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Scientific Article

Sensory analysis of dehydrated orange juices: quantitative descriptive analysis and sensory acceptability test

Análisis sensorial de jugos de naranja deshidratados: análisis descriptivo cuantitativo y ensayo de aceptabilidad sensorial

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Abstract

The objective of this work was to determine the sensory profile and the degree of acceptability of samples of commercial dehydrated orange juices (A-B-C) by quantitative descriptive analysis (QDA) and sensory acceptability testing. As samples B and C are marketed with the label "sweet orange", in sensory tests it was also analyzed whether the assessors and consumers perceived them as any sweeter. A panel of 8 assessors was selected for the QDA test, and trained on evaluating of the dehydrated orange juices. The acceptance test was performed with 50 consumers of both genders, who were selected for their daily consumption of dehydrated juices. In addition, in this test, the influence of gender of consumers on evaluations of the samples was analyzed. In the descriptive test, B and C were characterized by a greater intensity in orange and acid aroma and orange and acid flavor, samples A and C by a larger body, and A and B by exhibiting a greater intensity of the sweet flavor descriptor. In the test with consumers, B and C were perceived as the sweetest and those that presented the greatest overall acceptability. Furthermore, no differences were found between the ratings provided by men and women.

***Keywords*: sensory profile, commercial dehydrated juices, sweet, orange juices.**

Resumen

El objetivo de este trabajo fue determinar el perfil sensorial y el grado de aceptabilidad de muestras de jugos de naranja deshidratados comerciales (A-B-C) mediante análisis descriptivo cuantitativo (QDA por sus siglas en inglés) y pruebas de aceptabilidad sensorial. Como las muestras B y C se comercializan con la etiqueta "naranja dulce", en los ensayos sensoriales también se analizó si los evaluadores y consumidores las percibían más dulces. Se seleccionó un panel de 8 evaluadores para el ensayo QDA, y se los entrenó en la evaluación de jugos de naranja deshidratados. El ensayo de aceptabilidad sensorial se realizó con 50 consumidores de ambos géneros, quienes fueron seleccionados por su consumo diario de jugos deshidratados. Además, en esta prueba se analizó la influencia del género de los consumidores en la valoración de las muestras. En el test descriptivo, B y C se caracterizaron por una mayor intensidad en aroma a naranja y ácido y sabor a naranja y ácido, las muestras A y C por un mayor cuerpo, y A y B por exhibir una mayor intensidad del descriptor sabor dulce. En el ensayo con consumidores, B y C fueron percibidas como las más dulces y las que presentaron mayor aceptabilidad global. Además, no se encontraron diferencias en la evaluación proporcionada por hombres y mujeres.

***Palabras clave*: perfil sensorial, jugos deshidratados comerciales, dulce, jugos de naranja.**

1. Introduction

Sensory evaluation can be described as a bond between research and development, linking technical aspects of foods with consumer behavior and market research. There are many types of sensory analysis methodologies, and the selection of the method depends on the objective of the study and the type of information that is desired. They can be divided into two large groups: tests designed for trained assessors (discriminative and descriptive testing) and those conducted using consumers (sensory acceptability and preference tests) (Stone *et al*., 2020; Torrico *et al*., 2022).

Descriptive sensory analysis is one of the most sophisticated techniques in the scientific field of sensory evaluation. It involves the identification and the quantitative and qualitative description of sensory characteristics by a panel of individuals trained in the evaluation of the product (Meilgaard *et al*., 2007). They provide the basis for mapping product similarities and variances and determining those sensory characteristics that are important to acceptance (Mihafu *et al*., 2020). The qualitative characteristics include aroma, appearance, flavor, texture, taste and sound. The panel quantifies these properties in order to describe the attributes perceived in the product (Murray *et al*., 2001). The descriptive method is a very important tool for food companies, which can apply it to screen their products and compare them with competing products, also in quality control (effect of the ingredients or process variables), establishing instrument/sensory relationship, product development, and storage tests (shelf life, packaging effect), all of which would enable them to obtain the consumer-desired product (Meilgaard *et al*., 2007). Among descriptive tests, the quantitative descriptive analysis (QDA), developed by Stone *et al*. (1974), is based on the capacity of an assessor to verbalize perceptions in a reliable manner. The assessors are trained in the identification of attributes and use of scales by using reference samples, in order to use a consensus sensory vocabulary (Bécue-Bertaut, 2014; Rodríguez *et al*., 2014; Akasapu and Uppaluri, 2023).

