

# BEHAVIOR OF CONSUMERS OF FRESH TOMATOES: A STUDY USING FACTOR ANALYSIS

## ABSTRACT

The objective of this study was to understand the purchasing decision process of consumers of fresh tomatoes based on model proposed by Blackwell, Miniard and Engel (2013). For this purpose, a two-step research was conducted. The first phase consisted of a qualitative research, using twenty in-depth interviews in which producers, wholesalers, retailers and final consumers participated with the purpose of identifying variables to be investigated in the quantitative phase. In the second phase, a quantitative and descriptive survey was conducted, from which were obtained 415 valid questionnaires of fresh tomato consumers. The results revealed that the reasons behind the consumption of fresh tomatoes are associated with “sensory stimuli and pleasure”, or, in other words, to make the dishes aesthetically pleasing and tasteful, and for “healthiness and well-being”, because of the health benefits offered by tomato (e.g. rich in vitamins and minerals). Furthermore, the positive image that consumers create regarding fresh tomatoes and its consumption is closely linked to its use in salads and sauces. It was also observed that, among the factors considered by consumers during their purchasing decision process, the organoleptic characteristics were prominent, followed by concerns with health and the environment. Finally, consumers of fresh tomatoes tend to purchase once a week at vegetable stands and for domestic consumption.

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## 1 INTRODUCTION

Many researchers have been conducting studies in several countries with the aim of understanding purchase and consumption behavior of the consumers of fresh tomatoes. Brumfield (1993), for example, evaluated the decision-making process of buying fresh tomatoes in New Jersey, USA. Anastasiadis and Van Dam (2014) investigated the reasons and values behind the consumption of organic tomatoes in the Netherlands, and Sitorius, Henriques and Lucas (2014) studied the behavior of tomato consumers in East Timor. Adenegan et al. (2012) conducted a spatial analysis of fresh tomato prices in Nigeria, and Adeoye et al. (2016) researched the preferences and tastes of urban consumers of fresh tomatoes and the key factors that affect their purchasing decision. Ellison et al. (2015) studied how the location of the store might affect the perceptions of tomato consumers. Chen et al. (2015) evaluated the willingness of consumers to pay higher prices for organic tomatoes (willingness-to-pay) in China. Causse (2003) published a study on the nutritional and sensorial

qualities of non-processed tomato and their relation to consumer preferences. Boriss and Brunke (2005 and 2011) studied the changes in the behavior of the consumers of fresh tomatoes in the USA.

The tomato is a fruit of the Solanaceae family, which is comprised of fruits such as pepper, eggplant and potato, and is considered the most widespread vegetable in the world. Its name derives from the Aztec terms “tomalt”, “xitomate” and “xitotomate” (KIPLE and ORNELAS, 2000).

According to Causse (2003), fresh, or non-processed, tomato can be considered as one of the three most important vegetables in the world due to its nutritional, economic and social relevance in several countries. According to the FAO - Food and Agriculture Organization of the United Nations, tomato is grown in more than 170 countries, of the six continents (FAOSTAT, 2017).

Brazilian researchers also show interest in understanding the behavior of consumers of fresh tomatoes. Francilino et al. (2014) investigated the consumption of tomatoes in the municipality of Iguatu, in the state of Ceará, Brazil, where fresh tomato was identified as

one of the main vegetables consumed in the country. Hoppe et al. (2012) studied the behavior of consumers of organic tomato using the theory of planned behavior as background. Andreuccetti, Ferreira and Tavares (2005), in turn, identified the profile of fresh tomato buyers in supermarkets in the municipality of Campinas, São Paulo.

In addition, Grasseli and Souki (2007) and Souki, Amorim and Mendes (2008), demonstrated how important it is to verify what the consumers think of the object of study, since the images have functional, cognitive and symbolic dimensions that may significantly influence consumer decision.

This study sought to investigate the behavior of the consumers of fresh tomatoes, given that it is widely distributed worldwide, presenting great economic, social and nutritional importance to the population. However, few studies address the reasons of why consumers purchase such a product, and their perception of the possible benefits and harm related to the consumption of fresh tomatoes.

In addition, there are misgivings on the attributes that consumers consider when purchasing fresh tomatoes and on understanding the purchasing and consumption habits of these consumers, since they were not sufficiently elucidated by Brazilian literature on the subject (FRANCILINO et al., 2014; ANDREUCETTI, FERREIRA E TAVARES, 2005).

