

Accepted Manuscript

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PII: S0963-9969(17)30455-6
DOI: doi: [10.1016/j.foodres.2017.08.018](https://doi.org/10.1016/j.foodres.2017.08.018)
Reference: FRIN 6897

To appear in: *Food Research International*

Received date: 7 May 2017
Revised date: 9 August 2017
Accepted date: 12 August 2017

Please cite this article as: H. Rodrigues, D.P. Cielo, C. Gómez-Corona, A.A.S. Silveira, T.A. Marchesan, M.V. Galmarini, N.S.P.S. Richards , Eating flowers? Exploring attitudes and consumers' representation of edible flowers, *Food Research International* (2017), doi: [10.1016/j.foodres.2017.08.018](https://doi.org/10.1016/j.foodres.2017.08.018)

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Eating flowers? Exploring attitudes and consumers' representation of edible flowers

H. Rodrigues¹; D. P. Cielo²; C. Gómez-Corona³; A. A. S. Silveira²; T. A. Marchesan²;
M. V. Galmarini^{4,5}, N. S. P. S. Richards²

¹*School of Food Engineering, Department of Food and Nutrition, Universidade Estadual de Campinas, UNICAMP, Rua Monteiro Lobato, 80, Barão Geraldo, Campinas-SP, Brazil;*

²*Departament of Technology and Food Science, Universidade Federal de Santa Maria, UFSM, Av. Roraima, n. 1000, Cidade Universitária, Bairro Camobi, , Santa Maria-RS, Brazil;*

³*Sensory and Consumer Laboratory, Biotechnology Department, Universidad Autónoma Metropolitana, Av. San Rafael Atlixco No. 186, 09340 México City, Mexico;*

⁴*Consejo Nacional de Investigacion Científica y Tecnológica, Tte. Gral. Juan Domingo Perón 2158, C1040AAH CABA, Buenos Aires, Argentina and*

⁵*Universidad Católica Argentina, Facultad de Ingeniería y Ciencias Agrarias, Avenida Alicia Moreau de Justo 1500, C1107AFB CABA, Buenos Aires, Argentina*

Abstract

Edible flowers have gained more attention in recent years thanks to their perceived health benefits. Despite this attention, it seems that edible flowers are not popularized for consumption in South America, being considered unfamiliar for some cultures from this continent. In this context, the general goal of the present study was to investigate the three dimensions of social representation theory, the *representational field*, the *information* and the *attitude* of the two conditions of edible flowers: a more general “food made with flowers” and more directional product “yoghurt made with flowers”, using Brazilian consumers. To achieve this goal, a free word association task was applied. A total of 549 consumers participated in this study. Participants were divided into two conditions, in which the inductor expressions for the free word association task changed: (a) *food products made with flowers* and (b) *yoghurt made with flowers*. Results showed a very positive *attitude* to both situations, and consumers associated *Food products made with flowers* to “health care” while the central core of *yoghurt made with flowers* reflected the innovative condition of this product, supported here by their unpredictable character (*information* generated).

Key-words – edible flowers; social representation; consumer; word association; attitude; unfamiliar food

1. Introduction

The understanding of unfamiliar foods may help the knowledge of consumer intentions and attitudes capable of changing their food behavior. In our contemporary society, food is important not only as a source of nourishment, but also for developing trading and cultural links between nations (Wright, Nancarrow & Kwok, 2001). The patterns and rules of food consumption may vary according to the cultural differences of consumers (Mead, 1943; Pieniak, Verbeke, Vanhonacker, Guerrero & Hersleth, 2009) and the acceptance of a “new food” or “unfamiliar food” seems to depend on making it appear consistent with cultural perceptions and consumption patterns .

The research around “unfamiliar foods” has advanced considerably in recent decades. In some cases, this food category is the main research object (Tuorila, Meiselman, Cardello & Leshner, 1998) In other cases, scientists have used this topic in the advancement of the knowledge on gender differences in food preferences (Alley & Bourroughs, 1991) and as a vector in the study of new foods development, and consumers’ food neophobia (Tuorila, Lähteenmäki, Pohjalainen & Lotti, 2001).

Unfamiliar foods catch the attention of consumers based on the induction of curiosity (Van Trijp & Steenkamp, 1992), thanks to their exotic appearance and unknown character. An example is the use of insects and flowers in some cultures’ diets. For certain cultures, insects and flowers are part of the daily diet in countries like Mexico (Acuña et al, 2011) or China, while in other cultures they are completely strange and unfamiliar (Hartmann, 2015). Scientific work dedicated to the knowledge of consumers’ understanding and acceptance of edible insects (Looy, Dunkel & Wood, 2014; Capparros-Mejido et al., 2014; Tan et al., 2015; Piha et al, 2017) is very widespread. Nevertheless, for edible flowers, very little has been done, making it an important object of study.

At the moment, the appearance of edible flowers has mainly been limited to high-end foodservice establishments using them as garnish, but their potential is substantially greater. Visually stunning and bursting with health benefits, they have much to offer today’s health and wellness conscious consumers keen on adding something interesting to their salads (Euromonitor, 2014). Today, the literature on edible flowers and consumer perception is rather limited. One of the rare and very recent studies developed by Taiwanese scientists seems to reveal the factors that can influence the attitude of

consumers towards edible flowers (Chen & Wei, 2017). Through focus groups and questionnaires, the authors demonstrated the great influencers on attitude towards the consumption of edible flowers: specific curiosity, aroma and health consciousness. Regarding this last factor, the main interest in the use of flowers as food is due to its demonstrated healthiness capacity (Cunningham, 2015; Shi et al., 2009; Vinokur et al., 2006; Choi & Hwang, 2003) such as nutritional and antimicrobial properties (Lara-Cortéz et al., 2014) and antioxidant capacity (Mlcek & Rop, 2011).

