

ORIGINAL ARTICLE

**PERCEPTION OF POTENTIAL CONSUMERS
ABOUT JELLIES CONTAINING PROBIOTICS**

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Highlight: 1. Consumers would like to find probiotic plant-based products on the market. 2. In the Word Association Technique, probiotics were associated with intestinal health. 3. Jellies containing probiotics are seen very positively by consumers.

PRE-PROOF

(as accepted)

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ABSTRACT

Probiotic bacteria are traditionally carried in dairy products. However, there is a growing number of individuals who are lactose intolerant, hypercholesterolemic, and vegetarian, who require fat-restricted diets and/or who do not consume dairy products for cultural reasons. These restrictions justify the search for new non-dairy matrices as a vehicle for probiotic bacteria, as well as consumer perception studies in order to understand their dietary demands. Thus, the objective of this research was to evaluate the perception of Brazilian consumers about jellies containing probiotics. An online questionnaire was applied to 746 respondents from all regions of the country. The word association technique was used in which each word mentioned in the open questions was counted and grouped with synonymous words. It was found that 66.1% of respondents know what probiotics are and 93.3% have already consumed a probiotic product of dairy origin. On the other hand, only 49.5% had already consumed some plant-based probiotic food and the majority, 93.8%, would like to find more plant-based probiotic options on the market. Using the word association technique, it was found that consumers associate probiotics with health, especially intestinal health, and that the addition of these microorganisms to a fruit jelly increases the association of jellies with health on the part of respondents. Therefore, the consumption of probiotics, jams and jellies containing probiotics is seen positively by consumers, with there being great interest in more plant-based probiotic options, which points to a promising market.

Keywords: Probiotics. Fruit Jelly. Innovation. Word Association Tests. Consumer behavior. Projective techniques.

1 Introduction

Consumer interest in functional foods is growing, as they are associated with several health benefits. Probiotics are functional ingredients defined as live microbial supplements¹ that, when administered in adequate quantities, provide health benefits to the host²⁻³.

The probiotic products available on the market are predominantly dairy-based, which prevents consumption by consumers who are lactose intolerant, allergic to milk proteins, hypercholesterolemic, vegans and those who do not like milk and its derivatives. It is worth mentioning that, over the years, the global market for alternative milk products (non-dairy or similar) has become a multibillion-dollar business and will correspond to approximately 26 billion dollars by 2023⁴.

Among non-dairy products, the literature shows that fruits and vegetables can be a good carrier matrix for probiotics⁵⁻¹⁰, as they contain nutrients capable of maintaining the viability of these microorganisms.

Among the processing products, jellies stand out for being a common food on the Brazilian table and important for the country's economy, which has several fruits in its territory that can be used for its production¹¹. Furthermore, nutritionally balanced formulations can be produced that meet the health and convenience trend and, in this scenario, the incorporation of probiotic cultures can be a promising alternative.

Consumers' perception in relation to food is essential and different techniques have been used to understand their desires, as well as their perceptions in relation to food products. Among the techniques that have aroused interest in the food area is word association, which through visual or verbal stimuli presented, allows the individual to describe the product, using the first words or phrases associated with these stimuli¹²⁻¹³, centering the consumers in the product development, contributing to an effective exploration of your choices and insights. This technique has been used to study various products such as yogurt, dairy desserts, vegetable oils, chocolate, ice creams, hamburgers and orange juice¹³⁻²⁰, but studies with fruit jellies are scarce. Therefore, the present study aimed to evaluate consumers' perception of jellies containing probiotics using the word association technique.

2 Material and methods

2.1 Socioeconomic assessment and study of consumer perception about jellies and probiotics

This is an exploratory and descriptive study, conducted using an online questionnaire, containing 14 questions prepared by the authors, 11 of which were objective and 3 were open questions, disseminated through social media such as Instagram and WhatsApp groups in November 2020 to February 2021. The questions were divided into socioeconomic and participants' perception of probiotics and fruit jellies.