The objective of this study was to understand the behavior of the consumers of fresh tomatoes in Belo Horizonte, capital of the state of Minas Gerais, and, more specifically, to describe the stages of the purchasing decision process, aiming to:

- Identify the reasons that lead consumers to recognize the need to purchase fresh tomatoes, highlighting their perception of potential benefits or harm caused by the consumption of this fruit (Recognition of need);
- Verify the image the consumers create in relation to fresh tomatoes (Search for internal information – Memory);
- Determine the attributes and factors analyzed by consumers during the decision process of purchasing fresh tomatoes (Evaluation of alternatives);
- Describe the purchasing habits, with emphasis on the locations where the purchases are made, the frequency of purchase, the best seasons for purchasing fresh tomatoes, and the types and the quantity are purchased weekly by the respondents (Purchase);
- Describe the consumption habits, with an emphasis on the locations where consumers prefer to consume the product, according to days of the week in which it is consumed

and what types of dishes contain fresh tomatoes in their composition (Consumption).

In addition, the purchasing decision process proposed by Blackwell, Miniard and Engel (2013) was used as background. However, this study was not aimed to understand and describe the following stages: a) search for external information (influence groups and external media); b) post-purchase and post-consumption evaluation; and c) disposal and/or recycling.

Regarding managerial issues, this study seeks to understand the behavior of the consumers of fresh tomatoes and their decision-making process to support the elaboration of action plans for the agents from its production chain (e.g. producers, wholesalers, retailers, research bodies, government, transporters, consumers etc.). On the other hand, this work expands the academic knowledge, bringing answers to questions regarding consumer behavior that have not yet been elucidated by previous studies.

## **2 CONSUMER BEHAVIOR AND PURCHASE DECISION PROCESS**

According to Blackwell, Miniard and Engel (2013, p. 06) consumer behavior refers to “activities that people engage in when they obtain, consume and dispose of products and services”. The purchase decision process, in turn, is grouped in stages, as suggested by Blackwell, Miniard and Engel (2013); Mowen and Minor (2003); Schiffman and Kanuk (2000) and Solomon (2002).

This study is based on the model proposed by Engel, Blackwell and Miniard (2013) in which activities are grouped to explain purchase decision process. This model has seven stages, namely 1) recognition of need; 2) search for information; 3) evaluation of alternatives; 4) purchase; 5) consumption; 6) post-consumption evaluation; and 7) disposal (BLACKWELL, MINARD and ENGEL, 2013).

The first stage, called recognition of need, is the moment when the consumer perceives the existence of differences between one's current situation and the desired situation, which stimulates the activation of the decision process. It is therefore understood that this stage of the process consists of a discrepancy between the actual and the desired reality. When consumer degree of discrepancy is below a given minimum level, there will be no recognition of need. However, when this degree of discrepancy reaches a given intensity, there will be recognition of need. At this stage, it is possible to identify the reasons why consumers wish to obtain and consume certain products (BLACKWELL, MINARD and ENGEL, 2013).

In the second stage, denominated information search, consumers conduct internal and/or external searches to identify information that may assist during their decision process (BLACKWELL, MINARD and ENGEL, 2013; HOYER and MACINNIS, 2011).

Internal search occurs when the consumer resorts to his or her own memory to obtain information that may be useful for the decision-making process. Thus, prior knowledge on products, brands, suppliers, etc., which keeps in mind information, feelings and experiences of purchase and consumption over time, in addition to advertisements and/or word-of-mouth communication from other people will be retrieved at the moment of the decision. (BLACKWELL, MINARD and ENGEL, 2013; HOYER and MACINNIS, 2011).

External search occurs in two forms, namely: a) external media, such as radios, newspapers, magazines, television, Internet, leaflets and other promotional materials; b) influence groups, such as relatives, friends, co-workers, experts, artists, athletes or other opinion-forming agents. Both methods can be used to seek additional information concerning attributes and benefits of products, services, brands, etc. (BLACKWELL, MINARD and ENGEL, 2013; HOYER and MACINNIS, 2011).

The third stage of the purchase decision process, which concludes the pre-purchase stage, is called evaluation of alternatives. At this stage, consumers analyze the attributes offered by each of the alternatives identified in the previous stage to find the most appropriate solution for their needs and desires. During the evaluation of alternatives, consumers analyze aspects such as product characteristics, possible suppliers, how much to purchase, maximum prices to pay, payment methods and product delivery, among other items. It is emphasized that, at this stage, the consumer evaluates the advantages and disadvantages of each alternative identified in relation to the important dimensions of the product, service, supplier, brand, professional, etc., thus creating a set of considerations (BLACKWELL, MINIARD and ENGEL, 2013).

