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RESEARCH ARTICLE

Taste and choice: A comprehensive conjoint analysis of processed mango juice attributes

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Abstract

The food processing sector in India is experiencing significant growth, driven by urbanization, population expansion and evolving consumer lifestyles. Among the various segments, the market for processed mango juice is rapidly expanding, especially in the Asia Pacific region due to the increasing demand of consumers for natural and nutritious beverages. In India, the processed mango juice market is also expected to grow substantially, supported by major brands foreseeing the immense market potential. This is further aided by a favourable climate for mango cultivation. Despite challenges such as seasonal availability and price fluctuations, consumer preferences are shifting towards healthier options, positioning the processed mango juice market for continued expansion in the coming years. This study focuses on consumer preferences towards the major attributes of processed mango drinks. Utilizing a purposive sampling method, data were collected from 150 respondents through questionnaires and interviews, supplemented by secondary data analysis. The research employed percentage analysis to assess consumer preferences, revealing insights into demographic characteristics that can inform marketing strategies. Additionally, a choice-based conjoint analysis was conducted to explore consumer trade-offs among product attributes-flavour, packaging material, sweeteners and price-highlighting the importance of these factors in shaping consumer choices. The findings indicated that flavour and sweeteners are the primary factors driving consumer preferences, with a significant emphasis on taste over price and packaging considerations, ultimately leading to the identification of the most preferred product combinations based on total utility values.

Keywords

conjoint analysis; consumer preference; processed mango drink; product attributes; packaging materials; sweeteners; multinomial logit regression

Introduction

Processed mango juice, a popular beverage derived from one of the most beloved tropical fruits, offers numerous health benefits, including antioxidant properties that may help reduce the risk of chronic diseases such as digestive disorders, cardiovascular diseases, cancer, diabetes, anaemia, eye disorders and inflammation -related conditions (1). The processing of mango juice typically involves several stages. The resulting juice can be packaged for extended shelf life, making it a convenient option for consumers. With its sweet taste and vibrant colour, processed mango juice not only serves as a refreshing drink but also plays a significant role in

various culinary applications, from cocktails to desserts (2). As global demand for fruit juices continues to rise, processed mango juice represents a valuable product in the beverage market, appealing to health-conscious consumers and those seeking natural flavours (3). The most critical factor for the mango drink brands to lead the market is maintaining an authentic mango flavour profile. The price of these beverages also significantly impacts purchasing decisions, as consumers often seek value, especially in light of rising costs for other fruit juices like oranges. The availability of more mango drink brands compared to other fruit juices may be due to the local availability of mango at a lower cost. Sweetener choice has become increasingly important, with many consumers preferring natural sweeteners over artificial ones, reflecting a broader trend toward health consciousness. Packaging material influences consumer perceptions of quality and sustainability; eco-friendly packaging is gaining traction among environmentally aware shoppers (4). Together, these factors not only drive consumer choices but also reflect broader market trends toward convenience and health in the processed mango beverage sector, which is expected to grow significantly in response to changing consumer preferences and lifestyles.

The global market for processed mango juices is experiencing robust growth, with the processed mango products market valued at approximately USD 20.27 billion in 2023 and projected to reach around USD 34.94 billion by 2030, growing at a CAGR of 6.9 percent (5). Within this segment, processed mango juices are anticipated to grow at a CAGR of 7.4 percent, driven by increasing consumer demand for natural and nutritious beverages. The Asia Pacific region dominates this market, particularly in countries like India and China, while North America is expected to experience the fastest growth due to a shift towards organic and healthy alternatives (6, 7). Despite challenges such as the seasonal availability of fresh mangoes and price fluctuations, the popularity of mango-based products continues to rise, positioning the processed mango juice market for significant expansion in the coming years. The Indian processed mango juice market is expected to increase significantly, driven by rising consumer demand for natural and nutritious beverages (6). The processed mango products market in India is expected to be valued at around USD 3.83 billion by 2023, with significant growth anticipated in the future years. Major brands such as Frooti and Maaza are leading this category, capitalizing on the popularity of mango pulp, a fundamental ingredient in these beverages. India produces over 350,000 tons of mango puree each year, accounting for roughly half of global production and exports around 200,000 tons while eating 150,000 tons domestically. The processed mango juice industry benefits from a favourable climate for mango cultivation and a growing young population (65 percent of the Indian population is below the age of 35) (8) that enjoys fruit-based beverages. However, problems such as the seasonal availability of mangoes and variable costs may impede growth. Overall, the market is predicted to grow as customers become more health-conscious and manufacturers develop their product offerings to satisfy changing preferences (7).

Consumers prefer processed products particularly mango drinks for different attributes. Each product has its set of attributes that influence the consumer's choice. The attributes could be intrinsic, extrinsic, or both. The attributes of the products vary in various levels and these particular levels determine the extent to which the consumers prefer a certain product or service. Several studies have been conducted on consumer preference for different processed products and services based on their attributes. For studying the product attributes of mango juice using conjoint analysis, the methodology used in some other products is analysed. For orange juice, the attributes included flavour profiles that range from similar to fresh orange to stronger or weaker variations, along with sweetener options such as natural, artificial, sugar and honey. The pulp content could vary from more pulp to none and the method of production may be organic or conventional (9). The attributes of the orange juice can be parallelled with mango juice. Furthermore, considering the health trends that influence consumer choices due to the vitamin C content, can provide a broader context for analysing mango juice preferences. Similarly, in the case of ragi, it was evaluated based on taste (good or average), colour (red or white), price categories (high, medium, low) and cooking time (more or less) (10). This again emphasises the importance of attributes such as taste and price in understanding consumer preference. Moving to root-based processed foods, these were characterized by flavour options like sweetened, cheesy, or salty, texture variations (crunchy thin or thick slices), types of packaging (stand-up or glossy plastic) and packaging sizes (100g or 10g) (11). The vegetarian restaurant service focuses on food quality attributes such as organic, colourful and nutritious options, cuisine styles including Chinese, Indian and Italian, health concepts like weight loss and disease prevention, as well as restaurant design aesthetics ranging from simple to fashionable (12). For dairy milk, key attributes included nutrient content (protein, calcium, vitamin D), functionality related to maintaining strong muscles and bones, production methods (organic, locally produced) and price per gallon (13). Cerrado fruit preserves were assessed by flavour combinations such as marolo alone or mixed with soursop and sweet passion fruit, nutritional information indicating light or diet options and health claims that suggested reductions in cardiovascular disease and blood cholesterol (14). Coconut products were evaluated based on taste and flavour levels (low to high), shelf-life variations (low to high) and whether they were time-consuming to prepare (15). For eggs, attributes included functionality (omega vs. regular), price per egg across different ranges (Rs.4 to Rs.8), feed types for chickens (organic or conventional), packaging options by count (6 to 30) and colour variations (brown or white) (16). The food retail chain was described based on store locations, accessibility, product range from limited to wide offerings, service types available at stores and accepted payment modes, including cash and credit card options (17). The insights gained from these studies indicate that understanding consumer preferences through conjoint analysis can significantly inform marketing strategies and product development. Conjoint analysis offers a thorough method for assessing how customers value various product aspects by putting them in scenarios that necessitate making trade-offs between several features. Businesses may determine which traits have the greatest influence on consumers' purchasing decisions by using this method, which captures the complexity of consumer decision-making. For example, organizations might identify the best configuration that