Sensory acceptability is an affective method, very useful for evaluating food acceptability or preference (which product is liked or preferred). Consumers are not trained but selected based on previous use of product, economic social level and geographical area (Mihafu *et al*., 2020). This tests allow to clearly distinguish between consumer preferences and behavior, that is to say "what I prefer may not be what I buy". There are many factors that make consumers chose and eat a certain food product. Appearance is generally the first impression that a consumer receives of a product; then after they have tasted it, flavor is the attribute most usually mentioned by consumers as responsible for their preference of one food product over another one. The most common reason for consumer rejection of a food product is that it "has an unpleasant flavor". However, when they say that the taste is unpleasant they probably mean that they did not like the product for one or several reasons other than flavor (Meilgaard *et al*., 2007).

Among natural beverages, the production of orange juices is the most important and known process at a world scale given its health benefits and pleasant aroma (Rega *et al*., 2004; Pan *et al*., 2023). Orange juice can be marketed as fresh-squeezed juice, juice concentrate or dehydrated juice (spray dried). Dehydration extends the shelf life and reduces transport, packaging and storage costs due to the smaller volume and/or weight of the product (Shrestha *et al*., 2007; Goula and Adamopoulos, 2010). However, during the production of dehydrated fruit juices, some problems related to powder stickiness or manipulation can arise due to their hygroscopic nature (Chegini and Ghobadian, 2007). On the other hand, the quality of spray-dried foods depends on the process parameters (feed flow rate, inlet temperature, atomizer speed, feed concentration, feed temperature, air dry flow rate, etc.) (Chegini *et al*., 2008; Pino *et al*., 2018; dos Santos Rocha *et al.* 2022). There some reports in the literature on the sensory evaluation of fresh orange juices (Pérez-Aparicio *et al*., 2007; Pan *et al*., 2023), and commercial orange juices (Fernández-Vázquez *et al*., 2013; Kim *et al*., 2013). However, there is no data on the sensory analysis of dehydrated orange juices.

The objective of this work was to determine the sensory profile and degree of acceptability of three commercial dehydrated orange juice samples (A, B and C) by quantitative descriptive analysis and a sensory acceptability test. In addition, it was evaluated whether trained assessors and consumers perceived a greater degree of sweetness in the samples marketed under the legend "sweet orange."

2. Materials and methods

This study was approved by the ethical committee of the Faculty of Engineering (FE) of the National University of the Center of the Province of Buenos Aires (UNCPBA) and consent was obtained from each subject before their participation.

2.1 Sample

Three commercial samples of dehydrated orange juices were purchased: A (lot: L.80814j31AR), B (lot: 10L:96042) and C (lot: 10L:9D050) in a local market in Olavarría (Buenos Aires, Argentina). It should be noted that for the selection of the samples, the description of the container label ("sweet orange") was taken as a criterion, contrasting it with another sample without that specification (sample A). Samples B and C are marketed under the label "sweet orange". These samples were used

to carry out the following sensory tests: Quantitative descriptive analysis and Sensory acceptability test.

2.1.1 Sample preparation

Each dehydrated juice sample was dissolved into 1 L of commercial mineral water, according to label directions, and stored at 10±2 ºC.

2.2 Quantitative descriptive analysis

The descriptive analysis was performed according to ISO/DIS norm 13299:2003(E) for establishing a sensory profile. The different stages of the analysis (descriptor search sessions, training and evaluation) were carried out at the facilities of the Department of Chemical Engineering and Food Technology (FE, FUNCPBA, Olavarría, Buenos Aires), where the lighting, ventilation and sound requirements were met.