In the fourth stage, defined as the purchase, Blackwell, Miniard and Engel (2013) suggest questions such as: Why do people purchase? When do consumers decide what to purchase? When to purchase? How much and how to pay?, among others inherent to this process. Finally, at this stage, it is sought to understand what drives people to purchase a product by means of identifying purchasing factors, such as the moment and condition.

The fifth stage, denominated consumption, is part of the last phase of the decision-making process,

the post-purchase phase. This stage attempts to explain consumer behavior, whether they are users or not. It is necessary for Blackwell, Miniard and Engel (2013) to understand both behaviors, since understanding the users is a way of perceiving attractiveness and understanding non-users means future opportunities for growth. At this stage, the users and non-users define when, where and how they will consume the product.

The other stages proposed by Blackwell, Miniard and Engel's purchase decision process (2013), namely post-purchase/consumption evaluation and disposal or recycling, were not included in the present study.

### 3 METHODOLOGY

To understand the behavior of fresh tomato consumers, this research was structured in two phases, of qualitative and quantitative descriptive nature.

The first phase sought to obtain qualitative information on the purchase decision process of fresh tomato consumers to allow the investigation of quantitative factors. For this purpose, 20 in-depth interviews were conducted with producers, wholesalers, retailers and final consumers, selected by convenience and accessibility in Belo Horizonte, Minas Gerais, Brazil. The participants were personally interviewed for 30 to 40 minutes in locations such as small shops, supermarkets, supply centers and street markets. All interviews were recorded and later transcribed for analysis.

Semi-structured questionnaires were used during the interviews, developed specifically for each of the agents involved. For this purpose, issues related to each stage of the purchase decision process model proposed by Blackwell, Miniard and Engel (2013, p.86) were added to the script. Among them were the following questions:

- In your opinion, what do final consumers consider when purchasing fresh tomatoes? In other words, which features attract and repel the final consumer in the process of purchasing fresh tomatoes?
- Who usually perceives the need to purchase fresh tomatoes in your residence?
- Who are the people who influence the process of purchasing fresh tomatoes in your residence?
- What are the occasions when fresh tomatoes are usually purchased for your residence?

After transcribing the interviews, the Content Analysis technique was used (BARDIN, 2011) for analyzing the qualitative information obtained during the interviews. The results were categorized according

to the model proposed by Blackwell, Miniard and Engel (2013), thus generating the variables used for elaborating the quantitative survey.

Resident tomato consumers were grouped according to their geographic location, based on the nine regions defined by the Belo Horizonte City Hall (PBH): Barreiro, South-Central, East, Northeast, North, Northwest, Venda Nova, West and Pampulha (PBH, 2011), which were chosen as the research universe.

The quantitative phase of the research obtained a non-probabilistic quota sample according to the number of inhabitants in each of the nine regions, in order to allow the sample size to be calculated. The minimum total sample was calculated for 384 consumers with a 5% margin of error and confidence level of 95%, considering the estimated population of the city in 2016, of 2,513,451 inhabitants, according to IBGE (2016).

In order to establish the minimum sample for each region of the city, geoprocessing (ROCHA, 2002) and georeferencing techniques (LONGLEY et al., 2013) were used to identify the resident population in each of the sectors, respecting the borders of each administrative region.

For the quantitative interviews, a cross-sectional survey was conducted (PRODANOV AND FREITAS, 2013). The consumers of fresh tomatoes were selected by convenience and accessibility according to the quotas previously established for each region of Belo Horizonte. The respondents were invited to participate in the research soon after the purchase of fresh tomatoes, in locations such as street markets, vegetable stands, supermarkets and grocery stores. Those who volunteered to participate in the survey underwent an initial screening to verify whether they were effectively part of the intended audience. Thus, they were asked if they consumed fresh tomatoes and how often. Only those who consumed fresh tomatoes one or more times per week were selected to answer the survey.

Concerning the quantitative survey, questions related to Blackwell, Miniard and Engel's model of purchase decision process (2013) were inserted, such as: a) what are the reasons for consumers to purchase fresh tomatoes? b) what are the influencing groups that interfere in the decision process and who looks for information about the purchase of fresh tomatoes? c) what are the attributes analyzed for the purchase of fresh tomatoes? d) how often are fresh tomatoes purchased? e) which season is the best for purchasing fresh tomatoes? f) how often are fresh tomatoes consumed? g) when does consumption occur? e) where are the fresh tomatoes consumed? f) how much is one willing to pay?, among others.

Initially, 457 questionnaires were obtained and tabulated. However, after geocoding the residential addresses provided by the respondents and excluding missing values and outliers, 42 questionnaires were eliminated, thus totalizing a sample of 415 valid questionnaires.