optimizes customer appeal and sales potential by studying preferences for several feature combinations, such as flavour profiles, package types and pricing. Certain product attributes of different product lines are shown in Table 1.

The objective of the study was to determine how different attributes of processed mango juice such as the flavour of the drink, the selling price, the package type and the sweeteners used influence consumer preference. The attributes of mango juice such as selling price, package type, flavour and sweeteners have a direct influence on consumer preferences and purchasing decisions (18, 19). Price is especially prominent among budget-conscious consumers, influencing their choice of mango juice (19). Furthermore, packaging type influences convenience and perceived quality (20). Whereas the flavour of the juice has a substantial impact on consumer happiness and the chance of repeat purchases (21). The growing health concerns of the consumers influence the sweetener choices as many have been preferring health-friendly for a while (22). By concentrating on these characteristics, firms can better align their products with consumer expectations, thereby improving product development and marketing strategy. Mango juice was selected as the study product to know the influence of the attributes on the consumer decision, as it was the most available fruit juice variant with multiple brands across the country. Also, mango juice was available in many types of packaging materials and price variants compared to other types of juices. The study on consumer preference using mango juice would further contribute to the feasibility of the study as the mangoes were mostly domestically sourced. The findings would provide insights into consumer preferences for different mango drink features, helping the marketers involved in the business with information regarding the preferred attributes that attract consumers.

Table 1. Product attributes and levels of different product types

Sl. No.	Type of Product	Attributes	Levels
1	Orange juice	Flavour	Similar to fresh orange, stronger than fresh orange, weaker than fresh orange
		Sweeteners	Natural, artificial, sugar, honey
		Pulp	More pulp, medium pulp, no pulp
		Method of production	Organic, conventional
2	Ragi	Taste	Good, average
		Colour	Red, white
		Price	High (>Rs.25/kg), Medium (Rs.20-25/kg), Low (<Rs.20/kg)
		Cooking time	More, less
3	Root based processed foods	Flavour	Sweetened, cheesy, salty
		Texture	Crunchy thin slice, crunchy thick slice
		Type of packaging	Stand up, Glossy plastic
		Packaging size	100 g, 10 g
4	Vegetarian Restaurant service	Food quality	Organic food, colourful food, nutritious food
		Cuisine style	Chinese style, Indian, Italian
		Health concept	Lose weight, prevent diseases
		Restaurant design	Simple design, fashion design
5	Dairy milk	Nutrient content	Protein, Calcium, Vitamin D
		Function	Maintain strong muscles, strong bones
		Production method	Organic, locally produced, all natural
		Price/gal	$3.21, $3.80, $4.18
6	Cerrado fruit preserves	Flavour	Marolo, marolo and soursoup, marolo, soursoup and sweet passion fruit
		Nutritional information	Light, diet, absent
		Health claims	Reduces cardiovascular disease, reduce blood cholesterol
7	Coconut products	Taste	Low, medium, high
		Flavour	Low, medium, high
		Shelf life	Low, medium, high
		Time consuming	Yes, no
		Functional	Omega, Regular
8	Eggs	Price per egg	Rs.4, Rs.6, Rs.8
		Feed given to chicken	Organic, conventional
		Packaging (nos. per pack)	6, 10, 12, 30
		Colour	Brown, white
9	Food retail chain	Location of stores	Neighbourhood, accessible, does not matter
		Product range	Limited, wide
		Service at the stores	On request, complete
		Mode of payment	Cash, credit card, monthly cash credit

Materials and Methods

Sample design

The study examined consumer preferences for mango drinks in Thiruvananthapuram, Kerala, using a set of product attributes determined by various attribute levels. Different cities in Kerala, such as Kochi, Kozhikode and Thiruvananthapuram and comparatively smaller cities like Palakkad and Kottayam, were identified as potential regions for the study. Kochi's high commercialization creates skewed preferences due to the high variety of products and Kozhikode's inclination towards traditional foods could limit the insights in the study of processed juices. Smaller towns were ruled out due to their limited purchasing power. As a result of these insights, Thiruvananthapuram was selected due to its rich cultural heritage and diverse food-consuming demographics and habits. The existence of diverse people in Thiruvananthapuram made it ideal for this study. The study used a purposive sampling method, using questionnaires and planned interviews to gather data from a sample of 150 respondents who purchased mango drinks from various outlets. The choice of 150 sample respondents was deemed sufficient by analysing previous similar studies in a similar context. The usage of purposive sampling provided the probability that only the individuals in the target population relevant to the study were selected (23). This provided consistency in the collection of data. Standardized questionnaires and consistent interviewing were employed to reduce the biases in the data collection (24). The external verification of methods and strategies further reduced the chances of biases in the data collected (25). The data such as the preference towards the various levels of an attribute were collected from the sample respondents. The attribute levels of the products most preferred by consumers were subjected to conjoint analysis, which formed the product combinations with different attribute levels that were then ranked. Secondary data from various websites, articles and other publications were also collected for the necessary information. The data on the annual production of fruits and the percentage processed were collected from sources such as the Horticulture Department of India and APEDA. These were the credible organizations for the publication of such reports in the country.

