



Investigation of Consumer Preferences in the Fruit Juice Industry: An Application of Conjoint Analysis

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Abstract

This study aimed to determine the relative importance and part-worth utilities of flavor, pulp content, vitamin and mineral addition, and price in shaping consumer preferences for fruit juice products. A quantitative cross-sectional study was conducted among 384 consumers in Tehran Province, Iran. Data were collected using a structured questionnaire containing 15 fruit juice profiles generated through an orthogonal fractional factorial design from four attributes: flavor at four levels, pulp content at two levels, vitamin and mineral addition at two levels, and price at three levels. Respondents ranked the profiles according to their preferences. The data were analyzed using conjoint analysis and a logistic regression approach in STATA version 17. Part-worth utilities were estimated for each attribute level, and relative importance values were calculated to determine the contribution of each attribute to overall consumer preference. Separate analyses were also performed by gender and age group. Flavor was the most influential attribute, with a relative importance of 57%, followed by price at 21%, pulp content at 19%, and vitamin and mineral addition at 4%. Tropical flavor produced the highest positive part-worth utility, whereas citrus and berry flavors generated negative utilities. Fruit juice without pulp was preferred to juice with pulp. The 17,000-Toman price level had the highest positive utility, while the lowest and highest price levels received negative utilities. Flavor remained the dominant attribute in all gender and age segments. Women preferred tropical flavor and assigned greater importance to price, whereas men preferred melon flavor and placed greater importance on pulp content. Price was most influential among respondents aged 30–40 years, while pulp content was comparatively more important among those aged 40–50 years. Consumer preferences for fruit juice were driven primarily by sensory characteristics, particularly flavor, while nutritional enrichment had only a limited influence; therefore, product development should prioritize preferred flavors, pulp-free formulations, and moderate pricing while accounting for demographic differences.

Keywords: *Consumer preferences; fruit juice; conjoint analysis; part-worth utility; flavor; price; market segmentation*

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1. Introduction

Consumer preferences constitute a central concern in contemporary marketing, product development, and strategic management because they shape how individuals evaluate alternatives, form purchase intentions, and select among competing products. In highly competitive consumer markets, firms can no longer rely solely on broad assumptions about demand or on standardized product offerings. Instead, they must identify the specific attributes that create value for consumers and determine how buyers make trade-offs among sensory, functional, nutritional, and

economic characteristics. Consumer preference analysis therefore provides a foundation for market segmentation, product positioning, pricing, communication, and innovation. It also enables firms to distinguish between attributes that exert a meaningful influence on choice and those that may appear attractive from a managerial perspective but contribute little to actual consumer utility. Research across different industries has consistently shown that preferences are multidimensional, context-dependent, and affected by both product-related and consumer-related factors [1-3].



The concept of consumer preference refers to the comparative evaluation through which individuals favor one product, service, brand, or attribute configuration over another. Such preferences are not necessarily stable or based on a single criterion. They may emerge from an interaction among perceived quality, price, convenience, familiarity, social meaning, anticipated satisfaction, and personal values. Consumers may prefer a product because of its flavor or appearance, because it offers a perceived health benefit, because it is affordable, or because it corresponds to their lifestyle and identity. Moreover, the same consumer may assign different weights to these considerations across situations. For example, a buyer may prioritize price in routine purchases but place greater emphasis on quality, novelty, or ethical characteristics in special circumstances. Evidence from studies of brand selection, banking services, tourism, digital services, transportation, and food products indicates that preferences are shaped by a combination of utilitarian, experiential, social, and psychological evaluations [2-5].

Understanding these evaluations has become more important as markets have grown more fragmented and consumers have gained access to a wider range of alternatives. Digital platforms, social media, personalized advertising, and algorithmic recommendation systems expose consumers to large numbers of products and allow companies to tailor marketing messages to increasingly narrow segments. Artificial intelligence-based marketing systems can process extensive behavioral data and identify patterns in consumers' interests, purchase histories, and responses to promotional content, thereby supporting more individualized offers [6]. Similarly, predictive models based on social networks, internet-connected devices, and collaborative filtering techniques have been used to forecast preferences in electronic markets [7]. These developments have strengthened firms' capacity to anticipate consumer behavior, but they have also increased the need for reliable methods capable of distinguishing genuine product preferences from temporary digital engagement or promotional exposure.

Changes in consumption environments can also alter the relative importance of product and service attributes. During the COVID-19 pandemic, for example, consumers adjusted their shopping behavior and increased their reliance on social media and digital channels, demonstrating that preferences may shift in response to health concerns, mobility restrictions, and changes in access to products [8]. Supply-chain disruptions and changing demand patterns

have further highlighted the importance of organizational flexibility in adapting marketing strategies to evolving consumer expectations [9]. For food and beverage producers, this adaptability is especially important because consumer demand may change rapidly in response to health trends, income conditions, price inflation, product availability, and emerging concerns regarding sustainability or ethical production.

The fruit juice industry represents a particularly relevant setting for studying consumer preferences because fruit juices combine several distinct dimensions of value. They are consumed for refreshment and sensory enjoyment, but they are also frequently associated with nutrition, health, convenience, and naturalness. Consumers may evaluate fruit juices based on flavor, sweetness, color, texture, pulp content, vitamin enrichment, packaging, brand reputation, country of origin, or price. Some attributes are directly observable before purchase, whereas others are inferred from labels, marketing claims, or prior experience. This multiplicity of attributes means that a fruit juice cannot be adequately assessed through a single characteristic. A consumer may prefer a tropical flavor but reject a product with pulp, value vitamin enrichment but remain unwilling to pay a higher price, or choose a moderately priced option that offers an acceptable balance across several characteristics. Accordingly, research on fruit juice preferences should focus not merely on whether consumers like or dislike a product, but on how they evaluate combinations of product attributes.

Food-related preference research increasingly demonstrates that consumers attach value to both tangible and intangible product features. Studies of willingness to pay for animal welfare-friendly food products show that ethical considerations can generate price premiums when consumers perceive the production process as consistent with their values [10]. Similarly, a global review of edible insects and insect-derived products found that consumer acceptance and willingness to pay are affected by familiarity, perceived benefits, product form, cultural context, and socio-demographic characteristics [11]. Research on regional fish products has also shown that consumers may pay more for products associated with a specific geographic identity or production region [12]. Although fruit juice differs from these categories, the broader implication is that food choices are determined by bundles of sensory, nutritional, ethical, regional, and economic attributes rather than by price or taste alone.