Statistical analyzes such as descriptive analyzes and the Exploratory Factor Analysis (EFA) were used to meet the proposed objectives. Among the descriptive techniques, minimum, maximum, mean, median, standard deviation and frequency were obtained, as well as mean difference tests to compare the individual results of each region with the overall result of the sample (MALHOTRA, 2006, HAIR et al., 2009).

To identify the attributes considered by consumers of fresh tomatoes for the purchase decision process, an EFA was conducted to translate the data into factors that could explain the scale. The Cronbach's alpha of the factors were evaluated to measure their reliability (HAIR et al., 2009).

The main components were chosen as an extraction method, whereas the Varimax was used as a rotation method. For this purpose, the eigenvalue criterion was used to define the number of factors, which represent the amount of the construct variance explained by each factor. Only factors with eigenvalues greater than 1 were considered (HAIR et al., 2009).

The Kaiser-Meyer-Olkin (KMO) measure and the Bartlett's Test of Sphericity (BTS) were evaluated for verifying whether the EFA application was adequate. After determining the number of factors, the proportion of total variance of the scale was verified, attributed to the true score of the latent construct that is being measured (NETEMEYER; BEARDEN; SHARMA, 2003).

Regarding the image created by the consumers of the fresh tomatoes, the research participants were asked to indicate which was the first word that came to their mind when the term "fresh tomato" was mentioned. Then, the respondents were questioned on whether such mental associations were positive, neutral or negative.

To measure the stage of recognition of need, the main reasons, benefits and harm that could influence the recognition of consumers' need to purchase fresh tomatoes were investigated. The evaluated items were identified in the qualitative phase of the research and measured on a scale from 1 to 5, in which 1 meant "completely disagree" and 5 meant "completely agree" with the statements presented.

To describe the behavior of fresh tomato consumers during the stage of evaluation of alternatives, the quality attributes derived from other works developed in the food sector were used, such as Ribeiro (2013), Oliveira et al.

(2003), Chitarra and Chitarra (2005), Souki (2003), which include physical aspects, freshness, smell, color, healthiness, chemical and organic properties, origin, quality assurance, packaging, origin and producer, among others.

To understand the stage of purchase, the importance of the attributes considered more relevant by fresh tomato consumers were evaluated through the application of 22 questions elaborated from evidence found in the qualitative phase of the research, based on a Likert scale of 11 points, in which 0 meant "Low importance" and 10 meant "High importance" (NS meant "I do not know"). After analyzing the data, the questions regarding quality perception were grouped into five factors, which corresponded to the quality factors/attributes perceived by the consumer of fresh tomatoes.

## 4 RESULTS AND DISCUSSION

### 4.1 Results of the Qualitative Phase

Initially, the main results of the in-depth personal interviews conducted with producers, wholesalers, retailers and final consumers during the qualitative phase of the research will be presented. Such interviews provided important inputs for the construction of the quantitative survey.

Among the main results found in this phase are the definition of the purchase frequency bands, the types of fresh tomatoes most sold, the main locations of purchase, concerns of the various agents regarding the quality of the product, attributes analyzed by consumers and buyers, factors that influence product supply, such as the time of year and rainy seasons, for example.

The results showed that the agents had different views of the fruit, given that, while producers and wholesalers were concerned with the transport of fresh tomatoes and product standard for commercial purposes (e.g. color, size and type), retailers were concerned with price and packaging, in addition to the features abovementioned. On the other hand, the final consumer was not concerned with the transport and/or packaging of the product, but emphasized color, size and overall appearance.

Regarding the possible benefits and harm in consuming the fruit, most respondents were unaware of aspects such as its nutritional value, benefits or harm, its origin or the amount of pesticide used in its production.

It should be noted that, among the common characteristics about quality and preference in purchase and sale processes, all groups interviewed (producers, wholesalers, retailers and consumers) are interested in obtaining a product with a good appearance and good price.

However, there was no convergence among respondents on which attributes are more important. For example, while producers and wholesalers prefer the green product, retailers and final consumers prefer ripe tomato. The sizes (small, medium or large) and types (apple, cherry, among others) also varied among respondents.

Respondents agreed the best season for purchasing tomatoes is during the winter, given that, in the summer, the quality decreases due to rainfalls, which causes the price of the fruit to increase.

The information obtained in the qualitative phase along with those from literature review contributed to the development of the questionnaire applied during the quantitative phase of the research. The results of this research phase are presented and discussed below.