2.2.1 Panel selection

Teaching staff and students from the Department of Chemical Engineering and Food Technology, who had time availability and who did not present any physical impediment, were called to perform the sensory test according to the guidelines of the ISO8586-1 1993/IRAM20005-1 standard. Finally, eight assessors were chosen complying with the number of assessors recommended for this type of test (Mihafu *et al*., 2020).

2.2.2 Presentation of the samples

The samples were served at 10 °C in 50 mL plastic glasses and presented blind labelled with random 3-digit codes. The evaluation of the attributes was performed in the following order: aroma, appearance and flavor. The samples were served covered with a lid to prevent the loss of volatile compounds during the evaluation of the aroma attributes. Mineral water was served in 110 mL plastic glasses at room temperature for the assessors to rinse their mouth between evaluations.

2.2.3 Generation of descriptors

The assessors were presented with the samples in pairs: C (687) - B (369), C (433) - A (115) and B (552) - A (607). They evaluated the samples and were instructed to fill out the card provided, stating for which descriptors the samples were similar or different (Fig. 1). Finally, they generated a consensus list of descriptors (grouped by attribute) that represented the sensory characteristics of the various dehydrated juices. The descriptors of the aroma attribute were acid and orange, the appearance were orange color and body and of the flavor attribute were orange, acid and sweet. The panelists were advised by the panel leader in the use of the appropriate vocabulary, according to the ISO 5492:1992/IRAM 20001 (1995) norm.

Generation of descriptors for dehydrated orange juices

Name:…….. Date:……

Age: ……

You are presented with three pairs of orange juices in random order, labelled with 3-digit codes.
Starting from left to right, taste the samples and please indicate for which descriptors they are similar and for which descriptors they are different. Consider aroma, appearance and taste attributes.

Samples	They are similar in	They are different in
687 – 369		
433 – 115		
552 – 607		

Figure. 1. Worksheet used to search for descriptors of dehydrated orange juice.
Figura. 1. Planilla empleada para la búsqueda de descriptores de jugos de naranja deshidratados.

2.2.4 Training of the assessors

Different reference samples for each descriptor were presented to the assessors along with the dehydrated orange juice samples. The panelists were asked to compare the control samples and reach consensus on which ones were the most suitable to represent the descriptors that they had previously selected. Finally, they assigned a score value between 0 and 10 to each descriptor, which would serve as a reference to rate the descriptors found in the samples. Table 1 shows the aroma, appearance and flavor descriptors with their respective definitions, references and score. The scorecard is shown in Fig. 2, in which the assessors had to rate the perceived intensity for each descriptor in an unstructured line scale anchored at the ends with the terms “none” and “much”, corresponding to values 0 and 10, respectively.

Table 1. Definitions and references of descriptors of appearance, aroma and taste of dried orange juices.
Tabla 1. Definiciones y referencias de los descriptores de apariencia, aroma y sabor de los jugos de naranja deshidratados.

Descriptor	Definition	Reference	Score (0-10)*
Aroma			
Orange aroma	Evaluation of the aroma of artificial orange. Evaluated by the sense of smell when uncovering the juice sample.	Sample C (10L:9D050)	10
Acid aroma	Evaluation of the aroma intensity acid. Evaluated by the sense of smell when uncovering the juice sample.	1 g citric acid in 1 L of juice, prepared with sample B (10L:96042)	10
Appearance			
Orange color	Evaluation of the intensity of orange color. Evaluated on the surface of the sample.	Sample C (10L:9D050)	9
Body	Property of the sample to offer resistance to movement. Evaluated by manual stirring of the vessel.	Sample C (10L:9D050)	8
Flavor			
Orange flavor	Evaluation of the flavor of artificial orange. Evaluated when testing juice samples.	Sample C (10L:9D050)	10
Acid flavor	Evaluation of the flavor intensity acid. Evaluated when testing juice samples.	Dehydrated orange juice from a brand name	10
Sweet flavor	Evaluation of the flavor intensity sweet. Evaluated when testing juice samples.	16 g sucrose in 1 L juice, prepared with sample B (10L:96042)	8

* The score awarded to each reference was agreed by the panel.
* El puntaje otorgado a cada referencia fue consensuado por el panel.