Sensory attributes are particularly important in food and beverage markets because they contribute directly to

consumption experience. Flavor often serves as an immediate basis for product differentiation and may strongly affect both trial and repeat purchase. However, flavor preferences are heterogeneous, and consumers may seek variety rather than consistently purchasing the same option. Research in the wine market has demonstrated that variety-seeking behavior can be used to identify meaningful consumer segments and reveal differences in the propensity to switch among product alternatives [13]. In the context of fruit juice, flavor categories such as citrus, melon, tropical, and berries may appeal to different consumer groups, and some consumers may prefer familiar tastes while others favor novelty or exotic combinations. Consequently, identifying the utility attached to each flavor provides useful information for product portfolio design and market segmentation.

Texture and pulp content represent another important dimension of fruit juice evaluation. Pulp can be interpreted as a sign of naturalness, authenticity, and closeness to whole fruit, but it can also be perceived as inconvenient or undesirable because of its mouthfeel. The direction of preference may depend on age, consumption habits, cultural expectations, and the specific flavor involved. Some consumers may associate pulp with a healthier or less processed product, whereas others may prefer a smooth and uniform beverage. Because pulp changes the sensory experience without necessarily changing the primary flavor, its influence should be examined separately rather than treated as a minor product characteristic.

Nutritional enrichment is also frequently used to differentiate beverage products. Manufacturers often add vitamins and minerals or highlight naturally occurring nutrients in order to position products as functional or health-oriented. Nevertheless, the presence of nutritional claims does not guarantee a strong effect on consumer choice. Consumers may appreciate added vitamins but remain more responsive to flavor and price, particularly when the product category is already perceived as healthy. Furthermore, health claims may be interpreted differently depending on consumer knowledge, trust, perceived need, and familiarity with fortified products. Research on packaging and labeling shows that visual and informational cues can affect attention and product evaluation, indicating that the way nutritional information is presented may be as important as the characteristic itself [14, 15]. Eye-tracking studies of new food products further suggest that consumers do not process all label elements equally and may focus selectively on specific visual or informational features.

Price remains one of the most influential variables in consumer decision-making because it represents both a financial sacrifice and a signal of product quality. However, price effects are rarely linear or uniform. A very low price may be attractive to price-sensitive consumers but may also generate doubts regarding quality, while a high price may imply superior quality yet exceed consumers' willingness to pay. Mid-range prices may therefore produce higher utility when they balance affordability and perceived value. Research on dynamic pricing has shown that consumer responses depend not only on the amount charged but also on perceptions of fairness and consistency [16]. Mental accounting also influences how consumers evaluate payment structures and service rates, demonstrating that the framing and timing of payment can alter perceived value [17]. Although fruit juice is generally purchased through a simple unit price, consumers may still interpret price relative to expected quality, package size, brand image, and competing alternatives.

Pricing decisions should therefore be examined together with other product attributes. A consumer may accept a higher price for a preferred flavor or for a product perceived as nutritionally superior, while another may choose a lower-priced juice regardless of enrichment or texture. Studies of customized bundling indicate that product combinations and promotional structures can change consumers' valuation of individual components and influence purchase behavior [18]. This reinforces the importance of evaluating complete product profiles rather than isolating price from the characteristics for which consumers are paying. In fruit juice markets, the commercial value of vitamin enrichment or a particular flavor can only be fully understood when consumers evaluate these features alongside price.

Consumer decision-making is not always fully conscious or easily expressed. Traditional questionnaires rely on respondents' stated judgments, but emerging neuromarketing research has shown that physiological and neurological responses can also be used to classify preferences. Analysis of electroencephalographic signals, for example, has been employed to identify brain-region changes associated with consumer evaluations and choice [19]. Such research demonstrates that preferences may involve cognitive and affective processes that are not entirely captured through direct questioning. Nevertheless, stated-preference methods remain highly valuable because they can be implemented efficiently with large samples and can directly estimate how consumers trade off multiple product characteristics.

Psychological and contextual factors may further complicate preference formation. Financial behavior, trust, and interpersonal expectations can shape how individuals manage and disclose consumption-related decisions. Research on financial infidelity, although focused on romantic relationships rather than food choice, illustrates that spending behavior may involve secrecy, conflict, self-presentation, and competing personal priorities [20]. This broader consumer-behavior perspective suggests that observed purchasing decisions cannot always be reduced to objective product characteristics. Household dynamics, individual budgets, social expectations, and personal values may influence how consumers respond to price and product attributes.

The growing emphasis on consumer co-creation also highlights the importance of viewing consumers as active participants in value formation. Research on videogames-as-a-service has shown that consumers' experiences are strengthened when they participate in value co-creation and perceive opportunities for engagement and personalization [5]. Although fruit juice consumption does not involve the same level of interactive participation, consumers still contribute to product development through their preferences, feedback, reviews, and purchasing patterns. Firms that systematically incorporate this information into product design are more likely to develop offerings that correspond to market demand.

Conjoint analysis provides a suitable methodological framework for examining these multidimensional preferences. The method is based on the premise that consumers evaluate products as bundles of attributes and that the overall utility of a product can be decomposed into the part-worth utilities of its component levels. Instead of asking respondents whether flavor, pulp, nutritional enrichment, or price is important in the abstract, conjoint analysis presents combinations of these attributes and requires respondents to rank, rate, or choose among them. This procedure more closely resembles real purchasing decisions, in which desirable and undesirable characteristics coexist within the same product.

A major advantage of conjoint analysis is its ability to estimate relative attribute importance and identify the product configuration that is most attractive to consumers. It can reveal whether flavor exerts a stronger influence than price, whether vitamin addition compensates for an unfavorable texture, or whether consumers are willing to accept a higher price for a preferred combination. The method also supports segmentation because utilities can be

compared across demographic groups, including gender and age categories. Such comparisons are especially important when aggregate results conceal heterogeneous patterns. A product that performs well in the overall sample may appeal strongly to one subgroup but weakly to another.

Consumer segmentation has been widely recognized as essential for translating preference data into marketing strategy. Studies of brand selection indicate that preferences may change across stages of the customer life cycle and that firms should adapt their strategies accordingly [2]. Research on wine consumption likewise demonstrates that preference and variety-seeking patterns can identify distinct behavioral segments [13]. In fruit juice markets, demographic segmentation may reveal that younger consumers favor different flavors, price points, or enrichment options than older consumers, while gender-based differences may emerge in the valuation of pulp or vitamins. These insights can guide targeted product development, packaging, promotion, and distribution.

The relevance of preference heterogeneity is also evident in studies outside the food sector. Consumers differ in their acceptance of autonomous, shared, and electric ride-hailing services, with perceived barriers and benefits shaping adoption intentions [3]. Sports tourism consumers exhibit different motivations and service expectations depending on their preferences and travel objectives [4]. Home appliance buyers evaluate brands according to perceived quality, price, familiarity, and product features [1]. Taken together, these findings indicate that consumer choice is best understood through attribute-specific analysis rather than broad assumptions about what buyers value.

