} + \varepsilon_{ij}$$

Table 1. Product attributes in food industry

No.	Author	Products	Product Attributes
1.	(20)	Ice cream	Intrinsic: Taste and Texture Extrinsic: Packaging material and Shape Both: Health benefits and appearance
2.	(19)	Packed tea	Brand, Price, Strength, Package
3.	(26)	Orange juice	Packaging type, Packaging claim, Product claim and Price
4.	(27)	Green tea products	Traceability, OCOP (One Commune, One Product) star certification, Producer information, Product information and Purchase place
5.	(28)	Hybrid meat	Protein Type, Price per 12 oz (8 Franks), Fat Content per Frank (43 g) and Package Claims
6.	(15)	Milk tea	Pearl size Sugar level Price Brand Type Cream cheese inclusion Amount of ice
7.	(24)	Wine	Price, Type, Region and Vintage year
8.	(16)	Laptop	Brand, Cost Screen size, Storage capacity, Processor, Quality/ Money back guarantee
9.	(22)	Ice cream	Intrinsic: sweetener Extrinsic: Brand and Package size

In the realm of conjoint analysis, RUT is utilized to model consumer preferences by decomposing the total utility into these components. The deterministic component V_{ij} is typically modelled as a linear function of the attributes of the product alternatives, each characterized by specific part-worth utility coefficients. This method allows for the quantification of how different attribute levels, such as product form, taste, health benefits and price, impact overall consumer preference.

The Multinomial Logit (MNL) model, a practical application of RUT in this study, assumes that the random utility component ε_{ij} follows a Gumbel distribution, leading to the following choice probability formulation,

$$P_{ij} = \frac{\exp(V_{ij})}{\sum_k \exp(V_{ik})}$$

where P_{ij} denotes the probability of selecting alternative *j* over other available options *k*. This model was employed to estimate the utility values for each attribute level, enabling the analysis of consumer preferences for various ice cream product configurations.

In this research, the application of RUT through the MNL model facilitated the examination of how different attributes and their levels - specifically product form, taste, health benefits and price - influence consumer choice. By estimating the utility coefficients and calculating relative importance, the study identified key factors driving consumer preferences and optimized product configurations accordingly. This approach not only provides insights into consumer behaviour but also informs strategic decisions in product development and marketing (15).

Additionally Lancaster's model of consumer behaviour, the theory of brand preferences, as discussed by (16) also asserts that the products were valued based on their attributes and that variations among products represent different combinations of these attributes.

Materials and Methods

Data collection

Coimbatore is rapidly becoming a major consumer hub, driven by urbanization, economic growth and a growing middle class. Its warm climate and shift towards health-conscious choices make it a prime location for researching "plant based" ice cream preferences. The target respondents for this study were ice cream consumers of Coimbatore, Tamil Nadu. The study employed convenient sampling to collect responses via an online questionnaire (17). According to previous study, online survey distribution is a feasible approach for conducting conjoint analysis (18). 120 responses were collected using structured questionnaire, while larger sample sizes are generally recommended for consumer preference studies, a report argued that a smaller sample size can be justified, as having respondents complete more cognitive tasks can yield results comparable to those obtained from a larger sample (19). This study analysed product attributes related to functionality, usability and pleasure (20).

Data analysis

Descriptive analysis

In this study, descriptive statistics were used to determine the socioeconomic characteristics of the respondents and to identify the percentage of respondents who selected specific product variants for each attribute. The product variant within each attribute that received the highest percentage was then selected as the basis for developing alternative product configurations.

Conjoint analysis

Conjoint analysis, as defined by (21), is a survey-based analytical technique used to estimate the value individuals assign to different attributes or features of concepts, products, or services. This method requires respondents to rank, rate, or choose between multiple products or services, with each option characterized by a distinct set of attributes. As noted, conjoint analysis is particularly valuable because it identifies the relative importance of the attributes that shape consumer preferences (22).

