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Ice cream consumption preferences in Sullana, Peru

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Abstract

Ice cream is one of the most consumed desserts worldwide and due to the high production of fruits such as camu camu, mango, and grapes in northern Peru, it is intended to introduce artisanal ice cream with these fruits in the market. This study was exploratory, descriptive and cross-sectional. A questionnaire was applied to the population of Sullana, Peru. This report shows a relationship between consumers and non-consumers of ice cream according to gender (p=0.473), age (p=0.816), occupation (p=0.551) and willingness to pay (p=0.007). The results show that non-consumers buy ice cream for others. Consumers prefer handmade ice cream and served in a cup, they also prefer cookies, toffee, chocolate and fruits as toppings on ice cream. Most of the participants consume ice cream in all seasons of the year, on weekends and pay between 2.5 and 5 soles for the ice cream they buy. 36.8% prefer to consume ice cream in commercial establishments and 95.8% of the population would like the restaurant of their choice to offer artisan ice cream. These results provide ice cream manufacturers and local businesses with new insights into consumer preferences. In conclusion, the consumption of local products such as mango, camu camu, grape and avocado are important from a nutritional point of view to take advantage of their bioactive compounds, and from the producer's point of view can improve sales and product diversification through ice cream.

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Introduction

Ice cream is a frozen food product made from the mixing and processing of milk, sweeteners, flavorings, stabilizers, colorings and emulsifiers that incorporate air at the time of churning and have high energy values. Ice cream is one of the most consumed desserts worldwide, reaching a global value of 65.8 billion dollars in 2020, with a great dominance of the global market by the Asia-Pacific region. The ice cream market is expected to continue to grow moderately in 5 years.[1]

By 2026, the ice cream market will be valued at 83.7 billion dollars, taking into account the impact caused by the new coronavirus pandemic (COVID-19).[2] Likewise, the causes that explain this growth are the creation of new flavors, the demand for prepared foods, quality, innovation, low fat content and the increase in capital of artisanal ice cream parlors.[1]

According to previous studies,[3–5] a worldwide market segmentation has been established considering the flavor (vanilla flavor ice cream is the most consumed), the category (the most promoted ice cream is the most consumed), the product (ice cream in a glass is the most consumed), the distribution channel (supermarkets and hypermarkets are places where ice cream is the most).

The main countries that lead the ranking per capita consumption of ice cream worldwide are New Zealand 28.4 l, United States 20.8 l, Australia 18 l, Finland 14.2 l, Sweden 12.0 l, Canada 10.6 l and Denmark 9.8 l[6,7]

In Latin America, according to the report,[8] the main markets by volume of ice cream consumption (millions of liters) are found in Brazil with 532 l Mexico with 285 l, Chile with 156 l, Colombia with 101 l and Argentina with 74 l. However, Chile leads Latin America in per capita consumption of ice cream with 8.6 l, followed by Puerto Rico with 7.9 l, Costa Rica with 3.8 l, Uruguay with 2.9 l, Brazil with 2.7 l and Mexico with 2.3 l. The ice cream market will reach a compound annual growth rate (CAGR) of 2% during the periods 2020-2025 despite the global health crisis .[8,9]

In the Peruvian market, the consumption by volume of ice cream ranks sixth with 46 million liters and is expected to have a CAGR of 2.8% until the end of 2022. At a per capita level, ice cream consumption is 1.8 l, that is, 48% less than what is consumed in Chile. However, what makes ice cream companies profitable and successful is the limited competition in the production and sale of artisanal ice cream.[10,11] Artisanal ice cream parlours have been conquering the market by offering consumers new flavour experiences and innovations that favour consumers' health, as many of these ice creams do not contain additives.[12,13]

In Peru, the main companies which lead the ice cream market are D'Onofrio, Artika, Trendy and Helatony's, competing with each other in a market that exceeds 162.5 million dollars in sales each year.[14]

It is estimated that every time Peruvians leave their homes, they spend between 4 and 10 soles in an artisanal ice cream shop, very different from the 2 soles they spend buying ice cream from tricycles and bars, making it clear that socioeconomic status does not influence consumption. of ice cream, but the desire to try new flavors.[13,15]