For fruit juice manufacturers, accurate preference information has direct strategic implications. Product-development decisions involve substantial costs, and introducing a new flavor, modifying texture, fortifying a beverage, or changing price without evidence of consumer demand can result in poor market performance. Preference analysis can reduce this uncertainty by identifying the attribute levels associated with positive utility. It can also help firms avoid overinvesting in features that consumers consider relatively unimportant. For example, vitamin and mineral addition may appear commercially attractive because of growing interest in health-oriented products, but its actual effect may be limited when compared with flavor or price. Conversely, a seemingly minor feature such as pulp content may significantly affect acceptance among certain groups.

Accurate preference estimates can also improve promotional communication. Personalized marketing supported by artificial intelligence increasingly enables companies to match messages and products with the interests of specific consumers [6]. However, personalization is effective only when the underlying preference data are valid. If a firm incorrectly assumes that all health-conscious consumers prioritize vitamin enrichment or that all younger consumers favor low prices, personalized campaigns may be poorly targeted. Conjoint-derived utilities provide a more nuanced foundation because they quantify trade-offs instead of relying on simplistic categories.

The Iranian fruit juice market provides a relevant context for such analysis because consumers face diverse product options while also responding to economic constraints, changing health awareness, and evolving consumption patterns. Price sensitivity may be particularly important in periods of inflation, yet consumers may still be willing to pay more for preferred flavors or perceived quality. Tehran Province, as a large and diverse consumer market, offers an appropriate setting for investigating these issues. Its population includes consumers with varying ages, educational backgrounds, income conditions, and purchasing habits, making it possible to assess both overall preferences and subgroup differences.

Despite the strategic importance of consumer-centered product design, empirical evidence concerning the combined influence of flavor, pulp, vitamin and mineral addition, and price in the Iranian fruit juice market remains limited. Existing consumer-preference research demonstrates the value of examining willingness to pay, ethical attributes, regional identity, brand selection, payment structures, digital personalization, and sensory cues across a variety of markets [10-12, 17]. However, findings from one product category cannot automatically be transferred to fruit juice because the relative importance of attributes depends on the consumption context. A focused conjoint analysis is therefore required to determine how Iranian consumers evaluate fruit juice profiles and whether preference structures differ across demographic segments.

Accordingly, the aim of this study was to investigate consumer preferences in the fruit juice industry by estimating the relative importance and part-worth utilities of flavor, pulp content, vitamin and mineral addition, and price through conjoint analysis among consumers in Tehran Province.

2. Methodology

This study employed a quantitative, cross-sectional survey design to investigate consumer preferences in the fruit juice industry through conjoint analysis. The study was conducted in Tehran Province, Iran, and the target population consisted of adult consumers who were familiar with fruit juice products and had experience purchasing or consuming packaged fruit juices. Conjoint analysis was selected because it enables researchers to estimate the relative importance consumers assign to different product characteristics and to identify the trade-offs they make when evaluating alternative product configurations. Rather than examining each product characteristic independently, this approach presents respondents with complete product profiles composed of several attributes, thereby approximating the multidimensional decision-making process that consumers encounter in actual market settings.

A total of 384 respondents participated in the study and completed the questionnaire. Participation was voluntary, and only questionnaires with complete responses to the demographic and preference-evaluation sections were included in the analysis. The final sample included 190 women, representing approximately 49% of the respondents, while men accounted for approximately 51% of the sample. The age distribution was relatively balanced across the three predefined age groups. Approximately 33% of the respondents were between 20 and 30 years of age, 34% were between 30 and 40 years of age, and 33% were between 40 and 50 years of age. Regarding educational attainment, approximately one-third of the participants held bachelor's degrees, while another one-third held master's degrees. The remaining respondents had other levels of education. The demographic composition of the sample was considered broadly consistent with the population pattern of adult consumers residing in Tehran Province, particularly in terms of gender and age distribution.

Respondents were recruited from different urban areas of Tehran Province to obtain variation in demographic and consumer characteristics. Eligibility was based on being within the specified age range, residing in Tehran Province, and having prior experience with the consumption or purchase of packaged fruit juice. Before completing the questionnaire, respondents were informed about the purpose of the research, the voluntary nature of participation, and the confidentiality of their responses. No personally identifiable information was collected. Respondents were also informed

that their answers would be analyzed collectively and used solely for research purposes.

Data were collected using a structured questionnaire developed specifically for the conjoint analysis. The questionnaire consisted of a demographic section and a product-profile evaluation section. The demographic section collected information on participants' gender, age, and educational level. The product-profile section was designed to measure respondents' preferences for different combinations of fruit juice characteristics. The attributes and their corresponding levels were selected based on common characteristics of fruit juice products and their potential relevance to consumers' purchasing decisions.

The conjoint design included four product attributes: flavor, pulp content, the addition of vitamins and minerals, and price. Flavor was defined at four levels, consisting of citrus, melon, tropical, and berry flavors. Pulp content was represented by two levels, namely fruit juice with pulp and fruit juice without pulp. The nutritional-enrichment attribute was also defined at two levels, indicating either the presence or absence of added vitamins and minerals. Price was presented at three levels: 15,000, 17,000, and 19,000 Iranian Tomans. These attributes were selected to represent sensory, compositional, nutritional, and economic dimensions of fruit juice products. Together, they allowed the study to determine whether respondents placed greater emphasis on flavor variety, product texture, nutritional enrichment, or affordability when evaluating fruit juice alternatives.

A full factorial combination of the selected attribute levels would have produced 48 possible fruit juice profiles. Presenting all possible combinations to each respondent could have caused fatigue, reduced concentration, and increased the time required to complete the survey. Such a design could also have diminished the reliability of respondents' rankings because evaluating a large number of profiles would impose a substantial cognitive burden. Therefore, an orthogonal fractional factorial design was used to reduce the number of profiles while maintaining the ability to estimate the effects of the product attributes independently. Orthogonality is important in conjoint analysis because it minimizes correlations among attribute levels and permits separate estimation of the contribution of each attribute to consumer preferences. This procedure reduced the original 48 possible combinations to 15 profiles, making the evaluation task more manageable for respondents while retaining sufficient variation across the selected attribute levels.