Consumers who did not know jams, who worked in the area of technology, science or food engineering and those under 18 years of age were excluded from the study and young people, adults and elderly people between 18 and 67 years of age were included, totaling a simple random sample of 746 participants from all regions of Brazil.

The study was approved by the Human Research Ethics Committee of IF Sudeste MG, under CAAE number 30463920.4.0000.5588.

2.1.1 Preparation of socioeconomic questionnaire

The evaluation of consumers' perception about jellies and probiotics was carried out online on social networks, by sending a questionnaire prepared on Google Form (<https://docs.google.com/forms>). The questionnaire contained questions regarding the participant's knowledge about fruit jelly, the participant's professional training (which excluded or included the participant in the research), their perception of probiotic foods and socioeconomic aspects.

2.1.2 Study of consumer perception about probiotics and jellies

To evaluate the perception of consumers, study participants, they were presented with three stimuli (questions) that asked them to write the first descriptive words, sensations, feelings, etc. that comes to mind when: 1) Read about a probiotic product/food; 2) When you have the option to consume a fruit jelly and 3) When you have the option to consume a fruit jelly containing probiotics.

2.2 Statistical analysis

Analysis of questionnaire data was carried out by evaluating the frequency of responses to multiple-choice questions.

For the question that dealt with broad knowledge of probiotics, the percentage of responses was broken down into the different profile classes of respondents using the pivot table tool in Microsoft Excel – Office 365 Package. The difference in knowledge of probiotics between the different profiles of respondents was calculated through the rate (ratio) of respondents from the same class who answered yes (they know probiotics) divided by the number of respondents who answered no (they do not know probiotics). To create the word cloud for each of the three questions, the website Wordclouds.com (<https://www.wordclouds.com/>) was used and each word mentioned in the open questions was counted and grouped with similar words (synonyms) to avoid concept duplication. To create the word cloud, only words mentioned by at least 5% of participants were considered.

3 Results and discussion

3.1 Participant profile

Regarding the socioeconomic characterization of the participants (Table 1), it was verified that they are mostly from the Southeast region, aged between 18-27 years old, with postgraduate degrees and a salary range between R\$1001 and R\$3000. The female gender stood out among the participants with 69.0% compared to 30.0% of the male gender. The socioeconomic data obtained may be related to the location of the research, since the study was carried out in an institution in the southeast region. The predominance of the younger age group may be associated with them using the social networks where the questionnaire was published, and the predominance of female respondents may be related to women having a greater interest in participating in this type of study.