2.2.5 Sample evaluation

During the scoring session, each assessor was presented with three samples in duplicate in a random order, along with six scorecards (**Fig. 2**). Once the test was completed, each assessor was given a reward for their collaboration.

2.3 Sensory acceptability test

The test was performed according to the ISO 5492:1992/IRAM 20001 (1995) and ISO 8589:1998/IRAM 20003 (1995) norms.

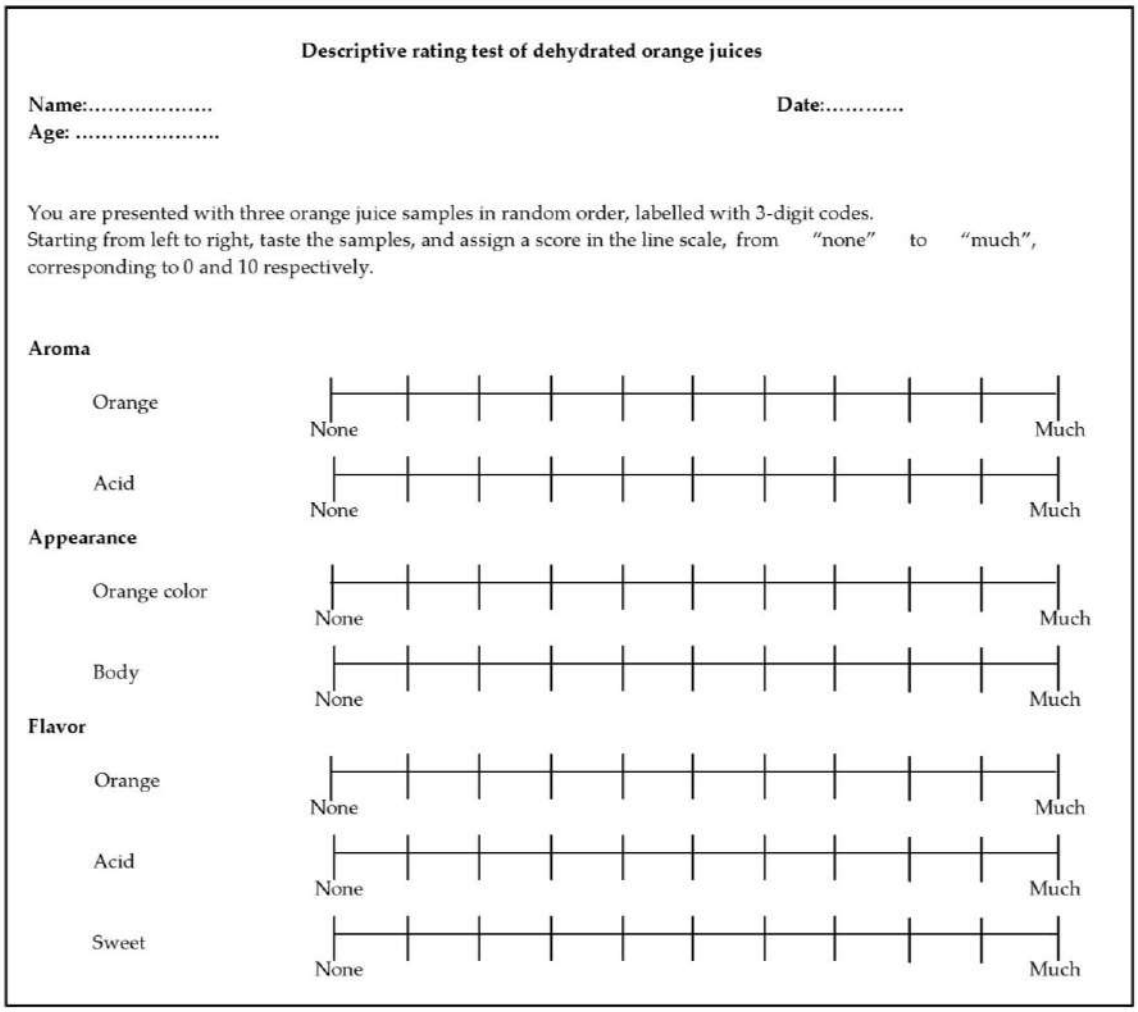

Figure 2. Worksheet used for the evaluation of samples of dehydrated orange juices.
Figura 2. Planilla empleada para la evaluación de las muestras de jugos de naranja deshidratados.