In this study, choice-based conjoint analysis was employed to rank product configurations. The utility values for each variant within each attribute were determined using MNL. The relative importance of each attribute was calculated using Eqn. 1 and Eqn. 2, while the mathematical model formulation for conjoint analysis is presented in Eqn. 3.

$$\text{Range} = \text{Maximum Utility value} - \text{Minimum Utility value} \quad (1)$$

$$\text{Relative Importance} = \frac{\text{Range of attribute}}{\text{Sum of ranges of all attribute}} * 100 \quad (2)$$

$$U_k = \beta_0 + \sum_{i=1}^{m}\sum_{j=1}^{n} u_{ijk} \quad (3)$$

where:

U_K = total utility of each product configuration alternative

β_o = a constant

U_{ijk} = utility of product configuration alternative *k* for attribute i and level *j*

m = number of attributes

n = number of levels

The results of the conjoint analysis were interpreted using various metrics, including utility values, relative importance and the ranking of product combinations as described in a standard protocol (19).

Results and Discussion

Cost-effectiveness of plant-based milk compared to cow milk

Plant-based milks, such as soy and almond milks, offer advantages for vegan and lactose-intolerant consumers, but they are typically more expensive than traditional cow or buffalo milk. Among plant-based options, soy milk is generally more affordable, with a cost of approximately ₹8 per kg, compared to ₹20 per kg for milk from animal sources (23). Almond milk, however, tends to be pricier due to the high cost of almonds and the processing required. While plant-based milks provide nutritional benefits, they often necessitate specialized processing, which can increase production costs. Additionally, they may have a shorter shelf life than cow's milk, leading to potential waste and further cost implications. These factors should be considered when evaluating the overall cost-effectiveness of plant-based milks for product production.

Descriptive analysis

Socioeconomic characteristics

Respondents provided demographic information about their age (in years), gender, educational background, annual family income (in rupees), occupational status, family size and number of kids in the family. The respondents' demographic distribution is reported in Table 2.

The product attributes were derived from usability, functionality and pleasure aspects and are presented in Table 3. Descriptive analysis was used to select the variants of each attributes for the study. The outcomes of the descriptive analysis can be seen in Tables 4.

Functionality aspect

The functionality aspect represents the most fundamental requirement for consumers, focusing on the product's ability to perform its intended functions. From the perspective of intrinsic and extrinsic attributes, these characteristics are classified as intrinsic, as they are inherent to the product itself. Attributes related to functionality include taste, aroma, colour, texture and other sensory characteristics. Taste, a major factor in ice cream purchasing decisions, was identified in this study as a key attribute from a functionality perspective. In relation to the taste attribute, consumers were presented with a range of flavours including Chocolate, Strawberry, Vanilla, Butterscotch, Black Currant and Mango. According to the survey results, the most popular choices were Butterscotch (33.33%) and Chocolate (27.50%), as shown in Table 4. For the purpose of constructing the product configuration, the functionality aspect was represented by a single attribute: taste, with two selected variants-Chocolate and Butterscotch.

Table 2. Socioeconomic characteristics of respondents (n = 120)

Socioeconomic characteristics	Respondents, *n* (%)
Age (in years)	
Up to 20	13 (10.83)
21 – 30	82 (68.33)
31 – 40	11 (9.17)
41 – 50	13 (10.83)
Above 50	1 (0.83)
Gender	
Female	55 (45.83)
Male	65 (54.17)
Educational background	
Higher secondary Education	2 (1.67)
Graduation	66 (55)
Post-Graduation	52 (43.33)
Occupational Status	
Student	57 (47.5)
Business	7 (5.83)
Unemployed	13 (10.83)
Home maker	6 (5)
Private Employee	35 (29.17)
Government Employee	2 (1.67)
Annual Family Income (in Rupees)	
Less than 20000	27 (22.5)
21000-30000	19 (15.83)
31000-40000	18 (15)
41000-50000	19 (15.83)
Above 50000	37 (30.83)
Family Size	
Less than 3 members	11 (9.17)
3-5 members	95 (79.17)
More than 5 members	14 (11.66)
Number of Kids in the Family (in numbers)	
0	53 (44.17)
1	16 (13.33)
2	44 (36.67)
3 or more	7 (5.83)