Concerning their consumption, flowers have long been present in the Asian cuisine and can be consumed fresh as a garnish or as an integral part of the dish (Kaisoon et al., 2011). Flowers can also be used to add color and flavor to food such as salads, soups, entrées, desserts and drinks (Barash, 1998). Over time, flowers have earned a place at the table of other cultures such as the European, Victorian English, East Indian and Middle Eastern. Despite this migration from East to West, it seems that edible flowers are not popularized for consumption in South America, thus being considered unfamiliar to some cultures from this continent. An example is Brazil. Flowers in Brazil have a recent commercial history (Aki & Perosa, 2002) and are almost always used for decorative purposes. However, nowadays, with globalization and its contribution to a better awareness in consumers and also to the comeback of earlier lifestyles, edible flowers have played an important role (Rop et al., 2012), but how does the Brazilian consumer represent the use of flowers as a food product? In this context, the main objective of the present study will be to verify the Brazilian consumer's understanding with regards to products made with flowers.

The construction of the Brazilian food repertory has accompanied the process of colonization of the country. Besides the presence of the Amerindians in the North of the country over the centuries, Brazil has been receiving immigrants from a diversity of cultures, for instance, European immigrants in the South, such as Germans, Poles and Italians, among others (Schwartzman, 1999); in addition, the Northeast of the country had a history of strong African presence due to slavery (Pena et al., 2001); Italians, Portuguese, Japanese (Reichl, 1995) and Lebanese (Narbona, 2007) also settled in the center of Brazil. This multicultural migratory chain forged a Brazilian food identity based on sensory diversity characteristics. According to Neto & Bezzi (2008) this is a result of the process of globalization, with emphasis on its consequences for the homogenization of customs to the detriment of the expression of cultural singularities. Globalization is also responsible for the transformation of Markets provoking fierce

competition beyond country borders and hence changing consumers' behavior. In this context, innovation is not just a matter of profitability; it has become a matter of survival for businesses (Michaut, 2004; Wind and Mahajan, 1997). Studies have shown that new products provide corporate vitality, enhanced performance-price index for consumers and opportunity to differentiate from competitors (Adams and LaCugna, 1994). Therefore, the introduction of flowers in the manufacture of food products in Brazil can be explained by the process of globalization and can add diversity and innovation to the country's trade, in addition to the nutritional benefits and health scope already shown for consumers.

To verify the Brazilian consumer's understanding of products made with flowers, we relied on the theory of social representations. This theory has been used in the past to approach consumer knowledge and understanding of food science (Bäckström et al., 2003; Bäckström et al., 2004; Bartels and Reinders, 2010; Onwezen and Bartels, 2013; Rodrigues et al., 2015; Gomez-Corona et al., 2016). The social representations in contemporary society can be equated with the myths of traditional societies, to the extent that they form systems of values and beliefs, providing people with a common code of communication (Moscovici, 1961; 2001; Wagner et al., 1999; Houtlainen & Tuorila, 2005).

The theory of social representations was born of the concept of collective representations enunciated by Durkheim in 1898, however, the concept was truly developed by Serge Moscovici in the sixties (Mouret, 2012). According to Jodelet (1989), social representations are "*a form of knowledge socially elaborated and shared, having a practical and constructive vision of a common reality to a social group*". This form of knowledge has three dimensions (Fig. 1): the *attitude*, which expresses a position, a general orientation, positive or negative in relation to the object of the representation; the *information*, which shows the sum and organization of knowledge about the object of the representation, numerous or not, diversified, precise or stereotyped; and finally, the *field of representation*, which is a set of information organized and structured in relation to an object (Moscovici, 2003). Therefore, social representations are a specific way of understanding and communicating what we already know, and equating every image to an idea and every idea to an image (Thompson & Fine, 1999).

In order to explore the content and structure of representations, the structural approach of social representations (Abric, 1976) called the "central core theory", was developed.

In accordance with this theory, a social representation is organized around a central core, a fundamental component that determines the meaning and organization of representation. This core is collectively shared and characterized by coherence, stability that solidifies it and makes it resistant to change (Abric, 2003). The other elements, so-called "peripherals" wander around the central core. They do not have the same function and importance, and are the result of an idiosyncrasy within the social group studied.

The central elements of the representation are independent of the contexts (Abric, 1994), and they correspond to non-negotiable characteristics socially associated with the object (Moscovici, 1993) while the peripheral elements express rather particular and contextualized experiences, which individuals associate conditionally with the object of representation (Moliner, 2016). From this perspective, we aimed to investigate the three dimensions of social representation, highlighted by Moscovici (1961), the *representational field*, the *information* and the *attitude* of the two conditions of edible flowers: a more general - "food made with flowers" – and a more directional product - "yoghurt made with flowers" – in Brazilian consumers. More specifically, we aimed at addressing the following questions: Do Brazilian consumers share a common representation of these two conditions? And, what is this representation?

Yoghurt was selected as a case study product due to the economic importance of this product category in the Brazilian economy, as Yoghurt and sour milk products grew by 8% in current terms in 2016 to reach BRL15.9 billion. Yoghurt offers the possibility of adding ingredients, as plain and fruit yoghurt posted the strongest performances in 2016, with respective current value growth of 11% and 9%. Growth was as a result of the addition of value that these products offered, such as Greek yoghurt, which continued to be presented in new flavors and was promoted as a healthy snack alternative, among other benefits such as the possibility of increasing protein ingestion (Euromonitor International, 2016). Does this product have the possibility of surpassing the fruity notes and moving into edible flowers?