### 4.2 Sample Characteristics

Regarding the profile of the interviewed fresh tomato consumers, it can be stated that 70.4% were women and 29.6% were men. Regarding their age, 1.7% of respondents were 17 years old, 11.0% were between 18 and 24 years, 21.5% were between 25 and 34 years, 18.8% were between 35 and 44 years, 23.4% were between 45 and 54 years, 13.9% were between 55 and 64 years and 7.5% were over 65 years old. Only 2.2% of the total of participants did not report their ages.

Regarding schooling, there was predominance of the high school level (43.4%), followed by elementary school (22.7%), higher education (10.1%), incomplete higher education (6.9%) and specialization (4.8%). The lowest participation was of consumers with master's and/or doctoral degree (1.2%). Only 1% did not answer this question.

Concerning the marital status of the consumers, 50.1% were married, 28.9% were single, 11.6% were divorced and 6.0% were widowed. Only 3.3% did not answer this question.

Regarding family income, 51.3% of the consumers had income up to R\$2,000.00, followed by consumers with income between R\$2,000 and R\$3,000.00, which represented 19.7% of respondents. Those who had income between R\$3,000 and R\$4,000.00 represented 8.7%. Of the total, 84 consumers had income above R\$4,000.00, representing 20.2% of respondents. All the participants answered this question.

### 4.3 Reasons Leading Consumers to Purchase Fresh Tomatoes

It was initially sought to identify the reasons that led consumers to purchase fresh tomatoes to understand the purchase decision process. Among the reasons identified, the ones that obtained the highest scores were to make

aesthetically pleasing and tasteful dishes, which reached the scores 4.81 and 4.75, respectively. These results were similar those found by Causse (2003).

In addition to the reasons that led consumers to recognize the need to purchase this vegetable, information on the possible benefits they wished for when purchasing such product was also collected. Among the benefits presented, consumers reported health-related expectations, such as “rich in vitamins” (4.45) and “ingesting minerals and antioxidants” (4.33), supporting the researches of Offord (1998) and Causse (2003).

As for the harm, consumers agreed on some statements regarding the possible harm the consumption of the fruit might cause. Among them, the most agreed on statement was “the tomato causes acidity in the mouth or in the stomach” (2.93), followed by “the tomato causes kidney stones to emerge “ (2.77). On the other hand, the possible risk of “causing prostate cancer” reached only 1.35 points and the lowest standard deviation, thus demonstrating that, in general, consumers tend to disagree with this statement.

It was also observed that, in general, the consumers presented a low level of knowledge on the possible benefits or harm caused by tomato consumption, particularly regarding the aspects related to health. This was observed because they tended to refrain from answering questions on the possible benefits such as “fighting cholesterol” (47.9%) and possible harm such as diverticulitis (60.7%) and osteoporosis (57.3%), marking the “I do not know” option of the questionnaire.

#### **4.4 The Images and Mental Associations Consumers Create in Relation to Fresh Tomatoes**

To identify the images and mental associations, consumers create regarding fresh tomatoes, they were asked what was the first word that came to mind when thinking of the fruit and whether the word reminded them of a negative, neutral or positive factor.

Among the research participants, 48.6% evoked the word “salad”, followed by “sauce” (7.4%) and “ketchup/tomato extract” (6.4%). Other words were cited by 37.6% of the respondents. These results confirm the association of the fruit with the forms of consumption presented in Harland and Larrinua’s book “Tomato: a guide to the pleasure of choosing, growing and cooking” (2009, p.140), which highlights the different forms of consumption of fresh tomatoes, among which the most cited are “salads”, “sauces”, “ketchup” and “soups”. It should be noted that such forms of consumption were confirmed by the studies of Sitorus et al. (2014) in East Timor and by 62.4% of the consumers who took part in the present research.

The factors of mental association concerning the tomato were positive for 97% of the cases. Only 1.5% of the mental associations presented negative connotations, with references to pesticides, acidity, bad and dry. Finally, the neutral associations represented 1.5% out of 391 words cited by the consumers interviewed in this research.

#### **4.5 Attributes and Factors Considered by the Consumers of Fresh Tomatoes During Purchase Decision Process**

To measure the attributes and factors considered determinant by the consumers during the stage of evaluation of alternatives, an Exploratory Factor Analysis (EFA) was conducted to summarize the attributes considered by tomato consumers in a smaller number of factors. The results of the Kaiser-Meyer-Olkin (KMO) measure were of 0.809 and the Bartlett’s Test of Sphericity (BTS) presented Sig of <1% (GL = 136, Est. = 4,814.886), as recommended by NETEMEYER; BEARDEN; SHARMA (2003).