2.3.1 Consumer recruitment

Two hundred teenagers of both genders between the ages of 15 and 17 from a secondary school in Argentina ("Adolfo Pérez Esquivel", Olavarría, Buenos Aires, Argentina) were invited to take part in a poll. The poll involved filling in a chart in which they were asked to mark with a cross the frequency of consumption (never, once a week, three times a week or every day) of certain non-alcoholic beverages (carbonated flavored water, still flavored water, mineral water, carbonated water, juice concentrate, dehydrated juice, fresh-squeezed juice, soft drinks and herbal-based drinks). The selection criterion was to choose those adolescents who reported a daily consumption of dehydrated juices.

2.3.2 Acceptability test

The acceptability test carried out at the facilities of the Department of Chemical Engineering and Food Technology (FE, UNCPBA, Olavarría, Buenos Aires). The test was performed with 50 regular consumers of this product (33 female, 17 male), who evaluated the samples using a hedonic scale. The samples were served at 10±2 ºC in 50 mL plastic glasses labelled with random 3-digit codes. Mineral water was provided to rinse their mouth between evaluations, served in 110 mL plastic glasses at room temperature.

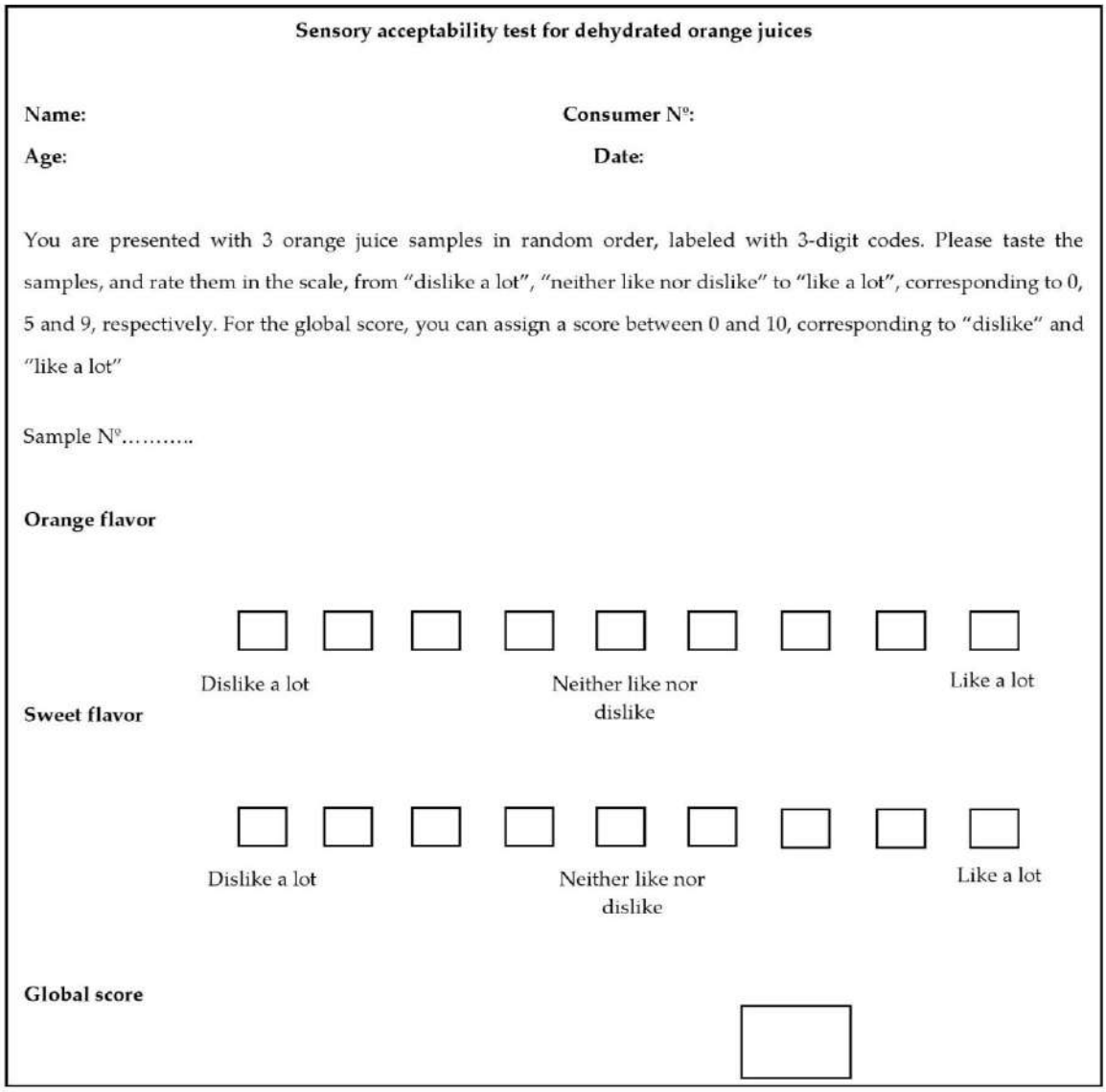

Figure 3. Worksheet used for the sensory acceptability test.
Figura 3. Planilla empleada para el ensayo de aceptabilidad sensorial.

The consumers were asked to score the level of acceptance that they perceived for each sample in a line scale anchored at the ends with the terms "dislike a lot", "neither like nor dislike" and "like a lot", corresponding to values 0, 5 and 9, respectively. The "global score" was also taken into account, for which consumers were asked to assign a value between 0 and 10, with 0 corresponding to "dislike" and 10 to "like a lot". The descriptors evaluated were "orange flavor" and "sweet flavor". It was analyzed if the incorporation of the adjective sweet incorporated in the legend of the packaging of juices B and C is perceived by consumers (Fig. 3). In addition, in this test, the influence of gender of consumers on evaluations of the samples was analyzed. Once the test was completed, each consumer was given a reward for their collaboration.