Each of the 15 profiles represented a distinct combination of flavor, pulp content, vitamin and mineral addition, and price. The profiles included citrus-flavored juice with pulp, without added vitamins and minerals, priced at 19,000 Tomans; berry-flavored juice without pulp or added vitamins and minerals, priced at 17,000 Tomans; berry-flavored juice with pulp and added vitamins and minerals, priced at 15,000 Tomans; berry-flavored juice with pulp but without added vitamins and minerals, priced at 15,000 Tomans; melon-flavored juice without pulp but with added vitamins and minerals, priced at 15,000 Tomans; and tropical-flavored juice with pulp and added vitamins and minerals, priced at 19,000 Tomans. Other profiles included melon-flavored juice with pulp and added vitamins and minerals at 17,000 Tomans; tropical-flavored juice without pulp or added vitamins and minerals at 15,000 Tomans; citrus-flavored juice without pulp but with added vitamins and minerals at 17,000 Tomans; tropical-flavored juice without pulp but with added vitamins and minerals at 19,000 Tomans; berry-flavored juice without pulp but with added vitamins and minerals at 19,000 Tomans; tropical-flavored juice with pulp but without added vitamins and minerals at 17,000 Tomans; melon-flavored juice without pulp or added vitamins and minerals at 19,000 Tomans; melon-flavored juice with pulp but without added vitamins and minerals at 19,000 Tomans; and citrus-flavored juice with pulp and added vitamins and minerals at 15,000 Tomans.

The profiles were presented in a standardized format so that respondents could compare them using the same information. Each respondent was asked to evaluate and rank the 15 profiles according to personal preference, from the most preferred to the least preferred alternative. The ranking procedure required respondents to consider all attributes simultaneously rather than evaluating flavor, pulp, nutritional enrichment, or price separately. This method was intended to reflect realistic consumer decision-making, in which the attractiveness of a product is determined by the combined effects of its characteristics. Before completing the ranking task, respondents were provided with a brief explanation of each attribute and its levels. They were instructed to assume that all unmentioned product characteristics, such as package size, brand reputation, availability, and product quality, were identical across the profiles. This instruction was included to ensure that respondents based their rankings only on the four attributes examined in the study.

The questionnaire was reviewed before the main data collection process to ensure that the attribute descriptions,

profile combinations, and response instructions were understandable. Particular attention was paid to the clarity of the flavor categories, the distinction between juice with and without pulp, the meaning of vitamin and mineral enrichment, and the presentation of prices. The final questionnaire was administered to the selected respondents, and completed questionnaires were examined for missing data, inconsistent rankings, or incomplete demographic information before statistical analysis.

The collected data were analyzed using descriptive statistics, conjoint analysis, and binomial logistic regression. Descriptive statistics were first calculated to summarize the demographic characteristics of the respondents. Frequencies and percentages were used to describe gender, age categories, and educational attainment. The distribution of respondents across demographic groups was examined to assess the composition of the sample and its correspondence with the adult consumer population of Tehran Province.

Conjoint analysis was used to estimate the contribution of each fruit juice attribute and attribute level to respondents' overall preferences. In the conjoint model, the total preference for a fruit juice profile was conceptualized as the sum of the utilities associated with its component attribute levels. Each attribute level was assigned a part-worth utility value representing its positive or negative contribution to the preference assigned to a particular profile. A higher positive utility indicated that the attribute level increased the attractiveness of the product, whereas a negative utility indicated that the level reduced consumer preference relative to the reference or average utility. The estimated utilities were used to determine which flavors, pulp conditions, nutritional-enrichment options, and price levels were most preferred by respondents.

The relative importance of each attribute was calculated from the range of its estimated utility values. For each attribute, the difference between the highest and lowest part-worth utility was determined. This range was then divided by the sum of the utility ranges for all attributes and multiplied by 100. The resulting percentage represented the relative importance of the attribute in the overall preference structure. Larger importance values indicated that changes in the levels of the respective attribute had a stronger influence on respondents' evaluations of fruit juice profiles. This procedure enabled comparison of the influence of flavor, pulp content, vitamin and mineral addition, and price on consumer preferences.

Price was treated as an ordered attribute because its three levels represented increasing monetary costs. The analysis

examined whether consumer utility declined as price increased and whether respondents were willing to accept higher prices in exchange for preferred flavors, pulp content, or vitamin and mineral enrichment. The flavor attribute was treated as categorical because the four flavor levels did not follow a natural numerical order. Pulp content and vitamin and mineral addition were treated as dichotomous attributes. Appropriate indicator coding was used to estimate the part-worth utilities associated with the categorical attribute levels.

Binomial logistic regression was additionally used to examine the probability that a fruit juice profile would be classified as preferred based on its attribute composition. For this analysis, the preference outcome was expressed as a binary variable distinguishing more-preferred profiles from less-preferred profiles according to respondents' rankings. Flavor, pulp content, vitamin and mineral addition, and price were entered as predictor variables. Logistic regression was considered appropriate because it estimates the relationship between several independent variables and the likelihood of a binary outcome. The model coefficients indicated the direction of association between each product characteristic and the probability that a profile would be preferred, while the exponentiated coefficients were interpreted as odds ratios. Odds ratios greater than one indicated that an attribute level increased the likelihood of preference relative to the reference category, whereas odds ratios below one indicated a reduced likelihood of preference.

The use of binomial logistic regression also provided an interpretable framework for evaluating consumer choice behavior. Logistic models are frequently applied in marketing research to predict whether consumers will select, purchase, or prefer a product based on product characteristics and consumer-related predictors. Their use is particularly valuable when the research objective is to estimate how changes in explanatory variables alter the probability of a specific market outcome. In the present study, the logistic regression results complemented the conjoint utility estimates by demonstrating how the presence of particular fruit juice attributes influenced the likelihood that a profile would be categorized among the preferred alternatives.

Before estimating the models, the dataset was examined for incomplete observations, invalid rankings, and coding errors. Multicollinearity among the explanatory variables was assessed to ensure that the effects of the attributes could be estimated reliably. The orthogonal design reduced dependencies among the attributes and supported the

independent estimation of their effects. Model adequacy was evaluated using appropriate goodness-of-fit statistics, classification accuracy, and the statistical significance of the regression coefficients. The correspondence between observed profile rankings and preferences predicted by the conjoint model was also examined to assess predictive validity. Statistical significance was evaluated at the 0.05 level, and the results were reported through estimated utilities, relative-importance percentages, regression coefficients, odds ratios, confidence intervals, probability values, and relevant model-fit indices.

3. Findings and Results

Following data collection, the responses were analyzed using a logistic regression approach. The statistical analyses were performed using STATA version 17. Table 1 presents the results obtained from the analysis of the total sample. The findings indicate that flavor was the most influential attribute in determining consumer preferences, with a relative importance of 57%. Among the flavor levels, tropical flavor received the highest part-worth utility and was therefore the most preferred flavor among the respondents.