According to the Ministry of Agrarian Development and Irrigation (MIDAGRI),[16] Piura is one of the Peruvian departments with the highest volume of fruit and vegetable production, such as bananas (251,504.00 t; 9.96%), mangoes (132,024.00 t; 8.38%), lemon (100,324.00 t; 5.07%) and grape (24,940.00 t; 4.15%). The government and non-governmental organizations (NGOs) are promoting the cultivation of native tropical fruits such as camu camu to reduce poverty in localities,[17] but the demand for generating a value chain for camu camu, mango and other fruits through the production of ice cream is not clear in the academic literature; the tropical climate of the region and the trends of consumption of natural products as a consequence of the COVID-19 are potentially exploitable scenarios.[18]

The consumer is defined as the individual who consumes or finally disposes of the product (ice cream), this individual can also be considered as a client if he/she buys the product. However, the non-consumer is the individual who does not consume ice cream, but who can purchase the product19, when

the client buys the product or service it achieves benefit for the consumer,[20] and in the process of ice cream consumption, clients also value the suggestive and stimulating experience generated by the purchased products.[21] It is important to know the behavior of consumers and their purchase intention because it offers a competitive advantage to companies to introduce new products or differentiate their products in the market.[22] However, small businesses such as traditional or artisanal ice cream shops do not invest in the development of robust market research, but rely on research provided by the academy.

Therefore, the objective of this study was to determine the preferences of ice cream consumers in the population of Sullana, Peru.

Materials and Methods

Participants

The population was constituted by 300,000 people from the province of Sullana, Piura-Peru, Simple random sampling was used to select the sample.[23] A confidence level of 95% was considered, with a precision error of 5% and a Z value of 1.96 in order to randomize the population and allow them to have the same probabilities of being chosen.[24] Based on the mentioned data, a sample size of 384 people from the province of Sullana, Piura-Peru was established.

Eligibility Criteria

Volunteers over 18 years of age were included and participants were recruited to complete the questionnaire between June and November 2022. The study was carried out in the Department of Food Industries of the Universidad Nacional de Frontera.

Ethical Considerations

The participants' data and the informed consent were treated according to the Declaration of Helsinki and its subsequent revisions.[25]

Research Type and Design

Exploratory, descriptive correlational research based on a mixed approach. The study design was non-experimental and cross-sectional.

Questionnaire Design

A survey technique was used and an online questionnaire based on 14 open and closed questions was used as an instrument.

Statistical Analysis

The data were analyzed with SPSS software version 23.0 for Windows (SPSS, Chicago, USA). Categorical variables were described in percentage (%). The X^2 test was used to compare the association of consumers and non-consumers. A statistical significance level of $p<0.05$ was used for data associations.

Results

General Characteristics of the Participants

384 participants responded to the questionnaire, one of whom was excluded as he did not have all the answers filled in. A total of 383 were considered for the study. The characteristics of the participants are detailed in Table 1.

Table 1: Characteristics of the participants

Variable	Participants %
Age group	
18-25 years	315 (82.2)
26-35 years	68 (17.8)
Gender	
Male	145 (37.9)
Female	238 (62.1)
Occupation	
Study	174 (45.4)
Study and work	107 (27.9)
Neither study nor work	6 (1.6)
Work dependent	50 (13.1)
Work independent	46 (12)
Monthly economic availability to spend in tastes with friends or family	
Less than 50 soles	172 (44.9)
51-100 soles	145 (37.9)
101-150 soles	34 (8.9)
151-200 soles	14 (3.7)
More than 201 soles	18 (4.7)

Socioeconomic Association and Ice Cream Consumption

Most ice cream consumers are available to pay between 2.50 and 5.00 soles for the ice cream they prefer to buy. Ice cream consumption is associated with gender (p=0.473), age (p=0.816), occupation (p=0.551) and available to pay (p=0.007) for ice cream purchase (see Table 2). The results show that non-consumers buy ice cream for others.