2.4 Data analysis

The results were analyzed by ANOVA with the InfoStat software (Di Rienzo *et al*., 2014), evaluating the differences between the samples for each descriptor and panel performance in the quantitative descriptive test, and only the differences between the samples in the sensory acceptability test (n=50). For the comparison of means, Tukey's test was used when significant differences were found (significance level of 5 %), with different letters indicating significant differences between the analyzed sources of variation. In the case of the acceptability test, for gender discrimination, a hypothesis test for paired means was conducted, with a level of significance of 5 % and $n<30$.

3. Results and discussion

3.1 Quantitative descriptive analysis

Of the descriptors agreed upon by the panel of evaluators, those corresponding to the flavor attribute (sweet, orange and sour) were also selected by other authors when they evaluated non-dehydrated commercial orange juices (Pérez Aparicio *et al*., 2007; Kim *et al*., 2013).

Table 2 shows the ANOVA results for the sample, assessors sources of variation and the sample*assessors interaction for all the descriptors of the aroma, appearance and flavor attributes. For all dehydrated orange juice descriptors there were significant differences ($p\leq0.05$) among the three samples, while significant differences were only detected among the evaluators for the orange color descriptor. In the orange color appearance descriptor and in all flavor attribute descriptors, a significant sample* assessors' interaction was detected ($p\leq0.05$).

Table 2. ANOVA for the sources of variation sample, evaluator and interaction sample*evaluator for the descriptors of the aroma, appearance and taste attributes.
Tabla 2. ANOVA para las fuentes de variación muestra, evaluador y la interacción muestra*evaluador para los descriptores de los atributos aroma, apariencia y sabor.