Table 1. Results for the Total Sample

Attribute	Level	Coefficient	Relative Importance	Part-Worth Utility
Flavor	Citrus	-0.55	57%	-28%
	Melon	0.74		10%
	Tropical	1.38		29%
	Berries	0.00		-11%
Pulp	Yes	-0.64	19%	-9%
	No	0.00		9%
Vitamin and mineral addition	Yes	0.13	4%	2%
	No	0.00		-2%
Price	15,000 Tomans	0.00	21%	-9%
	17,000 Tomans	0.70		12%
	19,000 Tomans	0.20		-3%

Another notable result was the relatively limited influence of vitamin and mineral addition on consumer preferences. This attribute accounted for only 4% of the total relative importance, indicating that it played a minor role in

respondents' evaluations of fruit juice profiles. Price was the second most influential attribute, with a relative importance of 21%, followed by pulp content, with a relative importance of 19%.

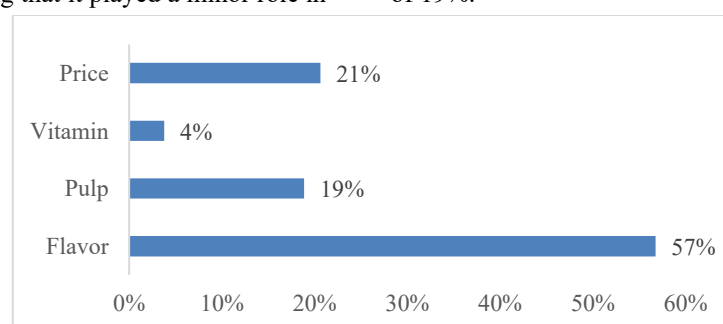


Figure 1. Relative Importance of Attributes in the Total Sample

The zero-centered part-worth utility estimates further clarify the direction and magnitude of consumer preferences. Tropical flavor had the highest positive utility score, followed by melon flavor. Citrus and berry flavors received negative utility scores and were therefore less preferred. The findings also indicate that respondents generally preferred

fruit juice without pulp. Although the addition of vitamins and minerals generated a slightly positive utility, its contribution to overall preference was limited. Regarding price, the 17,000-Toman level received the highest positive part-worth utility, whereas the 15,000- and 19,000-Toman price levels received negative utility scores.

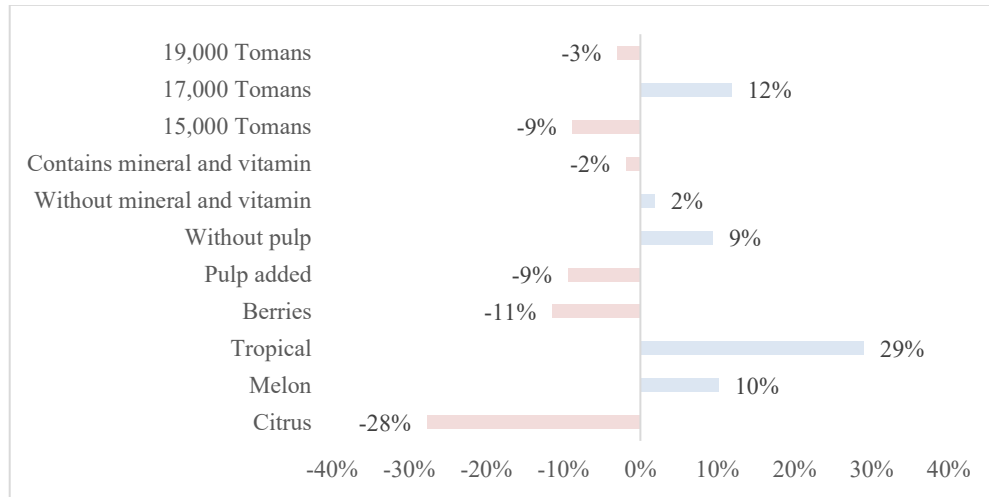


Figure 2. Zero-Centered Part-Worth Utilities for the Total Sample

Flavor remained the most influential attribute among both female and male respondents, accounting for 47% of the relative importance among women and 49% among men.

Nevertheless, several gender-based differences were observed in the relative importance of the remaining attributes and in the utilities assigned to their levels.

Table 2. Results by Gender

Gender	Attribute	Level	Relative Importance	Part-Worth Utility
Female	Flavor	Citrus	47%	-28%
		Melon		0%
		Tropical		20%
		Berries		8%
	Pulp	Yes	21%	-11%
		No		11%
	Vitamin and mineral addition	Yes	8%	4%
		No		-4%
	Price	15,000 Tomans	24%	-10%
		17,000 Tomans		14%
		19,000 Tomans		-4%
Male	Flavor	Citrus	49%	-3%
		Melon		26%
		Tropical		0%
		Berries		-23%
	Pulp	Yes	26%	-13%
		No		13%
	Vitamin and mineral addition	Yes	16%	-8%
		No		8%
	Price	15,000 Tomans	8%	-2%
		17,000 Tomans		-3%
		19,000 Tomans		5%

Female respondents showed the strongest preference for tropical flavor, whereas male respondents expressed the greatest preference for melon flavor. Berry flavor received a positive utility among female respondents but a strongly negative utility among male respondents. Both groups preferred fruit juice without pulp, although pulp content was

relatively more important to male respondents than to female respondents.

Female respondents showed a positive preference for fruit juices containing added vitamins and minerals, whereas male respondents preferred products without such additions. Price was considerably more influential among female respondents, accounting for 24% of relative importance,

compared with only 8% among male respondents. Women preferred the 17,000-Toman price level, while men assigned the highest positive utility to the 19,000-Toman price level.

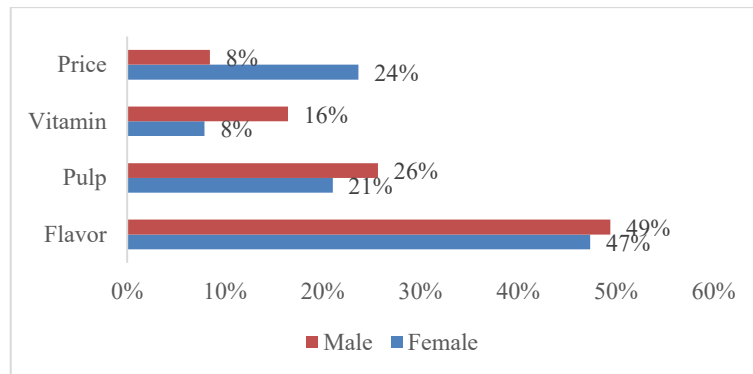


Figure 3. Relative Importance of Attributes by Gender

Across all age groups, flavor was the most influential attribute, whereas vitamin and mineral addition was generally the least influential. However, the relative importance of price and pulp content differed across age

categories. Price had the strongest influence among respondents aged 30–40 years, while pulp content was particularly influential among respondents aged 40–50 years.