2. Methods

2.1 Participants

A total of 549 participants were recruited at a central location in Rio Grande do Sul, Brazil. An intercept sampling procedure was used at affluence points in the city of Santa Maria; the interviewers stopped any possible participant and invited them to take part in the study. Participants were divided into two groups in which the inductor expression

for the free word association would change. There were 289 participants in one group (inductor expression 1) and 260 in the other (inductor expression 2). The details of the participants' demographics by group are shown in Table 1.

2.2 Procedure

Participants were first asked to read and sign a consent form of their voluntary participation in the study. Interviews were conducted individually, in the portuguese language and lasted less than five minutes. They included a free word association task followed by a ranking, and then a rating of the evoked words. As a familiarization phase, participants were asked to give all the words or expressions that came to their mind when the experimenter said the inductor words *sky* and *car*. Once participants were comfortable with the procedure, the study began with the expressions: 1) *Food products made with flowers* or 2) *Yoghurt made with flowers*, depending on the group they were in. Afterwards, they were asked to rank these evoked words from (1) *least important* to (10) *most important*. Finally, participants were asked to evaluate their positive or negative attitude to each word related to the inductor expressions on a seven-point scale going from -3 (completely negative) to +3 (completely positive).

2.3 Data analysis

2.3.1 Lemmatization, categorization and translation

Before conducting any analysis, the evoked words were formatted and grouped. The first step was to verify typing and/or spelling mistakes in the original Portuguese language. The second step was to operate a lemmatization (Bécue-Bertaut, Álvarez-Esteban and Pagès, 2008) which converts every word into its standardized form, known as a lemma, by: a) deleting all connectors, auxiliary terms and adverbs from each comment, and b) standardizing the evoked words in the infinitive for the verbs, singular for the nouns and masculine-singular for the adjectives. The third step was to regroup synonyms using a thesaurus which helped to identify the evident synonyms in the database. The words with the higher frequency of elicitation were used to group and rename all of their synonyms. The fourth step was with ambiguous words which were difficult to regroup. They were carefully analyzed by three researchers who decided if they could be regrouped or left as independent words (with low frequency of elicitation). This step was done cautiously to avoid over-interpretation or over grouping of words (Symoneaux, Galmarini & Mehinagic, 2012). And finally, the fifth step was to

translate the final words to English using a double translation approach, consisting of two basic steps: one person translates the words from Portuguese to English; afterwards those English words are given to another person who translates the English words into the Portuguese language. If a perfect match was found, the translated word was kept; otherwise, the translators changed the word several times until an agreement was reached. To test the differences of word frequencies, a Fisher exact test was performed between both countries and type of consumers for each semantic category.

2.3.2 Frequency-importance analysis of the social representation

According to Abric (2003), social representations can be divided into four zones (Fig. 2) by crossing the importance of the evoked words with their frequency of elicitation. The first zone, which regroups the elements with high frequency and considered as very important, is the central core zone. Zone 2 (low importance and high frequency) regroups the more important peripheral elements, named the first periphery. In zone 3 we found the contrasting elements which have low frequency of elicitation (fewer shared elements) but considered as being very important. This zone usually reveals the existence of minority sub-groups with a different representation. Zone 4, named the second periphery, provides the elements occurring less and considered not important in the representation.

With this in mind, a frequency and an importance cut-off points were determined for each inductor expression, inspired by the *prototypical analyses* from Vergès (1992). The frequency cut-off point was obtained, following Wachelke & Wolter (2011), adopting half the frequency of the most frequent category of words in the whole corpus as a cut-off. Following Abric (2003), the importance cut-off point was obtained by averaging the importance criteria across categories.

2.3.4 Polarity index

To evaluate the implicit attitude associated with the social representations, a polarity index (De Rosa, 2002) was calculated. As the participants were asked to evaluate the positive or negative connotation of each evoked word, the polarity was calculated as:

$$\text{Polarity index (P)} = \frac{\text{Number of positive words} - \text{Number of negative words}}{\text{Number of total evoked words}}$$

The polarity index can be calculated by participant (to define a positive or negative valence of their representation) or by word (to define a positive or negative connotation of each elicited word). In this study, the polarity index was calculated by word. In this case, the formula used is the same but the frequencies for positive and negative are referring to the same word. For example, the polarity index of *exotic* is calculated by the number of times it has positive connotations, minus the frequency of its negative connotations, divided by the total frequency of elicitation of the word *exotic*. The index can take a value from -1.0 to +1.0. Values of P from -1 to -0.1 indicate that the word has in general a negative connotation. Values of P from +0.1 to +1.0 indicate that the majority of the participants gave a positive connotation to that word (De Rosa, 2002).

3. Results

3.1 Formatting and categorization of evoked words

After lemmatization and triangulation process (categorization of words), the corpus produced from the two inducing expressions “*food products made with flowers*” and “*yoghurt made with flowers*”, remained with 23 and 20 categories of words respectively (Table 2). These categories of words will be named as “elements” from now on.

3.2 Frequency-importance analysis applied to “*food products made with flowers*” and “*yoghurt made with flowers*”

The cut-off citation frequencies for the two inducing expressions, “*food products made with flowers*” and “*yoghurt made with flowers*” are equal to 36 and 64.5, respectively. All categories of words that have a frequency above 36 for the first expression and 64.5 for the second were classified as having a high frequency, and those below those values were classified as having a low frequency. The average importance scores are equal to 7.4 for the two expressions. All categories with an importance score above these values were classified as having a high importance, while those with an importance score below that were considered as having a low importance. Figure 3A and 3B show the classification of the categories emerging from these cut-off points for “*food products made with flowers*” and “*yoghurt made with flowers*”, respectively.