Theoretical framework

Utility theory

The concept of utility, which stands for the value or satisfaction obtained from various product features, is the foundation of conjoint analysis (26). Every attribute level has a utility score (also called part-worth utilities) that indicates how much it adds to the total preference. Researchers can deduce these utility scores by using the choices made by respondents among product profiles, which allows for predictions regarding market behaviour (27). Utility theory in Conjoint Analysis is built on several assumptions.

Multi-attribute decision-making suggests that consumers evaluate products based on multiple attributes, each possessing varying levels (28).

Preference ordering assumes that consumers maintain a consistent ranking of options based on their perceived utility and select products that maximize their satisfaction (29).

Independence of irrelevant alternatives: The principle asserts that the preferences expressed by consumers should remain stable regardless of additional options presented (30).

Multinomial logit regression

Multinomial logit regression (MNL) is the statistical model in conjoint analysis grounded in utility theory, which helps to model consumer choice among multiple alternatives based on their perceived utility. The expected utility can be expressed as shown in Eqn. 1.

$$EU = \sum_{i=1}^{n} P_i U_i \qquad \text{Eqn. 1.}$$

where,

EU - expected utility

P_i - Probability of choosing alternatives

U_i - Utility of choosing alternative

The MNL model implies that utilities are independent of irrelevant alternatives (IIA), which means that the relative probability of selecting between two options is consistent regardless of other accessible options. Researchers can gain insights into customer preferences and accurately forecast market behaviour by predicting part-worth utilities for each attribute level using MNL regression, making it a valuable tool in market research and product creation (31).

Tools of analysis

Percentage analysis

The study computed and summarized the numerous characteristics by using descriptive statistics. The demographic characteristics and consumer preference towards the different attributes and levels of processed mango drinks were studied using the Percentage analysis. Eqn. 2 shows how the percentage analysis is done.

$$\text{Percentage Analysis} = \frac{\text{Number of samples taken}}{\text{Total no. of. samples}} \times 100 \qquad \text{Eqn. 2}$$

Percentage analysis offers valuable insights into the demographics of respondents, helping marketers tailor strategies to align with consumer preferences. Understanding these characteristics is crucial for effectively targeting different consumer segments in the mango drink market.

Conjoint analysis

To determine customer preferences, the conjoint analysis approach establishes consumer trade-offs among ideas with several attributes. Products are a chain of set levels of qualities and the total utility that the consumer consumes, according to this paradigm. It lists several attribute combinations that customers find most appealing and explains the significance of each feature as well as the reasons behind these combinations. Choice-based conjoint (CBC) analysis is the most used type of conjoint analysis. Respondents in CBC are shown sets of product profiles that systematically differ in a variety of features and levels (32). This design reflects how buyers make judgments about what to buy, selecting between competing options rather than evaluating each feature separately. Carefully defining characteristics and their levels is necessary for an effective conjoint analysis. Features ought to be pertinent to consumers' decision-making processes and ought to come in different configurations that correspond to actual options (33).

The conjoint analysis is depicted in the Fig. 1. Here in this study, product configurations were ranked using choice-based conjoint analysis. After some exploratory research, the different attributes of the products and their levels were determined. The product attributes and attribute levels in the study are shown in Table 2.

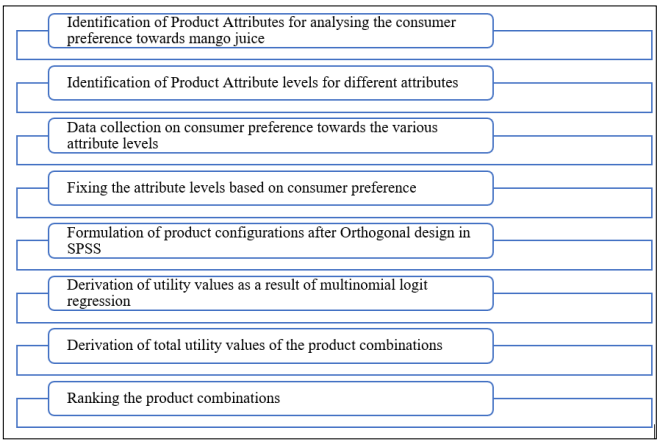

Fig 1. Conjoint analysis process.

Table 2. Attributes and levels used for conjoint analysis

Sl. No.	Attributes	Levels
1	Flavour	Weaker than fresh mango; Similar to fresh
2	Packaging	Plastic pouch, screw cap; Paper pouch, straw;
3	Sweeteners	Natural, Artificial
4	Price	Rs.40; Rs.42; Rs.45

The utility values for each attribute were determined using Multinomial Logit Regression (MNL). In conjoint analysis, the relative importance of product attributes was calculated using Eqn. 3.

$$\text{Relative importance} = \frac{\text{Range of attribute}}{\text{Sum ranges of all attributes}} \times 100 \quad \text{Eqn. 3}$$

Where the range of the attribute is found out using Eqn. 4.

$$\text{Range} = \text{Maximum utility value} - \text{Minimum utility value} \quad \text{Eqn. 4}$$

Results and Discussion

The demographic characteristics of the 150 sample respondents and primary data collected from them were studied and analysed for insights into consumer preference towards the major attributes of the processed mango drink.

Demographic details of the sample respondents

The demographic details of the sample respondents are shown in Table 3. Fig. 2 depicts the demographic characteristics of the sample respondents. The table revealed that out of the 150 sample respondents, male respondents made up 36 percent of the sample, while female respondents made up 64 percent. Female respondents were more knowledgeable about the components, attributes and nutrient value of the selected processed food products. The majority of respondents were aged between 31 and 40 years old, with nearly 80 percent between the ages of 21 and 50. The majority of respondents were graduates (65.33 percent), with 22.67 percent having higher secondary education. The majority of respondents were employed professionals in the workforce, with 46 percent working in the private sector. The majority of respondents were from nuclear families (80.67 percent), with 72 percent coming from families with three to five members. The majority of respondents had monthly incomes of more than Rs. 50,000 (54.67 percent). The majority of respondents were high earners, which may have influenced their purchasing habits for processed food products.