Table 1. Socioeconomic and sociodemographic characteristics of participants

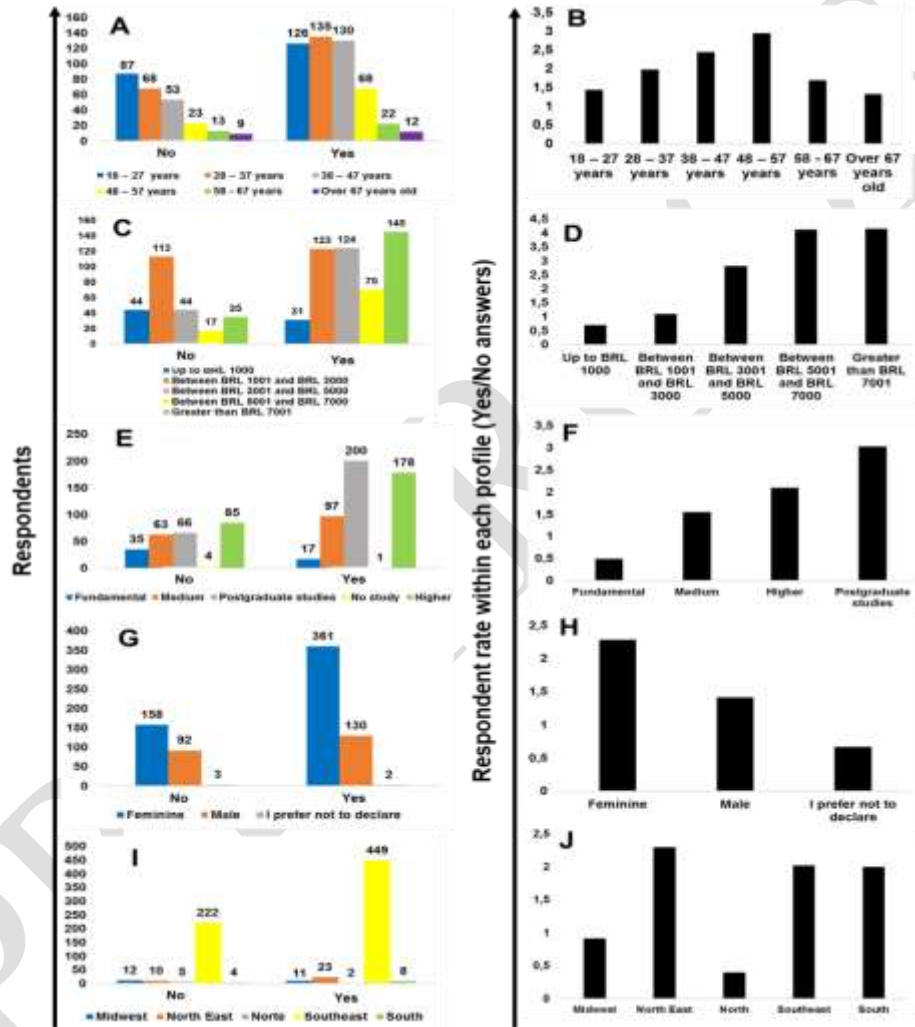
Socioeconomic and sociodemographic characteristics	Answers	Percentage (%) and number of participants (n)
Region	Southeast	90.0 % (n=671)
	North East	4.0 % (n=33)
	Midwest	3.0 % (n=23)
	South	2.0 % (n=12)
	North	1,0 % (n=7)
Age	Between 18 and 27 years old	29.0 % (n=213)
	Between 28 and 37 years old	27.0 % (n=203)
	Between 38 and 47 years old	24.0% (n=183)
	Between 48 and 57 years old	12.0 % (n=91)
	Between 58 and 67 years old	5.0 % (n=35)
	Above 67 years old	3.0 % (n=21)
Education level	Postgraduate	36.0 % (n=266)
	Higher education	35.0% (n=263)
	High school	21.0 % (n=160)
	Elementary school	7.0 % (n=52)
	No study	1.0% (n=5)
Main occupation	Public servants	31.5% (n=167)
	Salaried employees	20.2% (n=107)
	Freelance	13.7% (n=73)
	Students	12.2% (n=65)
	Retirees	9.6% (n=51)
	Businesspeople	7.5% (n=40)
	Other occupations	5.3% (n=28)
Monthly family income	Until R\$ 1,000	10.0 % (n=75)
	Between R\$ 1,001 and 3,000	32.0 % (n=236)
	Between R\$ 3,001 and 5,000	22.0 % (n=168)
	Between R\$ 5,001 e 7,000	12.0 % (n=87)
	Bigger then R\$ 7,001	24.0 % (n=180)

Source: The authors (2021), based on data collected in the research.

PERCEPTION OF POTENTIAL CONSUMERS ABOUT JELLIES CONTAINING PROBIOTICS

The majority of respondents (66.1%) know what probiotics are and it was found that this knowledge is influenced by socioeconomic characteristics (Figure 1). Knowledge of the term probiotics was also reported by 73% of participants in the study by Betz et al. (2015)²¹.

Figure 1 - Breakdown of responses on knowledge of probiotics, considering the different profiles of respondents.



Source: The authors (2021), based on data collected in the research. A, C, E, G and I: Number of answers to the question: Do you know what a probiotic is? B, D, F, H and J: Knowledge of each profile, expressed as the rate of respondents who answered “yes” divided by the number of respondents from the same profile who answered “no” to the question “Do you know what a probiotic is?”