Table 3 shows the frequencies of the words for each of the two inductor words. After performing a Fisher exact test, significant differences were found for *aroma*, *color*, *pleasant* and *novelty* (higher in “*yoghurt made with flowers*”). On the other hand,

differences that were higher in “food products made with flowers” are *exotic*, and *healthy*. Other words were only mentioned by one inductor word or the other.

The top left cell of figure 3A and 3B represents the categories with high frequency and high importance. This cell corresponds to the central core zone of the social representations and includes stable, shared and consensual elements. For the two inducing expressions “*food products made with flowers*” and “*yoghurt made with flowers*”, the central core consists of a single dimension with a single element for each one: *healthy* and *novelty*, respectively.

The top right cell represents the words that have both a high frequency and a low importance. This cell constitutes the first periphery of the representation and includes secondary elements of the representation. For “*food products made with flowers*”, this area includes three elements (*different*, *exotic* and *novelty*) forming a dimension of “new-unfamiliar”. For “*yoghurt made with flowers*”, the first periphery contains only the element *unexpected* that supports the *novelty* element present in the central core.

The bottom left cell represents the categories with a low frequency and a high importance. This cell corresponds to the contrasting zone and includes elements susceptible to change. This cell can reveal the existence of a subgroup carrier of a different representation. For this subgroup, the element of the contrasting zone might constitute the central core in addition to the elements spotted in the top left cell. This cell is also hosting elements that can be complements of the first periphery. For “*food products made with flowers*” it comprises elements that evoke sensory properties such as *taste*, *aroma* and *color*; elements related to hedonism and liking such as *delicious* and *attractive appearance*; elements that denote sustainability such as *reducing waste*; elements that describe a form of utilization such as *condiment* and finally, general elements like *fruits* and *common*. For “*yoghurt made with flowers*”, this area also includes elements related to sensory properties, such as *taste*, *color*, *aroma* and *texture*; food acceptability such as *pleasant*; elements that denote “new/unfamiliar” food category like *exotic*; ingredients such as *vegetable* and *fruits*; general element *food*; as well as the health dimension with the presence of the elements *healthy* and *natural*.

Finally, the bottom right cell represents the categories that have both low frequency and low importance. This cell corresponds to the second periphery of the representation and includes more idiosyncratic elements. For “*food products made with flowers*”, this area includes negative elements such as *doubt* and *rejection*; elements that evoke the idea of food product categories, such as *tea* and *aphrodisiac*, as well as elements that denote

curiosity (*funny*), sensory properties (*texture*) and ingredients (*vegetable*). For “*yoghurt made with flowers*”, this cell also includes negative elements such as *doubt*, *unpleasant* and *repulsion*; includes the inducing food category (*yoghurt*); the elements denoting the idea of “body care” such as *esthetic*, and finally, a general element (*object*).

3.3 Polarity index of elements

Figure 4 shows the polarity index calculated for associated elements for a) “*food products made with flowers*” and b) “*yoghurt made with flowers*”. The main point in these figures is that, in both groups, most participants associated a positive valence to the words they produced. Besides this general trend, some differences can be noted. “*Food product made with flowers*” was more positively evaluated in their rating than “*yoghurt made with flowers*”. The first inducing expression has only one negatively evaluated element, the element *rejection*, while that the second inducing expression has two: *unpleasant* and *repulsion*.

When we compare the polarity results with the areas of social representations, we can see that for both inducing expressions, in general, the elements located in the zone of contrasting elements are those that had a higher positive connotation.

4. Discussion

The present study investigated Brazilian consumers’ understanding and knowledge about “*food product made with flowers*” in general, and more particularly, “*yoghurt made with flowers*”. This work has elucidated the three dimensions of social representations (representational field, information and attitude) of the two given objects. From a socio-psychological approach, the structural design of social representation consists of various patterns, interacting, under the control of a very deep organizational structure, the central core. For this purpose, we employed the free word association procedure and the central core theory to reveal the structure, sense and organization of this representation and thus discover consumers’ impressions and understanding about the use of flowers as food products.

Representational field, information and attitude

We observed that whereas the two representational fields of social representation have common elements that are organized differently and therefore, may generate different information about food products and yoghurt made with flowers. *Food products made*

with flowers denotes a meaning in consumers that gravitates around the concept of “health”. According to the social representation literature, the central core is strongly marked by the collective memory of a given group and the standards to which it refers (Moscovici, 1961; Thompson & Fine, 1999). It is characterized by an essential property: stability. The central core for them is based on the idea that the use of flowers in the diet has a sense of “health care” represented by the central element *healthy*. This generated information, according to Moscovici (2003), in the social representation approach, which emerges here as an image, a continual need to reconstitute common sense, or the form of understanding that creates images and meanings, without which no collectivity can operate present in their representational field. In this case, food products made with flowers are “good for health”, independent of their sensory properties (*taste, aroma*) and hedonism/liking (*delicious* and *attractive appearance*), only indispensable for a minority of participants (elements presents in the contrasting zone, thus being the central core for them).

The peripheral zones of social representations have a role of concretization, regulation and protection of the central core. This role appears clearly in the first periphery for both prompt expressions. The first periphery from *food products made with flowers* presents elements that support the central core, anchored in the idea of “unfamiliar” and indicating that the use of flowers as a therapeutic output is very new and distant for them. When we observe the representational field of *yoghurt made with flowers*, we can observe that when we move from a use of flowers in foods, in general, to a specific food, in this case yoghurt, the information that is shown, reflects the lack of contact and knowledge of the participants with edible flowers. While in the central core of *food products made with flowers* we find a meaning of health care, the central core of *yoghurt made with flowers* reflects the innovative condition of this product. In both cases, elements indicating disapproval in relation to the use of flowers in food are only found in the second periphery, which tells us these are not relevant factors and thus, can easily disappear from the representation of that social group. Previous studies have shown that some food products are considered healthy by Brazilian consumers, like dairy products, cereals, juices, legumes and pasta (Ares, et al 2015). This point can explain why some of the consumers mentioned that yoghurt is healthy in the contrasting area of the representation.