Table 3. Demographic details of the sample respondents

Sl. No.	Gender	No. of sample respondents	Percentage to total (n=150)
1	Male	54	36.00
2	Female	96	64.00
Sl. No.	**Age (in years)**	**No. of sample respondents**	**Percentage to total (n=150)**
1	Up to 20	14	9.33
2	21-30	35	23.33
3	31-40	48	32.00
4	41-50	37	24.67
5	Above 50	16	10.67
Sl. No.	**Qualification**	**No. of sample respondents**	**Percentage to total (n=150)**
1	Primary education	3	2.00
2	Secondary education	15	10.00
3	Higher secondary Education	34	22.67
4	Graduation	98	65.33
Sl. No.	**Profession**	**No. of sample respondents**	**Percentage to total (n=150)**
1	Private sector	69	46.00
2	Public sector	29	19.33
3	Own business	22	14.67
4	Unemployed	27	18.00
5	Retired	3	2.00
Sl. No.	**Family type**	**No. of sample respondents**	**Percentage to total (n=150)**
1	Nuclear family	121	80.67
2	Joint family	29	19.33
Sl. No.	**Family size**	**No. of sample respondents**	**Percentage to total (n=150)**
1	Less than 3 members	13	8.67
2	3-5 members	108	72.00
3	More than 5 members	29	19.33
Sl. No.	**Monthly family income**	**No. of sample respondents**	**Percentage to total (n=150)**
1	20001-30000	4	2.67
2	30001-40000	14	9.33
3	40001-50000	50	33.33
4	Above 50000	82	54.67
	Total	**150**	**100**

Consumer preference towards various attributes of processed mango drinks

The product preference of consumers is determined by various attributes. In the case of processed mango drinks, attributes like flavour, packaging material, price and sweetener play a pivotal role in determining the consumer preference (19). The levels within these attributes help in determining perfectly what the consumer demands. Table 4 shows the consumer preference towards various attributes. The consumer preference towards the product attribute levels is systematically depicted in Fig 3.

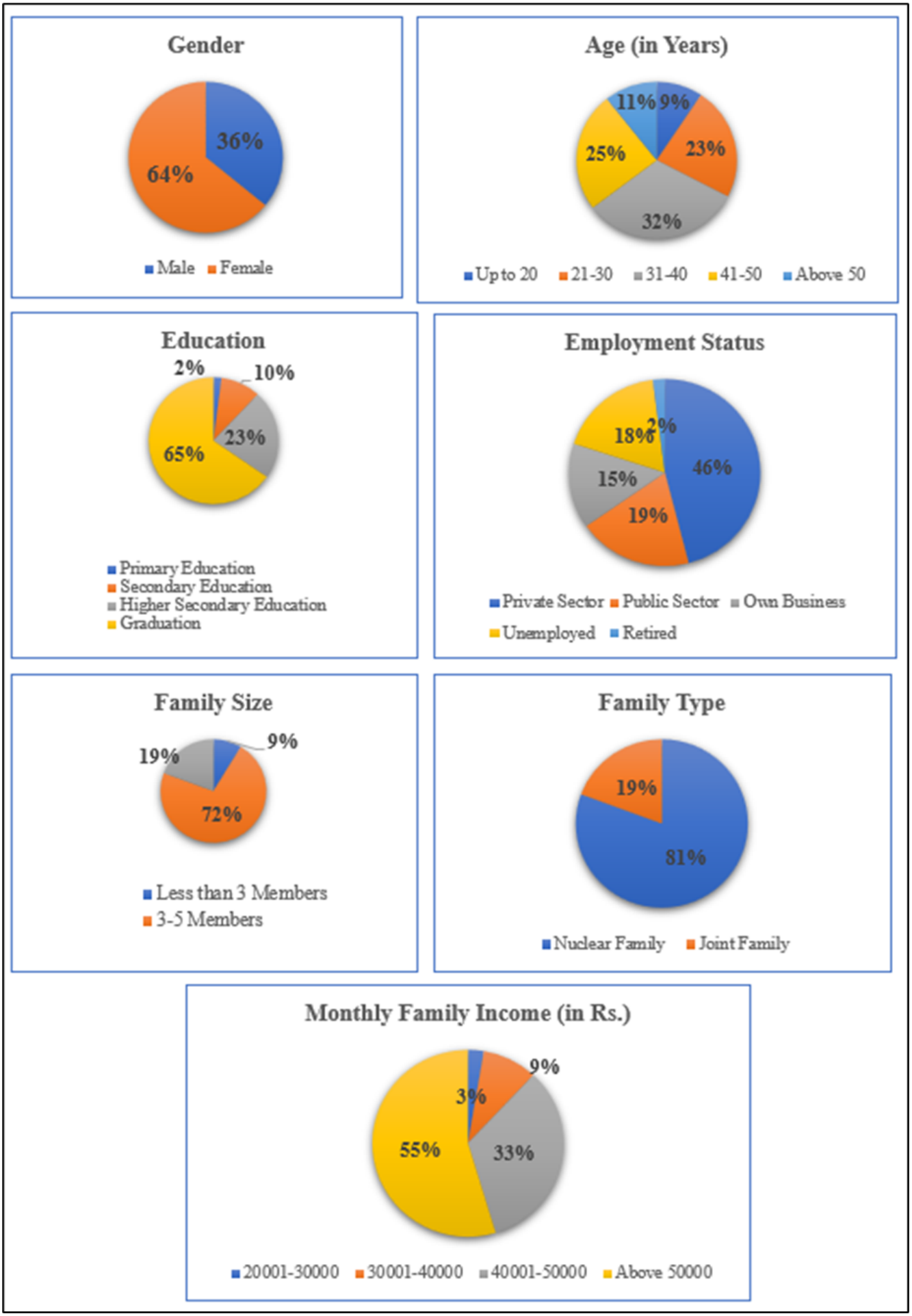

Fig 2. Demographic characteristics of the sample respondents.