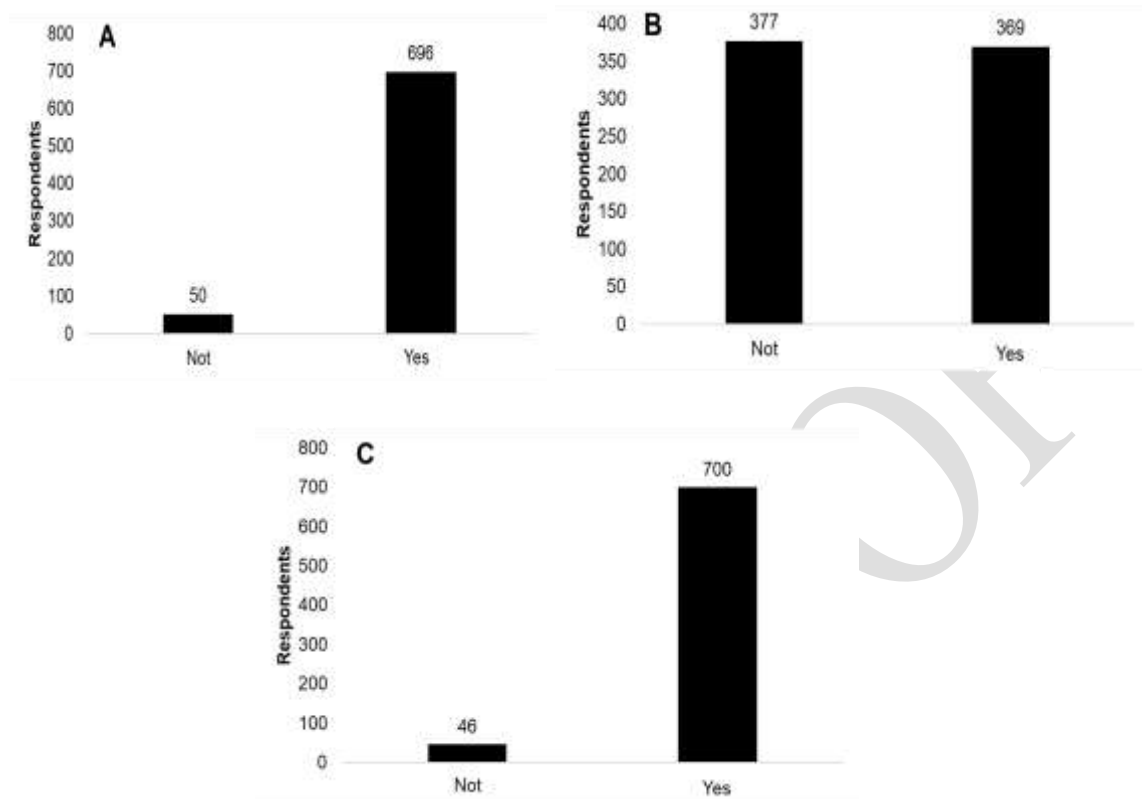
The greatest knowledge about probiotics was observed among people with family income above R\$5,001 (Figure 1D). Generally, the cost of probiotic products is higher than that of other conventional foods, which influences purchasing²² and this may be related to people with

greater purchasing power being more familiar with these microorganisms. In this study, the female public and individuals with a higher level of education (postgraduate) demonstrated proportionally greater knowledge about probiotics (Figure 1F, 1H). In general, men have less health care than women²³, which may justify women's greater knowledge of what probiotics are. In relation to the level of education, the difference may be influenced by the greater reading habit or even by the area of training. A higher level of education can also influence the habit of searching for information on different subjects and, therefore, on knowledge of probiotics.

The main age group that expressed knowledge about probiotics was 48 to 57 years old, followed by 38 to 47 years old (Figure 1B). The fact that younger people, who have not yet reached old age, know more about probiotics may be related to the fact that they have already consumed these products, in addition to being more connected to digital media and having greater access to advertisements.