Regarding flowers, it seems that there is no clear social representation of the concept. A possible explanation of the healthy perception of flowers can be explained if the

participants perceive the flowers as less processed food. According to Costa, Claro, Martins and Levy (2013), Brazilian consumers perceive processed food as being less healthy. This information may also reveal the predictors of the positive attitude of consumers in relation to the use of flowers as food. Polarity index results showed the very positive character of evoked elements, and it is in accordance with what has been demonstrated by Chen and Wey (2017) who investigated the factors affecting consumers' attitudes towards the consumption of edible flowers. Their research found that specific curiosity and health consciousness have a direct and indirect role in their attitude, and as floral food is relatively novel, when people are curious about floral food, they are likely to be interested in it, and show a positive attitude towards it. In our case, this is strongly marked by healthy and novelty, the two-central core of food products made with flowers and yoghurt made with flowers, respectively.

5. Conclusion

The current study has demonstrated the social representation of Brazilian consumers with regards to the use of flowers as food. In relation to our initial questions, the information extracted from the representational field and attitudes of the two conditions, food products in general and yoghurt made with flowers, is a little different. For the former, the use of flowers as food reflects a condition of "good for health" while for the specific product it is perceived as a novelty and unexpected. In terms of practical use, our results can guide marketers in the development of strategies to introduce flowers to the table of the Brazilian consumer, since a rejection is not salient (present only in the second periphery) in the representational field of the two proposed situations.

This study was exploratory and presents some limitations and expectations for future research. Firstly, the vast majority of participants were young people with a high educational background. For future studies, it would be interesting to recruit respondents with a greater diversity in age and educational level with the purpose of knowing if there exist influences on their conceptual perception of the introduction of flowers in the diet. Second, it would be interesting to make an intercultural study, between Brazil and another country from South America that does not have a tradition in consuming edible flowers, with the purpose of revealing cultural dimensions that are capable of highlighting some cultural habits that would be used for forming strategies to fight cultural barriers in the adoption of the flowers in de diet.

Acknowledgments

The authors want to warmly thank consumers from Santa Maria, Brazil, who participated in this study and Dr. Tobias Otterbring for his constructive comments. H.R. acknowledges the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Brazil*, for his postdoctoral fellowship.

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Table 1 - Demographic characteristics of the participants.

	Inductor expression 1	Inductor expression 2
Gender	%	%
Men	50	50
Women	50	50
Age	%	%
19 – 29 years	61	61
30 – 39 years	24	25
40 – 51 years	15	14
Education level	%	%
University	69	60
High school	21	34
Elementary	10	6

Table 2 – Equivalent translation in the Portuguese language of the categories and principal words (the three more frequently evoked) that formed each category

Food Product made with flowers		Yoghurt made with flowers	
Word category on English/Portuguese	More frequently evoked words that formed the category on English / Portuguese	Word category on English/Portuguese	More frequently evoked words that formed the category on English / Portuguese
aphrodisiac/ <i>afrodisíaco</i>	aphrodisiac, love, romantic/ <i>afrodisíaco, amor, romantic</i>	aesthetic/ <i>estética</i>	aesthetic, fitness, beauty/ <i>estética, ginástica, beleza</i>
aroma/ <i>aroma</i>	aroma, parfum, fragrant/ <i>aroma, perfume, fragrância</i>	aroma/ <i>aroma</i>	parfum, aromatic, smell / perfume, aromático, cheiro
attractive appearance/ <i>aparência atrativa</i>	attractive appearance, visual appeal, chic dish/ <i>aparência atrativa, apelo visual, prato chique</i>	color/ <i>cor</i>	red, white, colorful / <i>vermelho, branco, colorido</i>
color/ <i>cor</i>	colorful, blue, red/ <i>colorido, azul, vermelho</i>	doubt/ <i>dúvida</i>	doubt, maybe, indecision / <i>dúvida, talvez, indecisão</i>
common/ <i>comum</i>	common, I have heard, normal/ <i>comum, já ouvi falar, normal</i>	exotic/ <i>exótico</i>	eccentric, exotic, rare / <i>excêntrico, exótico, raro</i>
condiment/ <i>tempero</i>	condiment, basil, spicy/ <i>tempero, manjeriça, picante</i>	flowers/ <i>flores</i>	daysi, rose, hibiscus / <i>margarida, rosa, hibisco</i>
delicious/ <i>delícia</i>	delicious, yummy, appetizing/	food/ <i>alimento</i>	food, eat, dessert / <i>alimento, comer,</i>