After running the first EFA, five of the 22 attributes originally investigated in the questionnaire were eliminated, since they presented few similarities in comparison to the other attributes. Factor load was lower than 0.400 or revealed the existence of cross loads in two or more factors, violating the unidimensionality.

The second EFA allowed to group 17 attributes selected after the exclusion of the five factors, which resulted in an explanation of 78.70% of the data variance, as observed in Table 1.

Among the five factors considered by consumers of fresh tomatoes in Belo Horizonte that describe the behavior when evaluating the alternatives obtained after the EFA, the factor that presented the highest average was F2 - Organoleptic characteristics, with an average of 9.964 of 10. The second factor was F4 - Concerns about health and the environment, with an average of 9.081. F1 - Guarantee and security attributes obtained an average value of 6.733, while F5 - Physical characteristics reached an average of 6.690. Finally, the F3 - Packaging was considered the factor that presented less relevance in the decision process of buying fresh tomatoes (average of 5.791).

The F2 - Organoleptic characteristics consisted of attributes that refer to appearance, freshness, color, taste and texture, which is identified as “not to be damaged or crushed”. This result converges with the works developed by Fernqvist and Hunter (2012) and Fernqvist and Ekelund (2014), which also emphasized aspects related to the organoleptic characteristics of the tomato, particularly its taste and texture. Sitorus et al. (2014), Anastasiadis and Van Dam (2014), Lusk and

Briggeman (2009) and Brown (2003) also demonstrated the concern of the consumers regarding the visual and flavor characteristics of fresh tomatoes, corroborating the results obtained in this work.

F4 - Concerns about health and the environment was made up of attributes “Not to present pesticides and/or other chemical products”, “To be produced by ecologically sound methods (that respect the environment)” and “To be organic”. It should be noted that other studies have also shown concern about aspects related to environmentally sound production and health, particularly regarding the production and/or consumption of organic tomatoes (FERNQVIST and HUNTER, 2012; ANASTASIADIS and VAN DAM, 2014; CHEN et al., 2015; HOPPE et al., 2012; ELLISON et al., 2015; MAPLES, 2014 and CARROLL, BERNARD and PESEK JR., 2013).

The third most important factor from consumer point of view was denominated F1 - Guarantee and security attributes. This factor was comprised of attributes “origin seal”, “quality and guarantee seal”, “to be provided by a well-known company” and “to present an expiration date on the package. These attributes were also identified as important in the works developed by Fernqvist and Ekelund (2014), Carroll, Bernard and Pesek Jr. (2013) and Xu et al. (2015).

Regarding F5 - Physical characteristics, issues related to tomato size and red coloring were prominent, since they obtained regular importance averages (6.69) and standard deviation (2.489). This occurs because there are consumers who prefer larger or redder tomatoes and others choose smaller or greener products, thus creating groups with different consumption preference patterns, as suggested by the studies of Ballesteros (1995) and Rosa (1999) and Borguini (2005).

**TABLE 1** – Attributes and factors considered by the consumers during the stage of evaluation of alternatives

Factors	Attributes	Sim. <sup>1</sup>	EV <sup>2</sup>	CF <sup>3</sup>	AC <sup>4</sup>	Attributes		Factors	
						Average	SD	Average	SD
F1) Guarantee and security attributes	To present origin seal	0.916		0.933		6.851	3.418		
	To provide quality and guarantee seal	0.905		0.934		6.918	3.432		
	To be provided by a well-known company	0.775	28.75%	0.836	0.840	6.135	3.194	6.733	3.102
	To present expiration date on the package	0.816		0.881		6.947	3.367		
F2) Organoleptic characteristics	To look good	0.769		0.877		9.971	0.302		
	To be fresh	0.800		0.891		9.976	0.240		
	To present pleasing color	0.691	19.82%	0.828	0.940	9.973	0.224	9.964	0.244
	To look Tasty	0.477		0.681		9.928	0.476		
	Texture (not to be damaged or crushed)	0.650		0.805		9.966	0.294		
F3) Packaging	To be well packaged at the time of purchase	0.902		0.935		5.889	3.800		
	To have a pleasing packaging (a good presentation)	0.852	12.73%	0.878	0.922	5.227	3.620	5.791	3.437
	To have a package that protects the product well	0.865		0.883		6.248	3.653		
F4) Concerns about health and the environment	Not to present pesticides and/or other chemicals	0.728		0.846		9.514	1.582		
	To be produced by ecologically sound methods (that respect the environment)	0.882	11.17%	0.930	0.835	9.177	1.924	9.081	1.729
	To be organic	0.764		0.833		8.512	2.368		
F5) Physical characteristics	To be a big tomato	0.787		0.809		5.973	3.047		
	To be a pleasing red tomato	0.802	6.23%	0.828	0.664	7.398	2.704	6.690	2.489