Table 3. Results by Age Group

Age Group	Attribute	Level	Relative Importance	Part-Worth Utility
20–30 years	Flavor	Citrus	49%	–29%
		Melon		2%
		Tropical		20%
		Berries		7%
	Pulp	Yes	20%	–10%
		No		10%
	Vitamin and mineral addition	Yes	9%	4%
		No		–4%
	Price	15,000 Tomans	23%	–9%
		17,000 Tomans		13%
		19,000 Tomans		–4%
30–40 years	Flavor	Citrus	50%	–24%
		Melon		9%
		Tropical		25%
		Berries		–10%
	Pulp	Yes	16%	–8%
		No		8%
	Vitamin and mineral addition	Yes	3%	2%
		No		–2%
	Price	15,000 Tomans	31%	–12%
		17,000 Tomans		19%
		19,000 Tomans		–7%
40–50 years	Flavor	Citrus	54%	–26%
		Melon		3%
		Tropical		28%
		Berries		–5%
	Pulp	Yes	29%	–14%
		No		14%
	Vitamin and mineral addition	Yes	7%	4%
		No		–4%
	Price	15,000 Tomans	10%	0%
		17,000 Tomans		–5%
		19,000 Tomans		5%

Among respondents aged 20–30 years, flavor accounted for 49% of relative importance, followed by price at 23%, pulp content at 20%, and vitamin and mineral addition at 9%. Tropical flavor received the highest positive utility, whereas citrus flavor received the strongest negative utility. Respondents in this age group preferred juice without pulp, juice with added vitamins and minerals, and the 17,000-Toman price level.

Among respondents aged 30–40 years, flavor remained the most important attribute, accounting for 50% of relative importance. Price was particularly influential in this group, accounting for 31%, which was higher than in the other age categories. Tropical flavor and the 17,000-Toman price level received the highest positive utilities. Conversely, citrus

flavor and the 15,000-Toman price level received the strongest negative utilities. Pulp content and vitamin and mineral addition had comparatively limited effects on the preferences of this age group.

Among respondents aged 40–50 years, flavor had the highest relative importance, at 54%, followed by pulp content at 29%. Tropical flavor received the highest positive utility, while citrus flavor received the strongest negative utility. This age group displayed a pronounced preference for juice without pulp. Vitamin and mineral addition had a relatively limited influence, although the presence of added vitamins and minerals received a positive utility. Unlike the younger age groups, respondents aged 40–50 years assigned the highest positive price utility to the 19,000-Toman level.

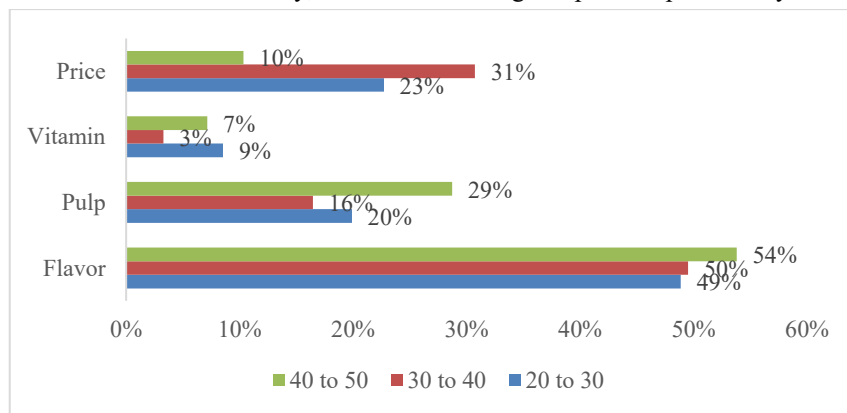


Figure 4. Relative Importance of Attributes by Age Group

4. Discussion and Conclusion

The present study investigated consumer preferences in the fruit juice industry by examining the relative importance and part-worth utilities of flavor, pulp content, vitamin and mineral addition, and price among consumers in Tehran Province. The overall findings showed that flavor was the most influential attribute, accounting for 57% of total relative importance, followed by price at 21%, pulp content at 19%, and vitamin and mineral addition at only 4%. Among the flavor levels, tropical flavor generated the highest positive part-worth utility, while citrus and berry flavors received negative utility values. Respondents generally preferred fruit juice without pulp, and the 17,000-Toman price level was more attractive than both the lower and higher price levels. The results also revealed meaningful differences across gender and age groups. Female respondents preferred tropical flavor and displayed greater sensitivity to price, whereas male respondents showed a stronger preference for melon flavor and assigned greater

importance to pulp and vitamin-related attributes. Across age groups, flavor consistently remained the dominant factor, although price was particularly influential among respondents aged 30–40 years, while pulp content was more important among those aged 40–50 years.

The dominant role of flavor indicates that sensory appeal was the primary basis on which respondents evaluated fruit juice profiles. This finding is theoretically plausible because flavor represents one of the most direct and immediately experienced characteristics of a beverage. Unlike nutritional enrichment, which may be perceived indirectly through labeling, flavor determines the anticipated and actual consumption experience. The strong influence of flavor is consistent with the broader consumer-behavior literature showing that product-specific experiential characteristics frequently outweigh more abstract or secondary product benefits. Studies of brand selection and product evaluation have shown that consumers often rely on salient product features that are easily understood and directly connected to expected satisfaction [1, 2]. In the fruit juice context, flavor functions as both a sensory attribute and a market-

positioning mechanism, making it a logical determinant of product preference.

The relatively high utility assigned to tropical flavor suggests that consumers may value novelty, diversity, or the perceived richness of nontraditional flavor combinations. Tropical flavors may be associated with freshness, indulgence, or product differentiation, particularly in markets where conventional fruit juices are widely available. This result can be interpreted in light of variety-seeking behavior, which describes consumers' tendency to switch among alternatives or favor novel experiences even when they are satisfied with familiar products. Research in the wine domain has demonstrated that variety seeking is an important source of consumer heterogeneity and can be used to identify market segments with different product expectations [13]. The preference for tropical flavor in the present study may therefore reflect a desire for sensory novelty rather than a simple rejection of traditional flavors.