	<i>delícia, gostoso, apetitoso</i>		<i>sobremesa</i>
different/ <i>diferente</i>	distinct, differentiated product, different/ <i>distinto, produto diferenciado, diferente</i>	fruits/ <i>frutas</i>	ananas, strawberry, peach / <i>abacaxi, morango, pêssego</i>
doubt/ <i>dúvida</i>	doubt, fear, depend on/ <i>dúvida, receio, depende</i>	healthy/ <i>saudável</i>	healthy, nutritious, herbal medicine / <i>saudável, nutritive, fitoterapia</i>
exotic/ <i>exótico</i>	exotic, eccentric, extravagant/ <i>exótico, excêntrico, extravagante</i>	natural/ <i>natural</i>	natural, nature, pure / <i>natural, natureza, puro</i>
flowers/ <i>flores</i>	rose, chrysanthemum, marigold/ <i>rosa, crisântemo, calêndula</i>	novelty/ <i>novidade</i>	unprecedented, discovery, novelty/ <i>inédito, descoberta, novidade</i>
fruits/ <i>frutas</i>	orange, red fruits, strawberry/ <i>laranja, frutas vermelhas, morango</i>	object/ <i>objeto</i>	disposable pot, spoon, fridge/ <i>pote descartável, colher, geladeira</i>
funny/ <i>engraçado</i>	funny, cool, amusing/ <i>engraçado, legal, divertido</i>	pleasant / <i>agradável</i>	pleasant, excellent, appreciate/ <i>agradável, excelente, aprecio</i>
healthy/ <i>saudável</i>	natural healing, health, vitamin/ <i>cura natural, saúde, vitamina</i>	repulsion/ <i>repulsão</i>	repulsion, not normal, disgusting/ <i>repulsão, anormal, desgostoso</i>
natural/	nature, landscape,	taste/	sweet, bitter, palate/

<i>natural</i>	purity/ <i>natureza, paisagem, pureza</i>	<i>sabor</i>	<i>doce, amargo, paladar</i>
novelty/ <i>novidade</i>	innovation, unknown, new/ <i>inovação, desconhecido, novo</i>	texture/ <i>textura</i>	texture, creamy, liquid/ <i>textura, cremoso, líquido</i>
pleasant/ <i>agradável</i>	pleasurable, excellent, good/ <i>prazeroso, excelente, bom</i>	unexpected/ <i>inesperado</i>	unexpected, unthought, surprise/ <i>inesperado, impensado, surpresa</i>
taste/ <i>sabor</i>	sweet taste, multi flavors, acid/ <i>sabor doce, multi-sabores, ácido</i>	unpleasant/ <i>desagradável</i>	unpleasant, hate, cloying/ <i>desagradável, detestar, enjoativo</i>
tea/ <i>chá</i>	tea, chamomile tea, herbal tea/ <i>chá, chá de camomila, chá de ervas</i>	vegetable/ <i>vegetal</i>	vegetable, plant, broccoli/ <i>vegetal, planta, brócolis</i>
texture/ <i>textura</i>	firmness, consistent, smooth texture/ <i>firmeza, consistente, textura suave</i>	yoghurt/ <i>iogurte</i>	yoghurt, activia, yoghurt of flowers/ <i>iogurte, activia, iogurte de flores</i>
reducing waste/ <i>aproveitamento</i>	availability, utility, viable/ <i>disponibilidade, utilidade, viável</i>		
rejection/ <i>rejeição</i>	rejection, bad, horrible/ <i>rejeição, ruim, horrível</i>		
vegetable/	vegetable, salad, lettuce/ <i>vegetal, salada, alface</i>		

<i>vegetal</i>			
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ACCEPTED MANUSCRIPT

Table 3 – Frequencies of the elicited words for “food products made with flowers”, and “yoghurt made with flowers”. The frequencies are compared using a Fisher exact test.

Word	Food products made with flowers (N 289) Frequency	Yoghurt made with flowers (N 260) Frequency	<i>P</i> value
Aesthetic	-	11	-
Aphrodisiac	5	-	-
Aroma	25	47	0.001
Attractive appearance	13	-	-
Color	10	20	0.038
Common	5	-	-
Condiment	5	-	-
Delicious	6	-	-
Different	72	-	-
Doubt	14	16	0.574
Exotic	37	16	0.009
Flowers	27	21	0.652
Food	-	5	-
Fruits	5	7	0.562
Funny	5	-	-
Healthy	40	17	0.005
Natural	9	5	0.427
Novelty	49	129	0.000
Objects	-	5	-
Pleasant	25	49	0.001
Reducing waste	8	-	-
Rejection	16	19	0.485
Taste	21	22	0.636
Tea	7	-	-
Texture	6	13	0.099
Unexpected	-	73	-
Unpleasant	-	21	-
Vegetable	17	6	0.053
Yoghurt	-	11	-

Bold letter indicates *P* values lower than 0.005

Figure captions

Fig. 1. Three-dimensional representation of the knowledge emanated from the social representations theory (Moscovici, 1961).

Fig. 2. Frequency-Importance analysis showing the 4 zones in a structural approach of the social representation (adapted from Abric, 2003).

Fig. 3. The four representation zones of a) *food products made with flowers* and b) *yoghurt made with flowers*.

Fig. 4. Polarity index of evoked elements calculated for a) *food product made with flowers* b) *yoghurt made with flowers*.

Fig. 1. Three-dimensional representation of the knowledge emanated from the social representations theory (Moscovici, 1961).

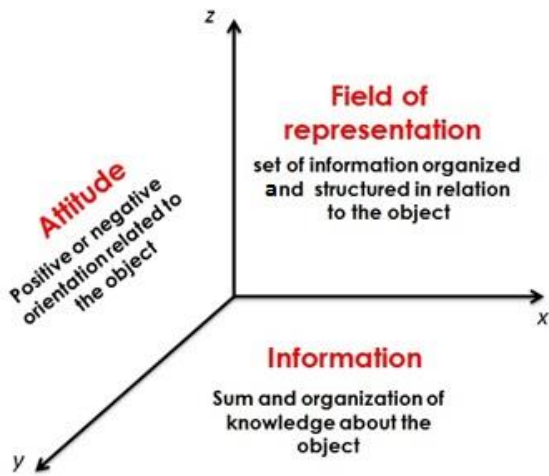


Fig. 2. Frequency-Importance analysis showing the 4 zones in a structural approach of the social representation (adapted from Abric, 2003).