Source: Research data

Note: Descriptive factor analysis

Subtitle: Sim<sup>1</sup> - Similarity; EV<sup>2</sup> - Explained variance; FL<sup>3</sup> - Factor load; CA<sup>4</sup> - Cronbach's alpha

The least important factor considered by the consumers in their decision process was F3 - Packaging. This factor was constituted by the attributes "To be well packaged at the time of purchase", "To have a pleasing packaging (a good presentation)" and "To have a package that protects the product well". The average obtained for this factor was of 5.791 with standard deviation of 3.437. Such a result may be explained by the fact that the fresh tomatoes in the researched city are, typically, commercialized in bulk, hence, the consumer chooses which tomatoes to pick. Because of this, producers and retailers themselves tend to treat fresh tomatoes as a commodity, differentiating it only by variety, but not giving due importance to packaging as a distinctive factor in terms of presentation, physical aspects and fruit protection.

Among the results obtained in the qualitative phase of the present research, it is possible to emphasize that some varieties that presented higher added value, such as Sweet Grape and Cherry tomatoes, have been packaged in a distinctive way with an emphasis on the nutritional information, brand, producer and origin, according to the studies conducted by Vieira et al. (2015), which presented evidence of the influence of packaging on the behavior of food consumer.

#### 4.6 Purchasing Habits of Fresh Tomato Consumers

To describe the purchasing habits of fresh tomato consumers, the locations where the purchases are made, their frequency of purchase, the best seasons of the year to purchase the fruit, the main types and quantity of tomato bought weekly, were described.

Among the locations where fresh tomatoes are purchased, tomato consumers are "omni-channel", or, in other words, they use many different locations, with preference to the vegetable stand (96.1%), followed by supermarkets and hypermarkets (64.1%).

As to frequency, it was observed that consumers of fresh tomatoes usually go to vegetable stands rather than supermarkets and hypermarkets. Among those who reported purchasing at fruit stands, 86.0% acquire fresh tomatoes at least once a week. Of this total, 52.0% purchase fresh tomatoes only once a week, 21.4% purchase tomatoes twice a week and 12.5% said they purchase tomatoes three times a week.

On the other hand, among those who purchase tomatoes at supermarkets and hypermarkets, 22.7% purchasing fresh tomatoes at least once a week. Of this total, 19.3% of consumers purchase fresh tomatoes only once a week, 2.7% purchase tomatoes twice a week and only 0.7% mentioned purchasing tomatoes three times a week.

Such information confirms that the frequency of purchase of fresh tomatoes varies significantly according to the type of store. The other types of stores surveyed obtained very low visit frequencies. Having said that, 13.3% of the respondents purchase tomatoes at street markets in the neighborhood, 8.2% at central or district markets, 1% directly from rural producers and 1% from Ceasa wholesalers.

Finally, regarding the best seasons of the year to purchase tomatoes, 89.0% of consumers consider spring the best season, classifying it as "Good" or "Very good". Autumn ranked second (86.3%), followed by summer (74.3%). On the other hand, winter presented a higher percentage of "Very bad" and "Bad" answers, totalizing 29.6% of the citations.

#### 4.7 Consumption Habits of Fresh Tomato Consumers

This research also aimed at describing the consumption habits of fresh tomato consumers, with an emphasis on the locations where they prefer to consume the product, the days of the week and what types of dishes contain fresh tomato in their composition.

In relation to consumption, it may occur throughout the week and/or on weekends. The location of preference for consumption is "at home", both during the week (98.5%) and on weekends (96.1%). It should be noted that there was no significant statistical difference at the level of 5% between consumption during the week and on weekends.

Concerning the dish in which the tomatoes are consumed, "salads" were the most cited. In addition, consumers who eat tomatoes between two and three times a week represented 93.0% of the participants of this research.

It was also verified that 71.1% of respondents consumed fresh tomatoes in "sandwiches", of which 37.1% stated that they consume sandwiches with fresh tomatoes weekly.

Regarding tomato consumption in "homemade tomato sauce", 64.6% of consumers declared consuming these sauces, of which 39.8% consume it at least once a week. The two most cited products derived from fresh tomatoes were "tomato extract" and "ready-to-eat tomato sauce", with 94.5% and 91.6% of the citations, respectively.

It is therefore understood that fresh tomatoes are consumed in different forms, in several places, both on weekdays and on weekends and the main consumption occurs in salads and sandwiches.