Table 4. Attributes of the mango drink that influence the sample respondents towards the product

Sl. No.	Attributes	No. of sample respondents	Percentage to total
	Flavour		
	Stronger than fresh mango	**37**	**24.67**
	Similar to fresh mango	**48**	**32.00**
1	**Weaker than fresh mango**	**32**	**21.33**
	Spicy mango	15	10.00
	Carbonated	18	12.00
	Total	**150**	**100.00**
	Packaging material		
	Plastic pouch, screw cap	**37**	**24.67**
	Paper pouch, straw	**51**	**34.00**
2	**Plastic bottle, screw cap**	**34**	**22.67**
	Glass bottles	9	6.00
	Aluminium cans	19	12.67
	Total	**150**	**100.00**
	Price (per 600 mL)		
	Below Rs.40	36	24.00
3	**Rs.40 to Rs.50**	**107**	**71.33**
	Above Rs.50	7	4.67
	Total	**150**	**100.00**
	Sweeteners		
	Natural	**101**	**67.33**
4	**Artificial**	**45**	**30.00**
	Monk fruit extract	4	2.67
	Total	**150**	**100.00**

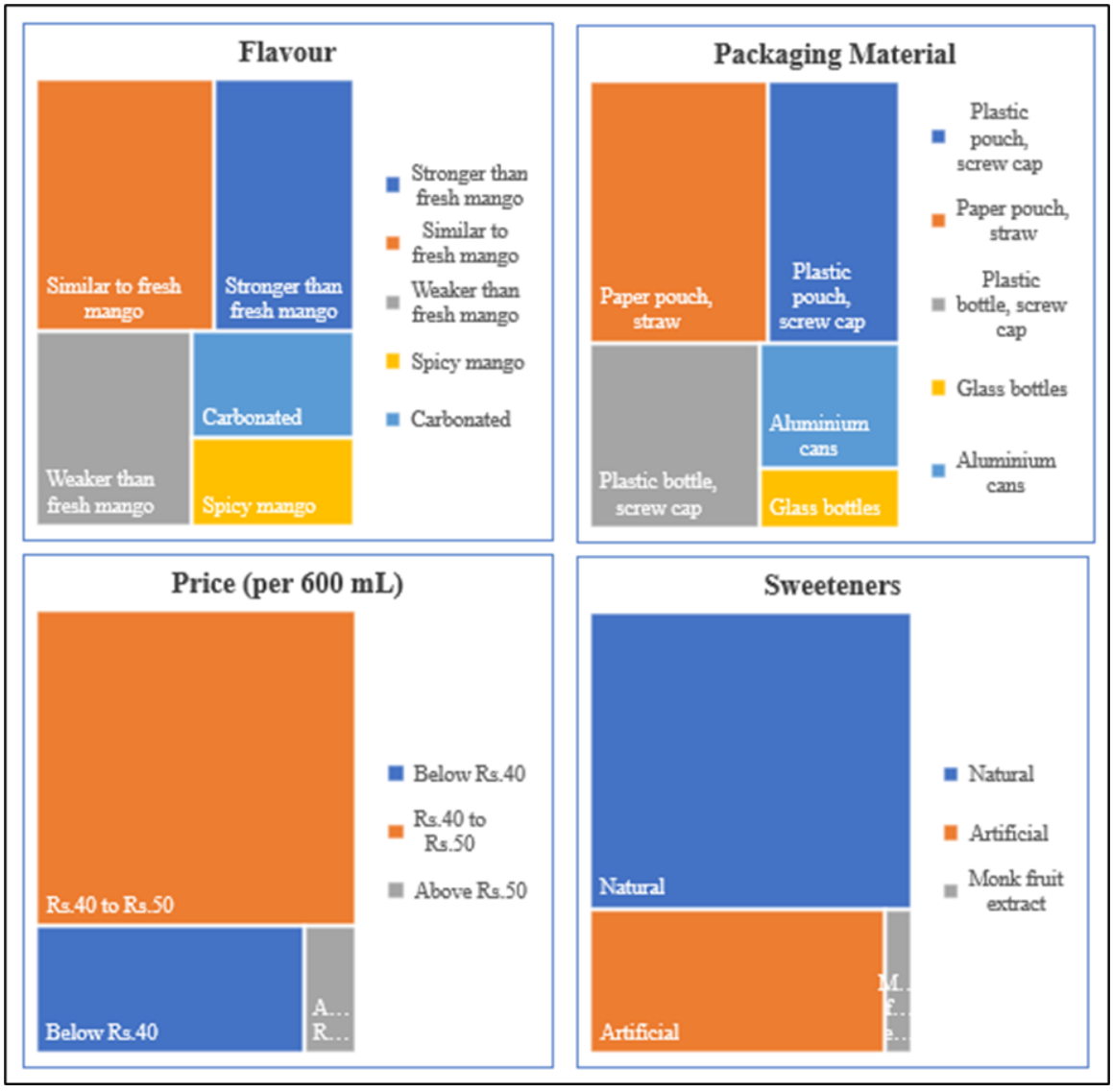

Fig 3. Consumer preference towards the product attribute levels.

The attribute levels were presented to the consumers to determine their preferences. In the flavour attribute, the level similar to fresh mango was preferred more (34 percent), followed by stronger than fresh mango (24.67 percent), weaker than fresh mango (21.33 percent), aluminium cans (12.67 percent) and glass bottles (6 percent). In the packaging material attribute, the paper pouch, straw was the most preferred (34 percent), followed by plastic pouch, screw cap (24.67 percent), plastic bottle, screw cap (22.67 percent), aluminium cans (12.67 percent) and glass bottles (6 percent). In the price attribute, the level Rs.40 to Rs.50 was the most preferred (71.33 percent), followed by below Rs.40 (24 percent) and above Rs.50 (4.67 percent). In the sweeteners attribute, natural sweeteners were the most preferred (67.33 percent), followed by artificial sweeteners (30 percent) and monk fruit extract (2.67 percent).