Table 2: Socioeconomic association and ice cream consumption

Description	**Consumers and non-consumers of ice creams**			
Gender	**No**	**Yes**	**X^2**	***p* value**
Male	7 (1.8 %)	138 (36.0 %)		
Woman	8 (2.1 %)	230 (60.1%)	0.515 a	0.473
Age	No	Yes		
18-25 years	12 (3.1%)	303 (79.1%)		
26-35 years	3 (0.8%)	65 (17%)	0.054[b]	0.816
Occupation	No	Yes		
Study	9 (5.2)	165 (94.8)		
Study and work	4 (3.7)	103 (96.3)		
Neither study nor work	0 (0)	6 (100)	3.044[c]	0.551
Work dependent	0 (0)	50 (100)		
Work independent	2 (4.3)	44 (95.7)		
How much do you pay for the ice cream you prefer to buy?	No	Yes		
2.50-2.99 soles	4 (4.2)	91 (95.8)		
3.00-3.49 soles	2(2.3)	86(97.7)	16.104d	0.007
3.50-3.99 soles	2(3.4)	56(96.6)		
4.00-4.49 soles	3(6.7)	42(93.3)		
4.50-5.00 soles	2(2.2)	89(97.8)		
5.01-10.00 soles	2 (33.3)	4 (66.7)		
Total		15(3.9)	368(96.1)	

a. 0 cells (0.0%) have expected a count lower than 5. The minimum expected count is 5.68.
b. 1 cells (25.0%) have expected a count of less than 5. The minimum expected count is 2.66
c. 4 cells (40.0%) have expected a count less than 5. The minimum expected count is 0.23
d. 6 cells (50.0%) have expected a count of less than 5. The minimum expected count is 0.23

Table 3: The ice cream flavor that consumers preferred in the last 6 months

Rice with milk	Mango (M. *indica*)
Choco mint	Camu camu (M. dubia)
Blancmange	Strawberry (*Fragaria ananassa*)
Rum with raisins	Grape (*Vitis vinifera*)
Chocolate	Raspberry (*Rubus idaeus*)
Vanilla chips	Passion fruit (*Passiflora edulis*)
Mint chips	Cherry (*Prunus cerasus*)
Sublime	Lucuma (*Pouteria lucuma*)
Charada	Lemon (*Citrus limon*)
Oreo	Watermelon (*Citrullus lanatus*)
Tutti frutti	Avocado (*Persea americana*)
Yogurt	Banana *(Musa paradisiaca*)
Vanilla	

Consumers indicated that in the last 6 months they preferred to consume ice cream of different flavors (see Table 3).

Ice Cream Consumption Preferences

The majority of the population (56.9%) prefers to consume ice cream in the summer. 76.8% prefer to consume homemade ice cream and 72.6% prefer the presentation in a cup and 52.5% consume ice cream on weekends (see Table 4).

Ice Cream Topping Preference

Ice cream consumers prefer a topping of cookies, candies, chocolate, fruits, honey, sprinkles, fugde, dragees and raisins on ice cream.

Table 4: Ice cream consumer preferences

Description	
In what season of the year do you consume the most ice cream?	n (%)
Autumn	1 (0.3)
Spring	14 (3.7)
Summer	218 (56.9)
All seasons	150 (39)
How often do you consume ice cream?	n (%)
Only on weekends	201 (52.5)
Once a week	113 (29.5)
Twice a week	58 (15.1)
3 times per week	11 (2.9)
What ice cream presentation do you prefer?	n (%)
Popsicle	24 (6.3)
Cone	81 (21.1)
Cup	278 (72.6)
How do you prefer the preparation of ice cream?	n (%)
Processed	89 (23.2)
Artisanal	294 (76.8)

Note: n=383, %= percentage

Table 5: Preferred ice cream brands

What brand of ice cream do you prefer to buy?	Preference
D'Onofrio	
Yámboly	
Pinkberry	
Artika	+
Nestlé	
Alaska	
Chalan	
Siberia	
McDonald´s	
Lamborghini	-
Bell's	
Tottus	
Aruba	

Note: – least preferred, + most preferred

Preferable Place to Consume Ice Cream

11.2% of the population prefers to consume ice cream in ice cream parlors, 20.4% in restaurants, 36.8% in commercial establishments, 14.4% in bars or markets, 12.3% at home and 5% prefer other places. However, 95.8% of the population would like the restaurant of their choice to offer homemade ice cream.

Preferable Consumers' Brands

For the study population, the brands they prefer to buy are D'Onofrio, Yámboly, Pinkberry, Artika, among others, see Table 5.

Discussion

This being the first study in the scientific literature to explore the ice cream consumption preferences of Peruvians, it is observed that the majority of the northern population consumes artisanal ice cream and ice cream in a cup during all seasons of the year. In addition, the weekend is a preferred day to consume ice cream. Climatic and seasonal factors influence ice cream consumption, which increases in cities where temperatures are higher.[10,13] The study population resides near the equator where the climatic environment is warmer and this phenomenon may explain why participants prefer to consume ice cream all seasons of the year.