It was evident that the majority of respondents (Figure 2A) had already consumed some probiotic product of dairy origin (93.3%) and that a smaller number of people had already consumed some probiotic product of plant origin (Figure 2B). The majority of participants (93.8%) expressed interest in more plant-based probiotic product options, such as probiotic jelly (Figure 2C). In the study of Betz et al. (2015), 72% of participants had already consumed probiotics through yogurt and 55% through cereals and granola bars, also indicating a predominance of consumption of probiotics of dairy origin²¹. This can be justified by the greater availability of probiotic dairy products on the market and due to the ease of incorporation and survival of these bacteria in this matrix. However, respondents' interest in probiotic foods of plant origin may be related to the growing number of vegans/vegetarians, lactose intolerants, those allergic to milk proteins, hypercholesterolemics or people who do not like milk, signaling a new market niche for be exploited¹⁰.

Figure 2 - Knowledge of the 796 respondents about the different foods that may contain probiotics and the desire to have more food options with this characteristic.



Source: The authors (2021), based on data collected in the research. A. Answer to the question: “Have you ever seen or tried any probiotic product of dairy origin (for example: yogurt, dairy drinks, cheese, etc.)?”; B. Answers to the question: “Have you ever seen or tried any probiotic product of plant origin (for example: sweets, juices, candies, cereal bars, etc.)?”; C. “Would you like to have more options for plant-based probiotic products, such as probiotic jelly?”

3.1.1 Consumer perception and expectations about probiotics and jellies

Figures 3, 4 and 5 present word clouds created from the terms most used by respondents, and graphically represent the frequency of citation of words in a size distribution, with the larger the word in the cloud, the more times it was cited by the participants, facilitating the visualization and interpretation of the results. Each participant used at least one word to describe/associate the product, totaling 108, 168 and 159 words for the sentences “What are the first words that come to mind when you read probiotic product/food?”; “Considering that you have the option of consuming fruit jelly, what are the first words that come to mind when you think of this option?” and “Considering that you have the option of consuming a fruit jelly containing probiotics, what are the first words that come to mind when you think of this

option?”, respectively. In the end, the words mentioned by at least 5% of the participants were used.

Regarding the words associated with probiotic product/food, when participants were presented with the question: “What are the first words that come to your mind when you read probiotic product/food?”, the main words mentioned were: Health (244 times); Regulate intestine (114 times); Benefits (93 times); Intestinal flora (58 times); Microorganisms (57 times); Beneficial bacteria (54 times); Food (54 times); Fermented milk (40 times) and Well-being (39 times) (Figure 3).

Figure 3- Word cloud associated with probiotic product/food.



Source: The authors (2021), based on data collected in the research.

Participants only used positive terms to associate with probiotic foods. These terms were separated into categories, being distributed in health with 60.42% (including health, intestinal flora, regular intestine, well-being); microorganisms with 14.74% (including beneficial bacteria, microorganisms); food with 12.48% (including foods and fermented milk) and benefits with 12.35%. Health aspects represented the majority of citations (Figure 3), suggesting that participants associate probiotics with health promotion, especially intestinal health. However, fewer consumers associated probiotics with microorganisms (beneficial microorganisms and bacteria), generating opportunities for clarifications that could positively impact consumption. Other studies observed similar data. Betz et al. (2015) also found that participants considered that the main benefit of consuming probiotics was digestion or intestinal health²¹. Ávila et al. (2020), when evaluating consumer perception and behavior in relation to probiotic dairy products, they also found a large number of words related mainly to intestinal

health²³. This proves that this functionality related to probiotics is well known among consumers.

The term fermented milk was also mentioned (Figure 3), showing the strong association that consumers still make between probiotics and dairy products, because for decades the probiotics market was focused on yogurts and fermented milks²⁵.