Based on the above findings, the major levels of the attributes - flavour, packaging material, price and sweeteners, i.e., the levels with the major share of consumer preference were selected for proceeding with the conjoint analysis. The highlighted product attribute levels in Table 4 were selected for conjoint analysis. The attributes of the product determined were differentiated into usability, functionality and pleasure aspects of the product. The details of this are shown in Table 5.

In this study, the product attributes selected were divided into different aspects. The flavour attribute with the attribute levels weaker than fresh mango, similar to fresh mango and stronger than fresh mango was considered the intrinsic factor and hence it was the functionality aspect. The extrinsic attributes – packaging material and price were the usability aspects and the attribute sweeteners were the pleasure aspect. In the price attribute, the prices of 600 mL quantity of mango drink of major brands in the market within the price range of Rs.40 to Rs.50 were analysed and the three levels were determined.

Product configuration

The variants of the attributes in Table 5 were formulated into product configurations using the employment of an orthogonal design in SPSS. Orthogonal design in the conjoint analysis is a way to quickly develop product configurations by organizing and selecting attribute combinations using structured tables known as orthogonal arrays. By reducing the number of tests required, this method enables researchers to evaluate numerous factors at once and guarantees that each attribute level is evenly represented in all possible combinations (34).

Nine product configurations were formulated in the study as a result of orthogonal design. The different product configurations are shown in Table 6. The nine different product combinations were subjected to the consumers to know their preferences. The questionnaire regarding the preference for the nine combinations was completed by the sample respondents. Based on the responses, the utility value for each attribute level was determined by running the Multinomial Logit Regression in SPSS.

Average utilities of attribute levels and relative importance of attributes

Utility value formulation in conjoint analysis involves calculating the part-worth utilities for different attributes after product configurations have been established. Each attribute level is assigned a utility score, reflecting its perceived value to consumers. This process begins by summing the part-worths for each level of an attribute, which is derived from consumer preferences during surveys. The average of these summed values provides the utility value for that specific attribute level. These utility values are crucial as they indicate how much each attribute influences consumer choices, allowing researchers to identify which combinations of features are most appealing. Ultimately, this information can be used to predict market behaviour, optimize product designs, as well as inform pricing strategies based on consumer willingness to pay for specific features (35).

The utility value of the various attribute levels derived as a result of multinomial logit regression is shown in Table 7. The values indicate the preferability of a certain attribute level. The higher value of utility indicated greater preference.

Results depicted in Fig 4 showed that a constant utility value of -2.68 was derived. In the functionality aspect, represented by the flavour attribute - the attribute level, similar to fresh mango (2.58) was the most preferred, followed by stronger than fresh mango (1.24) and weaker than fresh mango (0). This shows that consumers preferred to have the fresh mango flavour in the drink so that they could get the essence of freshness. The results highlighted the importance of maintaining the freshness and authenticity of mango flavours in products to meet consumer expectations and preferences effectively.

Table 5. Attributes and variants of product configuration

Functionality	Usability		Pleasure
Flavour	**Packaging material**	**Price**	**Sweeteners**
Weaker than fresh mango	Plastic pouch, screw cap	Rs.40	Natural
Similar to fresh mango	Paper pouch, straw	Rs.42	Artificial
Stronger than fresh mango	Plastic bottle, screw cap	Rs.45	

Table 6. Product configuration formulated by orthogonal design

Product combination	Functionality	Usability		Pleasure
	Flavour	**Packaging material**	**Price**	**Sweeteners**
1	Weaker than fresh mango	Plastic pouch, screw cap	Natural	40
2	Weaker than fresh mango	paper pouch, straw	Natural	42
3	Similar to fresh mango	Plastic bottle, screw cap	Natural	42
4	Similar to fresh mango	paper pouch, straw	Artificial	40
5	Similar to fresh mango	Plastic pouch, screw cap	Natural	45
6	Stronger than fresh mango	paper pouch, straw	Natural	45
7	Stronger than fresh mango	Plastic bottle, screw cap	Natural	40
8	Weaker than fresh mango	Plastic bottle, screw cap	Artificial	45
9	Stronger than fresh mango	Plastic pouch, screw cap	Artificial	42

Table 7. Utility values and relative importance of various attributes

Sl. No.	Attributes	Utility value	Relative importance (%)
		Flavour	
1	Weaker than fresh mango	0	44.10
	Similar to fresh mango	2.58	
	Stronger than fresh mango	1.24	
		Packaging material	
2	Plastic pouch, screw cap	-0.20	6.15
	Paper pouch, straw	0	
	Plastic bottle, screw cap	-0.36	
		Sweeteners	
3	Natural	2.14	36.58
	Artificial	0	
		Price (per 600 mL)	
4	Rs.40	0.50	18.16
	Rs.42	0.77	
	Rs.45	0	