According to MIDAGRI,[16] Piura is one of the main cities in Peru where more ice cream is consumed per person (3.0 l). Followed by Puerto Maldonado with 2.3 l; Tumbes 2.2 l; Huaraz 2.1l; Chimbote 2.1 l and Iquitos 2.0 l.[14,16] Therefore, this report is important to motivate the consumption of local and organic products such as mango, grape, banana, lemon or camu camu that are native in northern Peru, through ice cream, to value the identity of the community and diversify the production and economy of local businesses. In addition, recent studies are motivating the decision to purchase organic or local food products that favor the sustainability of production in the local community[26,27] because regardless of demographic characteristics, consumers prefer organic products.[26] Considering that food insecurity and dependence on export of some local products,[28] leads us to the guidance and consultancy of producers to promote the commercialization of agricultural crops,[29] valuing export by-products to make jams, ice creams, yogurts among others.

Ice cream is appreciated by people of different ages, however, in our study the majority of consumers were young middle-aged people willing to pay up to 5.00 soles (1.5 dollars) for the ice cream of their choice.[30] Most preferred sweet products such as biscuits, sweets, chocolate and fruit,[31] due to the fact that there are younger consumers who use various tactics when they want to buy ice cream, for example, aggressive, cognitive, persuasive, emotional or rational strategies, which are often used by children to influence the purchase decision with ice cream toppings.

The majority of consumers prefer ice cream from two well-known brands in Peru (D'onofrio or Yámboli) to other options because these brands are better positioned among the study population. These data are consistent with reports by different authors,[32] which showed the influence of brand on consumer purchase decision and the influence it has on popular culture. For this reason, the D'Onofrio ice cream brand leads the Peruvian market.[14]

There is no significant effect on the functionality of food when consumers in a given population do not have a high awareness of the health benefits of food,[33] generating value in training. Considering that more research is needed on the healthy sweetener to replace sugar in ice cream production, as consumer awareness of healthy foods has increased in some territories.[34] Mango sorbets are a good source of antioxidant compounds beneficial to health.[35] Mango has an exotic flavor[36] and is a delicious seasonal fruit with a large amount of nutrients and a unique taste.[37] It has been used in the production of yogurt, cream, popsicles, beverages and soft drinks.[38]

On the other hand, camu-camu contains a high level of ascorbic acid and its fresh consumption is limited due to its high acidity. However, in our research we observed that consumers prefer camu camu, mango, banana and similar ice creams due to certain qualities that consumers associate with these fruits,[39] suggesting that camu camu can be studied as a preservative for some properties of interest during cold storage. Camu camu pulp has been used in the preparation of drinks, creams, jellies, candies and liquor. Camu camu extract can be used as a natural supplementary source of vitamin C and antioxidant compounds that help the

body fight micro-organisms.[40] The antioxidants in the fruit help eliminate free radicals, preventing chronic and degenerative diseases,[41] contributing positively to the overall health of consumers.[42] This study has some limitations because it focused on the ice cream consumption preferences of the population of Sullana, Peru and does not necessarily reflect the ice cream consumption of the entire Peruvian population. Experimental and sensory tests were not realized with the ice cream. The research only considered the socioeconomic characteristics of ice cream consumers and non-consumers.

In the future, the creation of a sustainable brand of ice cream produced in the region can be studied, as well as the packaging of artisanal ice cream. The profile of phenolic compounds present in ice cream formulations can also be studied to evaluate their antioxidant capacity and other health benefits, considering that in each locality there are underutilized native products, such as avocado, camu camu and mango.

Therefore, the implementation of sustainable agricultural production and marketing policies is recommended to ensure the availability of healthy foods containing bioactive compounds.[28] Also, greater investments are required for the agricultural sector,[43] based on the research of new functional products such as mango, camu camu, banana and that these are accessible to consumers.

Conclusion

Most Peruvians prefer to consume homemade ice cream served in a cup, especially on weekends and during the summer. Their preferred ice cream toppings are cookies, toffee, chocolate and fruit. The majority of the population prefers to consume handmade ice cream in commercial establishments and restaurants. The consumption of local products such as mango, camu camu, grapes, and avocado is important from a nutritional point of view to take advantage of their bioactive compounds, and from the producer's point of view it will improve sales and product diversification.

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Conflict of Interest

All authors declare that they have no conflicts of interest.

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