Regarding the words that participants associate with the consumption of fruit jelly (Figure 4), it was found: delicious (with 186 citations); fruit (with 144 citations); sweet (with 126 citations); healthy (with 119 citations); flavor (with 66 citations); accompaniment (with 60 citations) and good (with 48 citations) which when categorized, would be distributed in flavor with a citation frequency of 54.86% (delight, sweet, flavor), health with 17.27% (healthy), fruit with 20.89%, monitoring with 8.70% and good with 6.96%. These words suggest a pleasurable feeling for consumers related to the consumption of jelly. Participants also related jelly to natural products and health, which is very positive, in addition to also indicating the consumption of jelly as an accompaniment to other foods.

Figure 4 - Word cloud associated with the consumption of fruit jelly.



Source: The authors (2021), based on data collected in the research.

The main fruit mentioned by participants was “strawberry” with 57 mentions, indicating that this fruit can be an alternative for making jellies with added probiotics. Fruit consumption is increasing and, due to its perishability, there is a great challenge in preserving it and increasing its shelf life²⁶. Given the positive expectations of respondents, especially the association with

the term healthy (Figure 4, Figure 5), jelly is an interesting option for the development of a probiotic food of plant origin.

Changing consumer preferences is a dynamic process and consumers are increasingly conscious about health and concerned about the benefits of food, leading manufacturers to emphasize functional products. Therefore, the key to the acceptance of new foods depends on their quality and the concept of added value based on their functionalities²⁷. Thus, it was found that consumer expectations about fruit jelly are positive and related to sensoriality and healthiness (Figure 5) and, even though it is a sweet food, mostly with added sugar, its development becomes interesting containing probiotics.

Regarding the question “Considering that you have the option of consuming a fruit jelly containing probiotics, what are the first words that come to mind when you think about this option?”, the main words mentioned were: healthy (222 times); deliciousness (80 times); good (74 times); benefits (68 times); flavor (54 times); fruit (54 times); feelings (44 times) and sweet (38 times) (Figure 5), which when categorized, would be distributed in flavor with 27.12% (delight, flavor, sweet), health with 35.01% (healthy), good with 11.67%, benefits with 10.72%, fruit with 8.51% and feelings with 6.94%.

Figure 5 - Word cloud associated with fruit jelly containing probiotics.



Source: The authors (2021), based on data collected in the research.

These terms suggest that participants associated the consumption of a probiotic jelly with a healthy diet, since the number of mentions of the term “healthy” increased considerably associating jellies with probiotics and the number of mentions of the word “sweet” decreased

(Figure 5), suggesting that the incorporation of probiotics into the product may increase the interest of health-conscious consumers, who also associate the product with the word “well-being”.

It was also found that respondents continued to associate jelly with “deliciousness” (Figure 5). The word “curiosity” was also mentioned many times, showing that consumers are interested in knowing what a probiotic fruit jelly would be like, suggesting the potential for innovation of this product on the market. Fruits continued to be cited considerably, reinforcing the appeal of products made with natural ingredients (Figure 5).

The global probiotics market has attracted the attention of the food industry to the development of new products containing probiotics, however, it is a challenge for the industry to predict how the ingredients will be perceived and how they should position the new products²⁸. In the present study, this stage was carried out with the aim of getting to know potential consumers and understanding what they expected and/or associated with the product studied.

Properties related to improving health in plant-based products can be better-explored and present greater potential in association with probiotics⁸. Given consumers' interest, curiosity and positive word associations in relation to jelly added with probiotics, in addition to the architecture of the plant matrix in aiding the survival of these microorganisms, this study suggests a market potential for this product, directing marketing strategies towards the consumer perception.

4 Conclusions

Most consumers are aware of probiotics and socioeconomic factors influence the level of knowledge. There is a predominance in the consumption of dairy-based probiotics, but there is a desire on the part of consumers for more varieties of probiotic foods, such as those based on plants.

The word association technique contributed to the exploration of consumers' choices and perceptions and the creation of a probiotic jelly is seen very positively by them, who relate the consumption of probiotics to improvements in health and the consumption of jelly to pleasant sensations, enhancing the association of this product with health when in the presence of probiotics. Consumers also showed curiosity about jelly with probiotics, suggesting its innovative and promising potential.

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