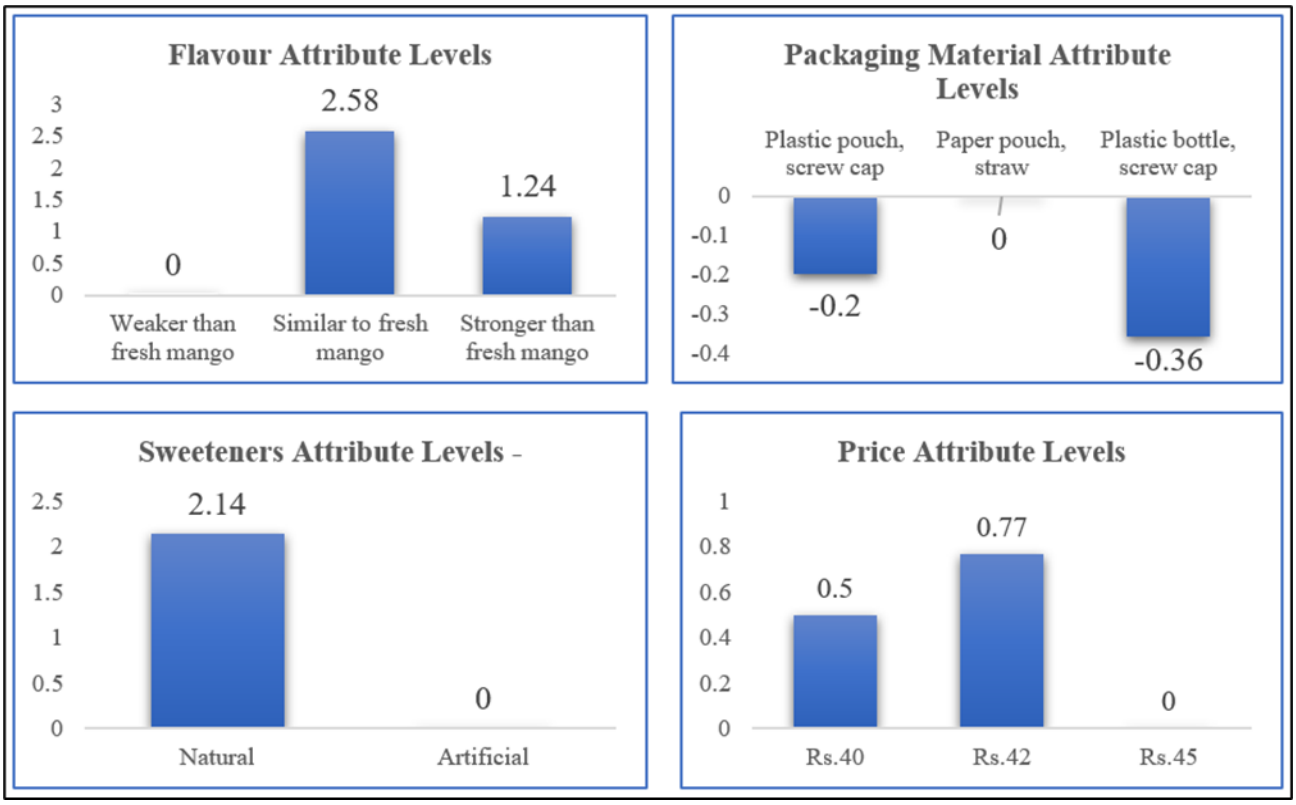

Fig 4. Utility value of the product attribute levels.

Consumers prefer mango-flavoured products that closely replicate the taste of fresh mangoes, as this authenticity enhances their overall sensory experience. This desire for a natural mango flavour aligns with their expectations for freshness and quality, making it a crucial factor in their purchasing decisions (36, 37).

In the usability aspect, regarding the packaging material attribute, the utility value for the paper pouch with straw was higher (0), followed by the plastic pouch with screw cap (-0.20) and plastic bottle with screw cap (-0.36). From the results, it could be inferred that most of the consumers prefer environmentally friendly packages over plastic packages. The lesser preference for plastic packages could infer that there was a clear preference for more sustainable packaging solutions that align with current consumer values. Consumers increasingly favour sustainable paper-based packaging over plastic options, driven by a desire for environmentally friendly solutions (38). Though, factors such as design complexity and cost remain crucial, the practice is adopted by many companies to balance sustainability with economic viability and to meet consumer expectations effectively (39). Regarding the price, the price of Rs.42 had a higher utility value (0.77) compared to Rs.40 (0.50) and Rs.45 (0). Here, the higher preference of price Rs.42 denoted that the preference was not always towards lower prices, but towards the pricing that provides more value to the product. The price-quality relationship is more pronounced for durable goods, where higher prices often signal better quality due to the expectation of longevity and performance. In contrast, for consumables and non-durable items, higher prices do not necessarily indicate superior quality (40). The pricing of consumables is primarily influenced by competitors' pricing strategies, as businesses often adjust their prices to remain competitive in the market. This competitive pricing approach allows companies to attract price-sensitive consumers by either matching or undercutting rival prices, ensuring they do not lose market share (41). Thus, the price of Rs.42 which was adopted by the major brands was found to be more common and consumers perceived that as of high quality.

In the pleasure aspect, regarding the sweeteners, natural sweeteners had more utility value (2.14) than artificial sweeteners (0). This concludes that more consumers were health -conscious, such that they reduced the usage of harmful preservatives and artificial sweeteners. It could be seen that consumers were demanding health-friendly options in the pleasure aspect of a product as well. Natural sweeteners are increasingly gaining traction as consumers actively seek healthier alternatives to artificial sweeteners. This shift is driven by a growing awareness of the negative health impacts associated with artificial options such as increased appetite and cravings, poor regulation of blood sugar, gastrointestinal issues, neurological symptoms such as headaches, potential cardiovascular risks and addiction-like effects (42), prompting many to favour sweeteners derived from natural sources (22).

Based on the utility values of various attribute levels, the relative importance of the attributes was calculated. The attribute flavour was found to have a higher relative importance (44.10 percent), followed by sweeteners (36.58 percent), price (18.16 percent) and packaging material (6.15 percent). This is depicted in Fig. 5. It could be concluded based on the findings that consumers prioritize taste above all other factors when making purchasing decisions. This hierarchy of attribute importance highlights that flavour and sweeteners are key drivers of consumer preferences, overshadowing price and packaging considerations. Taste is the most crucial factor for consumers when purchasing flavoured fruit products, as it directly influences their overall satisfaction and enjoyment of beverages. Following taste, price emerges as a significant consideration, as consumers seek affordable options that provide value without compromising on flavour.

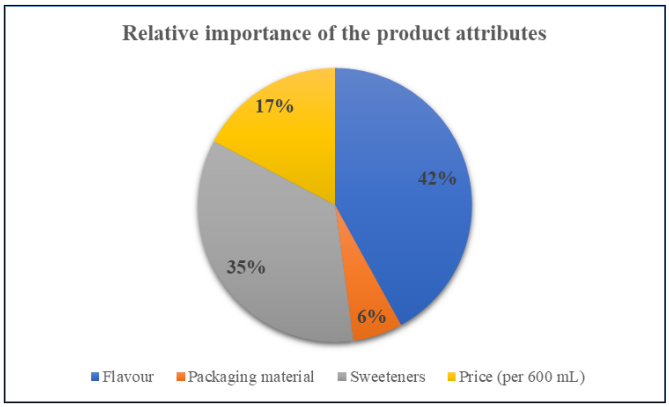

Fig 5. Relative importance of the product attributes.