At the same time, the negative utility associated with citrus flavor appears noteworthy because citrus is a common and widely recognized juice category. One possible explanation is that familiarity does not necessarily translate into stronger preference when consumers are asked to compare complete product profiles. Citrus products may be perceived as conventional, acidic, or less distinctive compared with tropical alternatives. Another possibility is that respondents evaluated citrus together with the other characteristics included in the conjoint profiles, such as pulp, enrichment, and price, and therefore reacted to the overall configuration rather than flavor in isolation. This illustrates a central advantage of conjoint analysis: it captures trade-offs among attributes and avoids assuming that a familiar product characteristic is automatically preferred. Research on consumer choice repeatedly shows that preference is context-dependent and can shift when attributes are evaluated jointly rather than independently [3, 12].

The preference for fruit juice without pulp indicates that smooth texture and ease of consumption may have been more desirable than perceived naturalness or authenticity. Although pulp can signal minimal processing and closeness to whole fruit, it also changes mouthfeel and may be considered inconvenient by consumers who prefer a uniform beverage. The negative utility of pulp suggests that respondents may have prioritized sensory smoothness over symbolic associations with naturalness. This result is compatible with the view that consumers evaluate products not only according to functional or health-related characteristics but also according to immediate ease of use

and consumption experience. Similar patterns have been observed in other product and service contexts in which convenience-related attributes shape consumer preferences even when alternative options appear technologically advanced or ethically desirable [3, 9].

The finding that vitamin and mineral addition had the lowest relative importance is particularly important. Although fortified beverages are often marketed as healthier or more functional, respondents in this study placed little overall weight on this attribute. This may indicate that fruit juice is already perceived as naturally nutritious, reducing the marginal value of additional vitamins and minerals. Consumers may also be skeptical of enrichment claims, may not clearly distinguish between naturally occurring and added nutrients, or may simply regard flavor and price as more relevant to routine purchasing decisions. The low importance of enrichment does not imply that consumers rejected vitamins and minerals altogether; rather, the small utility range indicates that this attribute contributed less to choice than the other characteristics.

This interpretation is consistent with food-preference research showing that health, ethical, and functional attributes influence consumer decisions only when they are credible, personally relevant, and presented in an understandable form. Studies of animal welfare-friendly foods and edible insect products have shown that consumers may value nontraditional product benefits, but willingness to pay depends on familiarity, perceived usefulness, cultural acceptance, and confidence in product information [10, 11]. Similarly, label and packaging research suggests that consumers do not attend equally to all informational elements and that some claims may have limited influence unless they are visually salient or meaningfully connected to consumer needs [14, 15]. Thus, vitamin and mineral addition may have had little effect because it was less salient or less differentiating than flavor, pulp, or price.

The price findings also require careful interpretation. The 17,000-Toman level generated the highest positive utility, whereas the 15,000- and 19,000-Toman levels were less preferred. This pattern suggests that respondents did not automatically choose the lowest-priced option. Instead, they may have interpreted the intermediate price as signaling an acceptable balance between affordability and quality. Very low prices can sometimes create uncertainty regarding product quality, while high prices may exceed consumers' perceived value. The preference for the middle price level therefore reflects a nonlinear price response rather than straightforward price minimization.

This result aligns with research showing that price is not evaluated solely as a financial cost but also as a fairness cue and a signal of value. Consumers may react negatively when prices seem inconsistent, excessively low, or unjustifiably high. Dynamic pricing research has demonstrated that perceived fairness significantly affects consumers' responses to price variation [16]. Mental accounting research likewise indicates that individuals interpret payments according to psychological frames rather than objective amounts alone [17]. In the current study, the middle price may have fallen within a psychologically acceptable range, providing reassurance about product quality without creating excessive financial sacrifice.

The role of price can also be understood in relation to customized product offerings. Consumers may be willing to pay more when they perceive that a product bundle matches their preferred combination of features. Research on strategic customized bundling has shown that the value of a product component depends on how it is combined with other features and presented to consumers [18]. Therefore, the positive utility of the 17,000-Toman level may reflect its interaction with preferred flavors or product configurations rather than an independent preference for that amount. This is consistent with conjoint theory, which assumes that consumers evaluate complete bundles and make compensatory trade-offs among attributes.

Gender-based findings further demonstrate that aggregate consumer preferences conceal substantial heterogeneity. Flavor remained the most important attribute for both women and men, but the preferred flavor differed. Women assigned the highest utility to tropical flavor, whereas men preferred melon flavor. Women also evaluated berry flavor positively, while men assigned it a strongly negative utility. These differences may reflect variations in flavor familiarity, sensory expectations, consumption habits, or symbolic associations. Previous research across several markets has shown that consumer preferences vary according to demographic characteristics and that segmentation is necessary for effective product positioning [1, 2, 4].

Female respondents also placed substantially greater importance on price than male respondents. The 17,000-Toman level was preferred among women, whereas men assigned the highest utility to the 19,000-Toman level. This may suggest that female participants were more attentive to value-for-money considerations, while male participants were more likely to interpret the higher price as acceptable or potentially indicative of superior quality. However, gender should not be treated as a direct causal explanation,

because differences in income, household purchasing roles, frequency of fruit juice consumption, and brand experience may also shape price sensitivity. Financial decision-making research demonstrates that expenditure patterns are embedded in broader psychological and relational contexts [20]. Thus, the observed gender difference may reflect underlying economic or household factors not directly measured in this study.

The gender-specific findings regarding vitamin and mineral addition were also notable. Female respondents showed a modest positive utility for added vitamins and minerals, whereas male respondents preferred products without such additions. This pattern may indicate that women were somewhat more responsive to health-oriented product positioning. Nevertheless, vitamin and mineral addition remained less important than flavor and price among women. Therefore, health-related claims may be useful as supporting rather than primary positioning features. The finding also corresponds with evidence that consumers respond differently to informational and functional product cues depending on their needs, prior beliefs, and attentional patterns [14, 19].

Both male and female participants preferred fruit juice without pulp, although pulp was relatively more important among men. This consistency suggests that the preference for smooth texture was broadly shared across gender groups. From a product-development perspective, pulp-free formulations may therefore have wider market acceptance. At the same time, the stronger importance of pulp among male respondents suggests that texture-related preferences should not be ignored when designing segment-specific products. A specialized pulp-containing product may still appeal to a narrower group, particularly if marketed around authenticity, naturalness, or fruit content.

The age-based analyses reinforced the overall importance of flavor but revealed differences in the relative influence of price and pulp. Tropical flavor was the most preferred level across all three age groups, while citrus remained negatively evaluated. This consistency suggests that the attractiveness of tropical flavor was not confined to a single age segment. It may therefore represent a broadly appealing basis for new product development. Nevertheless, the strength of the utility differed, with the highest tropical-flavor utility observed among respondents aged 40–50 years. This result challenges the assumption that novel or exotic flavors necessarily appeal primarily to younger consumers.