Table 3. Attributes selected for conjoint analysis

Functionality (Intrinsic Aspect)	Usability (Extrinsic Aspect)		Pleasure (Intrinsic & Extrinsic Aspect)
Taste	Product form	Price	Health Benefits

Usability aspect

The usability aspect is the aspect that the consumer desires after the functionality aspect has been fulfilled (20). Attributes related to usability include form, size, packaging materials, labels, expiration date information, storage instructions and benefit details. These are considered extrinsic attributes of the product. For building the product configuration, product form and price were selected as key usability attributes. Consumers were offered product form options including cup, cone, bar and family pack, with the cone (60.83%) and cup (24.16%) being the most preferred choices, as shown in Table 4. As previously described, price is a key factor influencing consumers' purchasing decisions (19). Awareness of a product's price has a positive effect on their intention to make a purchase. Price levels presented to consumers were categorized as below Rs.30, Rs.30-70, Rs.70-120 and above Rs.120, with Rs.30-70 (55.83%) and Rs.70-120 (21.66%) being the most preferred ranges, as shown in Table 4. The price levels were finalized by comparing consumer preferences with the existing market prices of ice cream offering

health benefits. Therefore, the product configuration was constructed using two attributes: product form, with two variants (cone and cup) and price, with three variants (Rs.60, Rs.85 and Rs.110).

Pleasure aspect

The pleasure aspect refers to consumers' desire for product attributes that go beyond functional benefits and cater to their emotional and sensory needs. This can encompass both intrinsic and extrinsic attributes of the product. In this study, attributes related to pleasure included brand/image, health benefits, appearance and packaging design. Survey results revealed that 85.83% of consumers expressed a willingness to purchase plant-based ice cream with health benefits, as shown in Fig 1. Based on this, health benefits were selected as a key attribute for product configuration. The most popular choices were no artificial additives (51.66%), low fat (16.66%), low sugar (15.83%) and low calorie (10.83%), as detailed in Table 4. Consequently, the product configuration was developed with the attribute "Health Benefits," featuring three variants-no artificial additives, low sugar and low fat, specifically tailored for plant-based ice cream made from soy and almond milk.

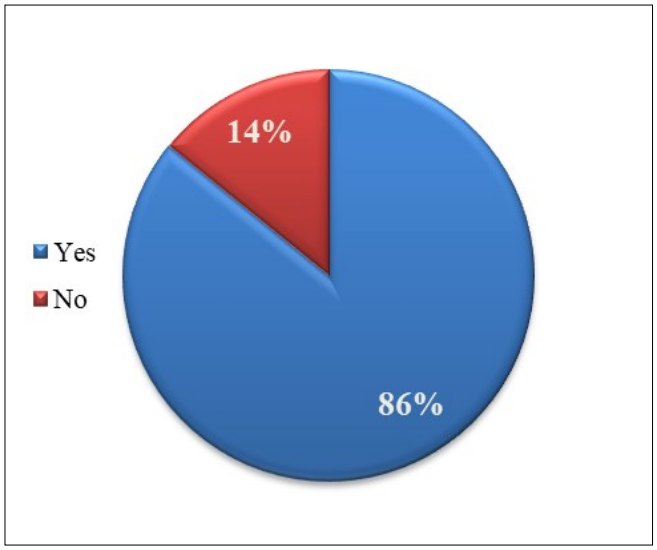

Fig. 1. Consumer willingness to purchase plant based ice cream with health benefits.

Conjoint analysis

Product configuration

An orthogonal design was employed to generate alternative product configurations. The orthogonal design was employed to ensure a manageable number of configurations for participants to evaluate (16). The configurations were based on the selected attributes and their respective levels. For the functionality aspect, a single attribute, taste, was chosen with two variants: chocolate and butterscotch. In terms of the usability aspect, two attributes were selected: product form and price. The product form attribute had two levels: cone and cup, while the price attribute comprised three levels: Rs. 60, Rs. 85 and Rs. 110. For the pleasure aspect, the chosen attribute was health benefits, which included three levels: no artificial additives, low sugar and low fat.