Descriptor	SV	SS	df	MSE	F	p
Aroma						
Orange aroma	Model	119.42	23	5.19	3.72	0.0011
	Sample	83.64	2	41.82	29.96	<0.0001
	Assessor	2.58	7	0.37	0.26	0.9619
	Sample*assessor	33.20	14	2.37	1.70	0.1228
	Error	33.50	24	1.40		
	Total	152.92	47			
Acid aroma	Model	116.33	23	5.06	2.28	0.0248
	Sample	88.97	2	44.48	20.10	<0.0001
	Assessor	8.49	7	1.21	0.55	0.7894
	Sample*assessor	18.86	14	1.35	0.61	0.8318
	Error	53.13	24	2.21		
	Total	169.45	47			
Appearance						
Orange color	Model	95.74	23	4.16	47.02	<0.0001
	Sample	81.54	2	44.48	20.10	<0.0001
	Assessor	4.66	7	0.67	7.52	0.0001
	Sample*assessor	9.54	14	0.68	7.70	<0.0001
	Error	2.12	24	0.09		
	Total	97.87	47			
Body	Model	133.12	23	5.79	6.07	<0.0001
	Sample	97.64	2	48.82	51.22	<0.0001
	Assessor	8.70	7	1.24	1.30	0.2906
	Sample*assessor	26.78	14	1.91	2.01	0.0645
	Error	22.87	24	0.95		
	Total	155.99	47			
Flavor						
Orange flavor	Model	140.49	23	6.11	4.39	0.0003
	Sample	90.76	2	45.38	32.63	<0.0001
	Assessor	3.41	7	0.49	0.35	0.9217
	Sample*assessor	46.32	14	3.31	2.38	0.0299
	Error	33.38	24	1.39		
	Total	173.87	47			
Acid flavor	Model	175.58	23	7.63	4.94	0.0001
	Sample	119.66	2	59.83	38.68	<0.0001
	Assessor	6.24	7	0.89	0.58	0.7677
	Sample*assessor	49.68	14	3.55	2.29	0.0356
	Error	37.13	24	1.55		
	Total	212.70	47			
Sweet flavor	Model	99.95	23	4.35	3.99	0.0006
	Sample	41.84	2	20.92	19.22	<0.0001
	Assessor	9.79	7	1.40	1.28	0.2996
	Sample*assessor	48.32	14	3.45	3.17	0.0063
	Error	26.13	24	1.09		
	Total	126.08	47			

SV: Source of variation, SS: Sum of squares, gf: degrees of freedom, MSE: Mean squares of the error, F: Fisher.
FV: Fuente de variación, SC: Suma de cuadrados, gl: grados de libertad, CM: Cuadrados medios del error, F: Fisher.

Based on the statistical results, the sensory profile of the dehydrated orange juice samples for the descriptors on which the 8 assessors could reach consensus (orange aroma, acid aroma and body) is shown in Fig. 4. It can be observed that samples B and C presented a significantly higher intensity in orange aroma and acid aroma. On the other hand, samples A and C exhibited a significantly more intense body (viscosity) than sample B.

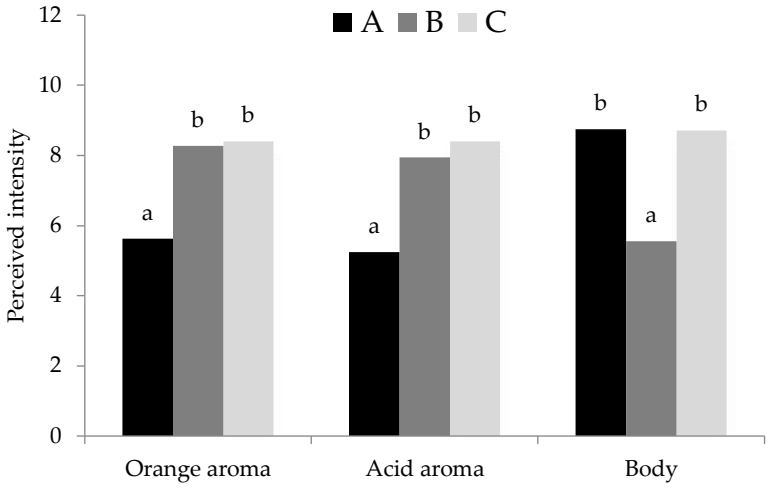

Fig. 4. Intensity of perception for the descriptors orange aroma, acid aroma and body in the samples of dehydrated orange juices, taking into account all panel members.
Different letters indicate significant differences (p≤0.05).
Fig. 4. Intensidad de percepción para los descriptores aroma naranja, aroma ácido y cuerpo en las muestras de jugos de naranja deshidratados, teniendo en cuenta a todos los integrantes de panel.
Letras distintas indican diferencias significativas (p≤0.05).