Among respondents aged 20–30 years, price, pulp, and vitamin addition all had moderate but secondary importance.

This group preferred the 17,000-Toman price level, fruit juice without pulp, and products with added vitamins and minerals. Younger consumers may be receptive to nutritional enrichment while still prioritizing taste and affordability. Their positive response to enrichment may also reflect greater exposure to health-oriented marketing or functional beverage trends through digital media. Research on social media use and consumer shopping behavior has shown that younger and digitally engaged consumers may be especially responsive to changing product information and consumption trends [8]. Personalized marketing systems may further reinforce such preferences by repeatedly exposing consumers to health and lifestyle-oriented product messages [6].

For respondents aged 30–40 years, price accounted for 31% of relative importance, the highest proportion across the age groups. This suggests that consumers in this category were especially sensitive to the economic dimension of fruit juice choice. Individuals in this age range may face substantial household expenses and therefore evaluate routine purchases more carefully. Their strong preference for the middle price level again indicates that price sensitivity does not necessarily mean preference for the cheapest option. Instead, these consumers may seek a credible balance between quality and expenditure. This pattern is compatible with mental accounting theory, according to which consumers allocate spending within psychologically defined budgets and evaluate whether a purchase fits the expected value of a category [17].

Among participants aged 40–50 years, pulp was more influential than price, and the no-pulp level received a particularly high positive utility. This indicates that texture and ease of consumption became more important in this group. At the same time, the highest price level received a positive utility, whereas the middle price was negatively evaluated. One possible interpretation is that some older respondents associated the higher price with higher quality or greater reliability. However, because income and perceived quality were not measured, this explanation remains tentative. Studies of consumer willingness to pay show that consumers may accept price premiums when they believe that a product offers superior quality, ethical value, regional authenticity, or other meaningful benefits [10, 12].

The age-group findings support the broader principle that consumer markets are heterogeneous and should not be approached through a single average profile. Research in multiple sectors has shown that differences in demographic characteristics, experience, and usage context shape the

value assigned to product and service features [3, 5]. For fruit juice manufacturers, the implication is that product portfolios may perform better when they include differentiated offerings rather than a single standardized configuration. However, because tropical flavor and no-pulp formulations performed strongly across several groups, these attributes may provide a suitable foundation for mass-market products.

The results also have implications for the use of advanced consumer analytics. Predictive systems based on artificial intelligence, social networks, and behavioral data are increasingly used to identify likely purchases and personalize recommendations [6, 7]. The present findings suggest that such systems should incorporate interactions among sensory, nutritional, and economic characteristics rather than relying on isolated indicators. For example, predicting that a consumer prefers fortified beverages may be insufficient if flavor and price have much stronger effects on actual choice. Conjoint-derived utilities can therefore complement digital behavioral data by clarifying the trade-offs that underlie stated preference.

Furthermore, the findings demonstrate that explicit consumer reports remain valuable despite the growing use of neuromarketing tools. EEG-based research has shown that consumer preferences can be classified through changes in neural activity, revealing implicit processes involved in decision-making [19]. Nevertheless, conjoint analysis offers a practical means of quantifying attribute utilities in a large sample and translating them into actionable product configurations. The two approaches should be viewed as complementary: neuromarketing can deepen understanding of automatic responses, while conjoint analysis provides direct estimates of the market value of specific attribute combinations.

Overall, the present results support the view that fruit juice preferences are primarily sensory but are modified by economic, textural, nutritional, and demographic factors. Flavor dominated the choice process, but the preferred configuration was not simply the least expensive or most nutritionally enhanced product. Instead, respondents favored a combination characterized by tropical flavor, no pulp, and a moderate price. This pattern illustrates the multidimensional nature of consumer decision-making and emphasizes the importance of designing products as integrated bundles of attributes. It also shows that manufacturers should avoid assuming that health enrichment or low price will compensate for an unattractive sensory profile.

This study had several limitations that should be considered when interpreting the findings. First, the sample was restricted to consumers in Tehran Province, and the results may not be generalizable to consumers in other regions of Iran with different cultural, economic, and consumption patterns. Second, the study relied on stated preferences rather than actual purchase behavior, and respondents' rankings may not fully correspond to their decisions in real retail environments. Third, only four attributes were included in the conjoint design. Other relevant factors, such as brand, packaging, sugar content, juice concentration, product origin, package size, organic certification, and familiarity, were not examined. Fourth, the binary logistic approach required the ranking outcomes to be converted into a preferred-versus-nonpreferred form, which may have reduced some of the information contained in the original rankings. Finally, demographic variables such as household income, occupation, family size, consumption frequency, and health orientation were not included, although these factors may explain some of the observed gender- and age-based differences.

Future studies should replicate the analysis in other provinces and include rural as well as urban consumers to determine whether the observed preference structure is geographically stable. Researchers should incorporate a wider range of product attributes, including sugar level, packaging type, brand reputation, fruit concentration, organic status, serving size, and nutritional claims. Choice-based conjoint experiments could be used to simulate retail decisions more realistically and compare stated preferences with actual or experimentally observed purchases. Future research should also examine interactions among attributes, such as whether vitamin enrichment is valued more strongly when combined with specific flavors or premium packaging. Including income, household composition, purchasing frequency, health consciousness, and brand loyalty would permit more refined consumer segmentation. Longitudinal studies could additionally assess whether preferences change in response to inflation, health campaigns, seasonal availability, or repeated exposure to new products.

Fruit juice manufacturers should prioritize flavor development because sensory preference appears to be the strongest determinant of product acceptance. Tropical flavors may offer promising opportunities for broad-market products, although manufacturers should conduct sensory testing before large-scale commercialization. Smooth, pulp-free formulations are likely to appeal to a substantial proportion of consumers, while pulp-containing products

may be positioned for smaller segments seeking naturalness or authenticity. A moderate pricing strategy may be more effective than competing solely through the lowest price, because consumers may interpret an intermediate price as offering a better balance between quality and affordability. Vitamin and mineral enrichment should be used as a supplementary value proposition rather than the central basis of promotion. Firms should also segment their product and communication strategies by age and gender, emphasizing value and tropical flavor for female and middle-aged consumers, while considering melon flavor and premium positioning for selected male segments. Product-development teams should integrate conjoint results with retail sales, sensory testing, and consumer feedback before finalizing new offerings.

Authors' Contributions

Authors equally contributed to this article.

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Declaration of Interest

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Ethical Considerations

All procedures performed in this study were under the ethical standards.

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