## 5 FINAL CONSIDERATIONS

Although tomatoes are present in more than 170 countries, having been domestically produced for nearly 500 years and present high nutritional, social and economic

importance, knowledge on the behavior of fresh tomato consumers remains superficial in Brazil. In this sense, the present study contributes managerially in order for agents of the tomato production chain (producers, wholesalers and retailers) understand the many dimensions of consumer behavior, thus refining their marketing strategies.

Due to the high penetration of fresh tomato into Brazilian households, the recent changes in its price has had a direct impact on the country's economy due to the large market variation. Understanding the behavior of fresh tomato consumers, including their preference and consumption habits (for example frequency, place of purchase, volume, price, types of dish, place of consumption, quality factors), may contribute to the development of strategies to meet the needs and desires of consumers, as well as favor the optimization of product supply and demand.

The results obtained in this study reinforce those obtained by Thøgersen (2009) and Causse (2003), in which the authors state that the consumption of fresh tomatoes is connected to sensory stimuli and pleasure, making the dishes more beautiful and tasty, and to health and well-being, presenting health benefits due to its vitamins and minerals.

However, the results demonstrated the lack of knowledge and difference of opinions regarding the possible harm that fresh tomatoes might cause. This situation indicates the need for the tomato production chain agents (producers, wholesalers, retailers) to be more proactive in clarifying the concerning the nutritional properties of the fruit, as well as possible benefits and harm it may bring.

In general, the mental associations in relation to the fruit were positive or very positive, combining tomato with salads and sauces, thus reinforcing the connection with health, well-being, sensory stimuli and pleasure (richness of vitamins, minerals, flavor and beauty of the dishes), as reported by Harland and Larrinua (2009).

Regarding influence groups, it was observed that the buyer, or in other words the person who effectively moves from the residence to the sale's location, is the main participant in purchasing decision process, thus reinforcing the importance of increasing the cognitive resources connected to the attributes of the fresh tomato. However, their spouses and relatives also influence them.

The results also allowed the conclusion that the visual and health-related characteristics are prominent among the other attributes considered by consumers during the decision process of purchasing fresh tomatoes. Regarding the visual characteristics of tomatoes, it is possible to verify the importance of good appearance, freshness, color and the absence of damages.

In relation to health, it is possible to highlight the issues of informing the consumer whether there was use of pesticides, whether it is organic and whether the producer in question respects the environment. In other words, fresh tomato consumers would like to receive information on the type of production, origin of the fruit and the impact of the crop over the environment, thus reinforcing the need to identify the producer and the type of crop at the sale's location. Mattos et al. (2009) support this result, given that the increase of competitiveness in different production chains of the agribusiness made the producers offer products with higher quality and higher added value, without losing sight of food safety. It should be noted that one way to manage food safety would be to monitor the entire process, from production to retailer distribution.

With respect to the preferences of fresh tomato consumers in Belo Horizonte, it can be concluded that the vegetable stand is the preferred place of purchase, with consumers purchasing tomatoes weekly in this type of place, whereas the purchases of tomatoes in supermarkets tend to be biweekly. Concerning the place of consumption, the preference is in the consumer's own residence, either during the week or on weekends.

From the academic point of view, the research uses Blackwell, Miniard and Engel's well-known theoretical model of purchase decision process (2013), illustrating its applicability to portray this important agribusiness productive chain. As an academic contribution, this research puts into operation the concepts of the theoretical model in the form of a quantitative collection instrument. Such an instrument could be used *mutatis mutandis* in researches on the behavior of consumers of other important agribusiness products.

## 6 STUDY LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The authors recognize that this research presented several limitations, such as consisting of a cross-section research, that is, the data were collected only at one point in time. New events may therefore influence the purchase decision process of fresh tomato consumers (COSTELL, TARREGA and BAYARRI, 2010).

The results obtained refer exclusively to the consumers of Belo Horizonte, Minas Gerais, Brazil. The choice of a non-probabilistic quota sample does not allow inferences about the population. It should also be noted that the consumers who participated in the present research were at the sale's location after purchasing fresh tomatoes, where they were approached and invited to participate.

This research does not, therefore, consider consumers who were not immediately purchasing.

As suggestions for future research, one may include consumers who are not immediately purchasing and compare their behavior to those who are purchasing the product.

To compare the purchase and consumption behavior of different populations, one may broaden the geographical scope of research, including other cities, regions and countries, which may have different behavior patterns. Finally, longitudinal cuts to evaluate the evolution of the behavior of fresh tomato consumers over time is proposed.

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