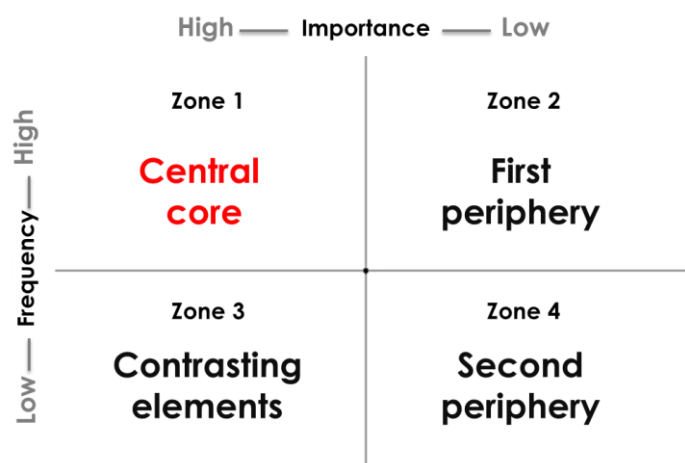


Fig. 3. The four representation zones of a) *food products made with flowers* and b) *yoghurt made with flowers*.

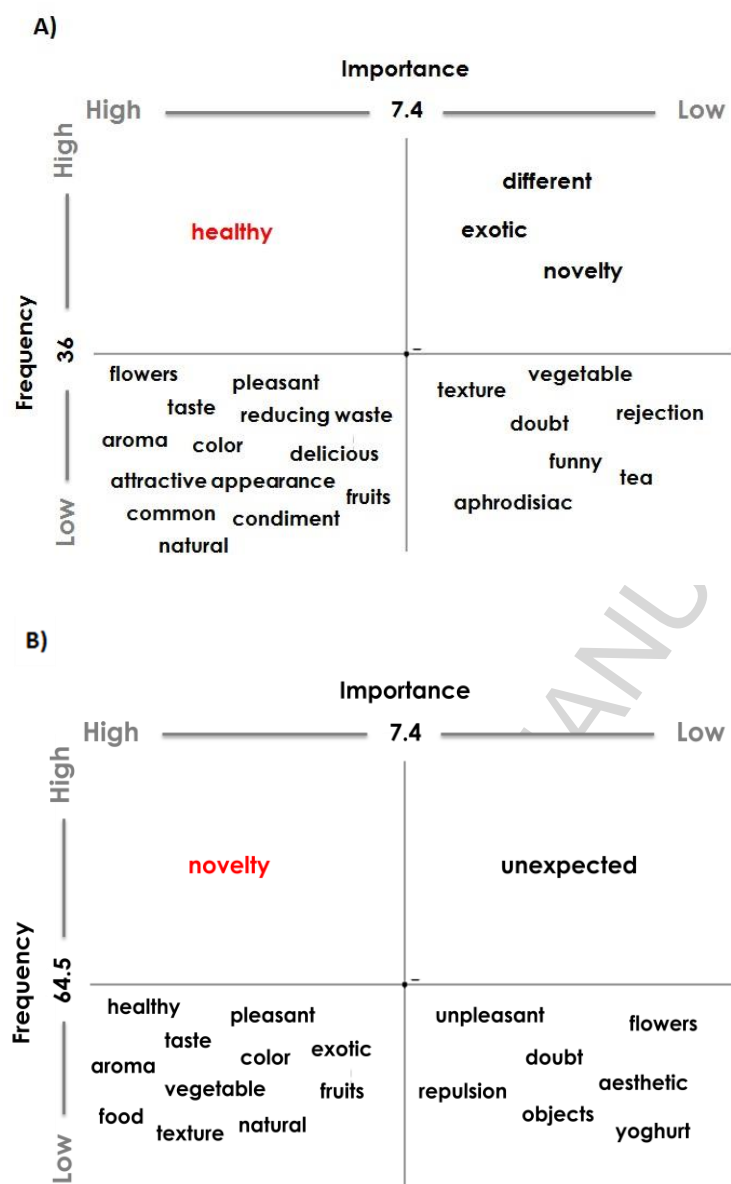
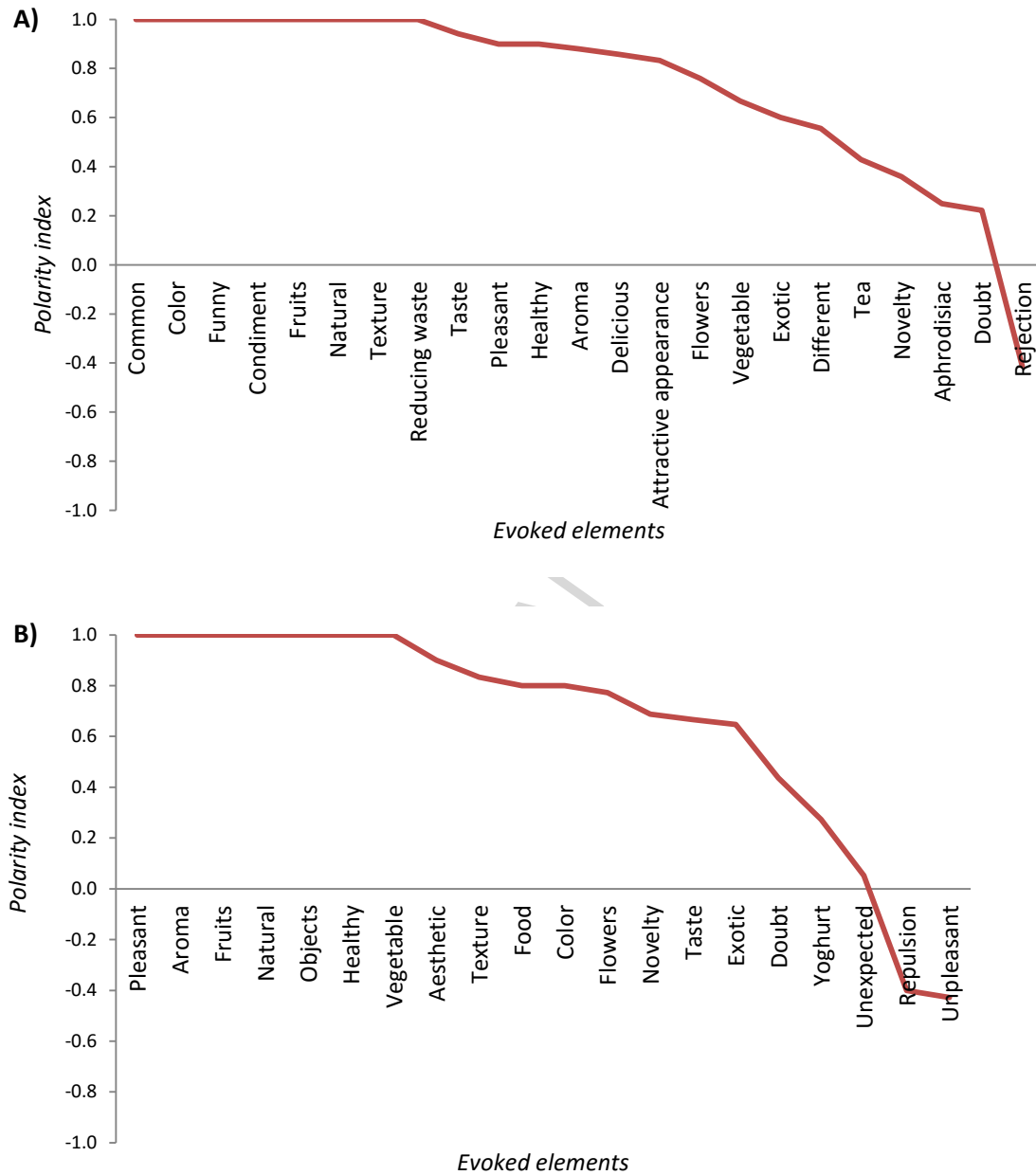
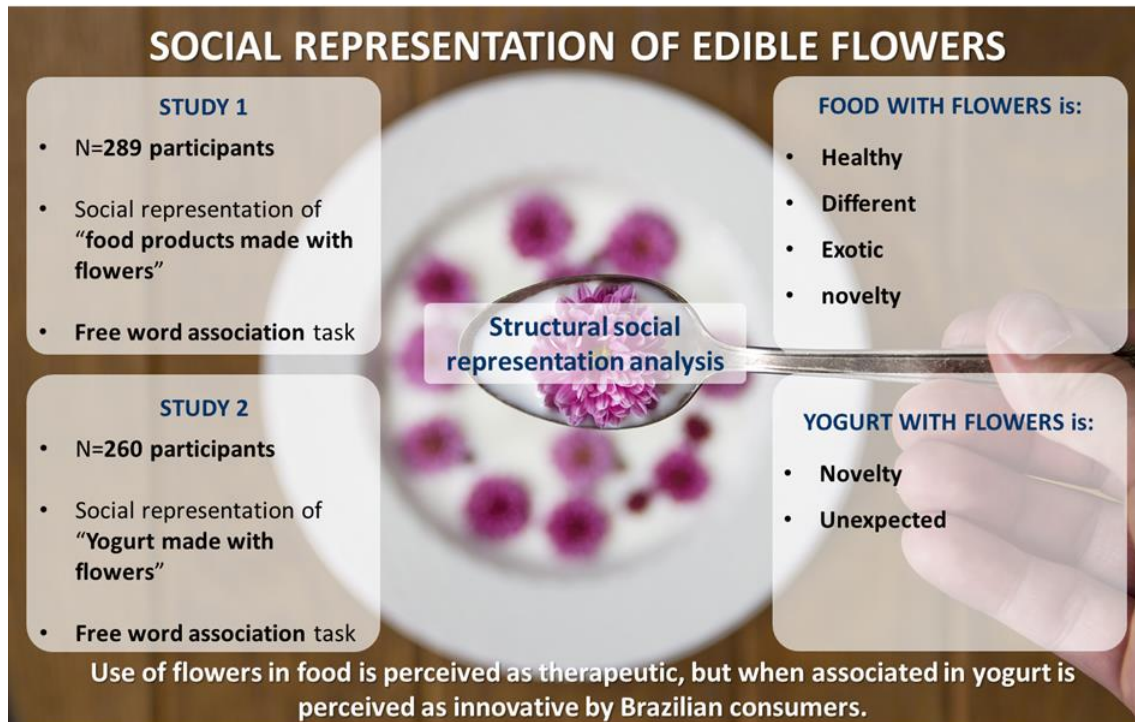


Fig. 4. Polarity index of evoked elements calculated for a) *food product made with flowers* b) *yoghurt made with flowers*.



Graphical abstract



Highlights

- Social representation of food made with flowers contain the word healthy, as core element
- Different, exotic and novelty are important categories associated to food with flowers.
- Social representation of yoghurt made with flowers contain as main words novelty product and unexpected
- Overall, Brazilian consumers have a positive attitude towards food products with flowers.