The attributes and their levels used to construct the product configurations are summarized in Table 5. In total, four factors were considered: taste and product form with two levels each and health benefits and price with three levels each. Using a full factorial design, this would result in 2×2×3×3=36 possible product combinations. However, an orthogonal design conducted via SPSS 27 identified 9 optimal product configurations for the conjoint analysis, as shown in Table 6. This approach ensured an efficient and manageable number of product profiles for evaluation, similar to the previous implementations (16, 17).

Utility value

Utilities, or part-worths, are numerical values that quantify the desirability of specific product features (21). A survey was conducted to gather respondents' preferences for nine product configurations. Choice-based conjoint (CBC) analysis was employed, presenting respondents with three questions, each containing three choices, from which they selected their preferred option for purchase. Utility values were assigned to each configuration, derived using MNL, as previously recommended (24). In an unpublished note it was noted that when responses involve selecting one or more options from multiple alternatives, a multinomial logit model should be applied (25). Based on an orthogonal design and respondents' preferences, the utility values for each variant within each attribute were obtained through MNL. Table 7 displays the estimated utility values of the attributes and their respective variants. A higher positive utility value indicates greater demand for a product variant, while a negative value signifies lower desirability. Table 7 presents the utility values for each attribute variant, revealing that for the product form attribute, consumers

Table 5. Attributes and variants of product configuration

Functionality	Usability		Pleasure
Taste	**Product form**	**Price**	**Health Benefits**
Butterscotch	Cone	Rs.60	No Artificial Additive
Chocolate	Cup	Rs.85	Low Sugar
		Rs.110	Low Fat

Table 6. Product configuration for conjoint analysis

Product Configuration	Functionality	Pleasure	Usability	
	Taste	**Health Benefits**	**Product form**	**Price**
1	Chocolate	Low sugar	Cone	Rs.85
2	Chocolate	Low sugar	Cone	Rs.60
3	Butterscotch	Low sugar	Cone	Rs.110
4	Butterscotch	No Artificial Additive	Cone	Rs.85
5	Butterscotch	Low fat	Cup	Rs.60
6	Chocolate	Low fat	Cone	Rs.110
7	Chocolate	No Artificial Additive	Cone	Rs.60
8	Chocolate	Low fat	Cone	Rs.85
9	Chocolate	No Artificial Additive	Cone	Rs.110

Table 4. Consumer preference for each variant of attributes

Taste	Per cent	Product form	Per cent	Health benefits	Per cent	Price	Per cent
Butterscotch	**33.33**	**Cone**	**60.83**	**No artificial additive**	**51.66**	**30-70**	**55.83**
Chocolate	**27.50**	**Cups**	**24.16**	**Low fat**	**16.66**	**70-120**	**21.66**
Black currant	15.00	Bars	7.5	**Low sugar**	**15.83**	Below 30	11.66
Vanilla	13.33	Family pack	7.5	Low in calorie	10.83	Above 120	10.83
Strawberry	7.50			Other	5		
Mango	3.33						

Table 7. Utility value of each attribute from Multinomial Logistic Regression

Attribute (Relative Importance)	Variant	Utility value
Product form (33.53)	Cone	1.618
	Cup	0
Taste (7.58)	Butterscotch	0.366
	Chocolate	0
Health (10.15)	No Artificial Additive	-0.169
	Low Sugar	-0.490
	Low Fat	0
Price (48.72)	Rs.60	0
	Rs.85	-1.721
	Rs.110	-2.351
(Constant)	**3.438**	

favoured cone shape with utility of 1.618 which indicated a strong preference, supporting the idea that traditional form may evoke positive associations with indulgence and enjoyment. For the taste attribute, butterscotch was the most preferred with utility of 0.366, followed by chocolate. In terms of health benefits, low fat was the most sought after attribute with 0 utility, while products labelled with no artificial additives (-0.169) and low sugar (-0.490) showed relatively less demand. This highlights a potential misconception or lack of consumer awareness regarding these health claims. Regarding price, Rs. 60 with 0 utility value indicated a clear threshold, followed by Rs. 85 (-1.721) and Rs. 110 (-2.351). This reinforced the necessity for brands to maintain competitive pricing while ensuring perceived value.