The total utility value of each product combination arrived at as a result of orthogonal design in SPSS was found to be the sum of the utility values of all the attribute levels in the combination with the constant utility value i.e., -2.68. The total utility value of the product configuration 3 was calculated as follows: 2.58 + (-0.36) + 2.14 + 0.77 + (-2.68) = 2.45. The details of this are seen in Table 8 and are depicted in Fig. 6.

Product combination 3 had a higher utility value followed by product combination 5 and product combination 7, as seen in Table 8. Product configuration 3 included attribute levels: similar to fresh mango flavour, plastic bottle with screw cap packaging, natural sweetener and price of Rs.42. The next preferred combination featured a flavour that was similar to fresh mango, plastic pouch with screw cap package, natural sweetener and price of Rs.45. The product combination with a flavour that was

Table 8. Total utility value of product combinations

Product Configuration	Total Utility	Ranking
1	-0.24	7
2	0.23	6
3	2.45	1
4	0.4	5
5	1.84	2
6	0.7	4
7	0.84	3
8	-3.04	9
9	-0.87	8

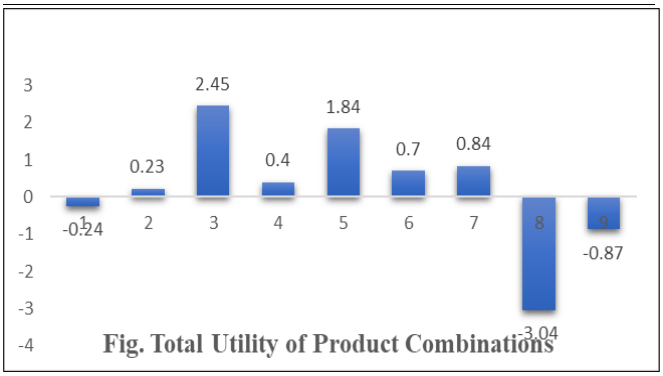

Fig 6. Total utility value of the product combinations.

weaker than fresh mango, plastic bottle with screw cap packaging, artificial sweetener and priced Rs.45 was found to be the least preferred. The findings conclude that, though price and packaging are important, the strength of the flavour significantly influences consumer preferences. In the realm of processed mango products, consumers prioritize attributes such as price, product type and taste, indicating a strong preference for mango puree that is both affordable and has a distinct sour flavour (19). This preference suggests that cost-effective options that deliver a tangy taste resonate well with consumers, influencing their purchasing decisions and overall satisfaction with the product. In the category of ready-to-drink juices, taste emerged as the most critical attribute for the majority of respondents, highlighting its pivotal role in influencing consumer satisfaction and repeat purchases (2).

Based on the findings, to enhance consumer satisfaction flavour profiles should be developed to be stronger and more appealing, as flavour is identified as the most critical attribute influencing consumer preferences. Additionally, while paper pouch packaging is currently preferred, its functionality and aesthetic appeal could be improved to enhance overall satisfaction. A careful price strategy should be evaluated for higher utility combinations to ensure they remain competitive while maximizing perceived value. A focused marketing campaign should highlight the unique attributes of the top-performing combinations to attract consumer attention and effectively drive sales. Manufacturers can enhance consumer satisfaction by developing stronger and more appealing flavour profiles for their products, as flavour is the most critical attribute influencing preferences. Additionally, while paper pouch packaging is currently favoured, there is an opportunity to improve its functionality and aesthetic appeal, which could further elevate consumer satisfaction and drive sales. Implementing a careful pricing strategy that balances utility and competitiveness will maximize perceived value, while a focused marketing campaign should highlight the unique attributes of top-performing combinations to effectively attract consumer attention.

Conclusion

The study highlights the critical role of product attributes in shaping consumer preferences for processed mango drinks. The findings revealed that flavour was the most significant factor influencing consumer choices, with a strong preference for attributes that maintain the freshness and authenticity of mango flavours. Irrespective of the fruit type, consumers universally seek products that deliver authentic and enjoyable flavours, as these are essential for encouraging repeat purchases and fostering brand loyalty. Additionally, the preference for environmentally friendly packaging solutions underscores a growing consumer demand for sustainability in product design. This demand for sustainability is not limited to mango drinks, suggesting that manufacturers should invest in sustainable packaging materials and practices to appeal to environmentally conscious consumers. The analysis also indicates that while the price is an important consideration, consumers are willing to pay more for products that offer higher perceived value, particularly when it comes to flavour and natural ingredients. To enhance consumer satisfaction and drive sales, it is recommended that manufacturers focus on developing stronger and more appealing flavour profiles, improving the functionality and aesthetics of the packaging and implementing strategic pricing that reflects the value offered. Furthermore, targeted marketing campaigns should emphasize the unique attributes of high-performing product combinations to effectively engage consumers and capitalize on their preferences. Overall, these insights provide a roadmap for optimizing product offerings in the competitive food processing sector. To build upon the findings and recommendations, several future research suggestions could be proposed. Exploring consumer preferences based on different segments within various demographic characteristics and lifestyle choices could help manufacturers tailor their products more effectively. Additionally, tracking these findings on consumer preferences over time would provide valuable insights into how attitudes shift in response to evolving market trends and health awareness. Analysing global market trends in processed fruit beverages would offer a broader context for understanding regional differences in consumer preferences. Collectively, these research avenues can enhance strategic marketing efforts and product development, ensuring that manufacturers remain responsive to the dynamic needs of consumers across diverse markets.

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Authors' contributions

GK did conceptualization of the concept, methodology being employed, data collection, statistical analysis and manuscript writing. ST did the literature review, defined the problem and derived the objectives and overall supervision of the work. SS contributed in the manuscript editing and conceptualization of the work. PM contributed by correcting formal analysis and with necessary data collection. GR assisted in the statistical analysis. All authors read and approved the final manuscript.

Compliance with ethical standards

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

Ethical issues: None

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