Relative importance

Alongside total utility values, relative importance scores for each attribute were also calculated. These scores highlight the significance of each attribute in influencing consumer preferences (22). The range of utility values for each attribute was first computed and the total range for all attributes was determined. For instance, the relative importance of the product form attribute, with a range of 1.618 and a total range of 4.825 across all attributes, was calculated as Eqn. 4:

$$\text{Relative Importance} = 1.618 / 4.825 \times 100 = 33.53\% \quad (4)$$

Price emerged as the most critical factor influencing consumer choices, with a relative importance of 48.72%. This finding aligns with existing literature that emphasizes price sensitivity in food product purchases (18). It was followed by product form, health and taste, as shown the Table 7. This was in line with previous finding, which highlighted the price attribute as the most important factor for similar FMCG (Fast moving consumer goods) products (24). In contrast, another report emphasized the significant role of attributes such as taste in influencing consumer preferences (20).

Combination ranking

The ranking of product configurations was conducted based on the previously selected configurations. This ranking process was driven by the utility values. The total utility value of each product configuration was calculated based on the utility values of the attribute variants, as demonstrated in Eqn. 5. For example, the total utility value of product configuration 1, comprising chocolate, cone shape, low sugar and priced at Rs. 85, is calculated as follows:

$$U1 = 3.438 + 0 + (1.618) + (-0.490) + (-1.721) = 2.845 \quad (5)$$

Similarly, total utility values can be computed for each product configuration alternative. These values are then used to rank the configurations accordingly. Table 8 presents the results, showing that product configuration 7 (chocolate, cone, no artificial additives, priced at Rs. 60) was the most preferred by consumers, with a total utility value of 4.887. This was closely followed by product configuration 2 (chocolate, cone, low sugar, priced at Rs. 60). In contrast, Product Configuration 9 (chocolate flavor, cone shape, no artificial additives, priced at Rs. 110) emerged as the least preferred option, with a total utility value of only 0.918.

Table 8. Total utility and ranking for each product configuration

Product Configuration	Total Utility	Ranking
1	2.845	6
2	4.566	2
3	2.581	8
4	3.532	4
5	3.804	3
6	2.705	7
7	**4.887**	**1**
8	3.335	5
9	**0.918**	**9**

A comparative analysis of the utility values associated with each attribute variant revealed that the cone shape was the most favoured in the product form category, while butterscotch was the top preference in the taste category. Furthermore, low fat was identified as the most desirable health benefit and Rs. 60 was the most preferred price point. These findings highlight consumer preferences and can inform product development and marketing strategies in the functional ice cream segment.

Harmful effects of plant-based ingredients in frozen desserts

Refined vegetable oils, often used in frozen dessert production, carry several health risks due to their high omega-6 fatty acid content, which can promote inflammation and raise the risk of heart disease. The refining process also creates harmful trans fats, which increase bad cholesterol (LDL) while lowering good cholesterol (HDL), further contributing to cardiovascular problems. Additionally, these oils are susceptible to oxidation, producing free radicals that can damage cells and lead to chronic illnesses. Similarly, mayonnaise made from soy milk, though a dairy-free option may contain unhealthy fats and additives that can cause weight gain, digestive issues and hormonal imbalances due to the phytoestrogens in soy. Excessive consumption of both ingredients can adversely affect overall health.

Conclusion

This study reveals that price is the most influential factor for consumers choosing plant-based ice cream in Coimbatore, with low-fat content, chocolate flavor and cone shape also being key preferences. The optimal product configuration is a cone-shaped, chocolate-flavored, low-fat ice cream priced at Rs. 70. Manufacturers should focus on these attributes to meet consumer demand, as the growing interest in health-conscious and plant-based diets presents significant opportunities for the frozen dessert market.

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Authors' contributions

The study was conceptualized by SR, CM and SS, who also developed the methodology. Validation was carried out by VVAG and PSK, while SR and CM conducted the formal analysis. The investigation involved SR, CM, VVAG and PSK, with SR handling data curation. SR prepared the original draft, and all authors - SR, CM, SS, VVAG and PSK - contributed to reviewing and editing the manuscript. All authors reviewed and approved the final version.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

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