In the case of the descriptors for which the panelists showed different levels of perception (orange color) and/or significant interactions were observed between the sources of variation sample*evaluators (flavor attribute descriptors and orange color), only were considered for the data analysis the scores of those assessors who evaluated the juice samples with a similar trend.

The according to the results of ANOVA for the three descriptors of the flavor attribute for orange flavor and acid flavor the panel could reach consensus, without considering the contribution of only one assessor (gl=6), whereas for sweet flavor it was necessary to exclude the values of two assessors (gl=5). These results would seem to indicate that the panelists need further training in these descriptors. Taking into account this analysis, samples B and C were characterized by intense orange and acid flavors, whereas samples A and B presented a more intense sweet flavor (Fig. 5). As mentioned above, sample B turns out to be the most balanced in terms of flavor (orange, acidity and

sweetness), sample C is considered more acidic and has a greater orange flavor than sweet, while sample A stands out for being sweeter than orange or acid flavor.

As for orange color, there was a great disparity in how the assessors perceived it, and it was not possible to make a comparison between the samples for this descriptor. This could be attributed to the fact that color perception is based on the responses of photoreceptors in the retina and on how they are interpreted in the brain, which requires a lot of training (Fernández-Vázquez *et al*., 2013).

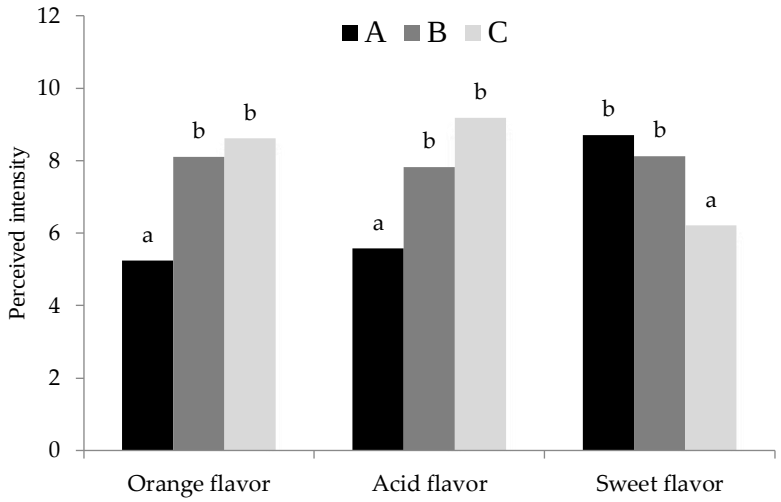

Fig. 5. Intensity of perception for the descriptors orange flavor (n = 7), acid taste (n = 7) and sweet taste (n = 6) in the samples of dehydrated orange juices.
Different letters indicate significant differences (p≤0.05).
Fig. 5. Intensidad de percepción para los descriptores sabor naranja (n=7), sabor ácido (n=7) y sabor dulce (n=6) en las muestras de jugos de naranja deshidratados.
Letras distintas indican diferencias significativas (p≤0.05).

3.2 Sensory acceptability test

The level of acceptance for the three samples of dehydrated orange juices is shown in Fig. 6. Samples B and C presented a significantly higher intensity ($p<0.0001$) for orange flavor (6.74±2.09 and 6.66±2.12) and sweet flavor (6.88±2.10 and 6.26±2.30, respectively) than sample A (4.92±2.60 and 4.68±2.43, orange flavor and sweet flavor, respectively). The results obtained from the evaluation of sweet flavor indicate that consumers perceived samples B and C as sweeter, confirming the label in the products marketed as "sweet orange". Consumers consistently assigned to samples B and C significantly higher ($p<0.0001$) global scores (7.69±2.19 and 7.39±1.94, respectively), which would indicate a high level of acceptance of these samples.

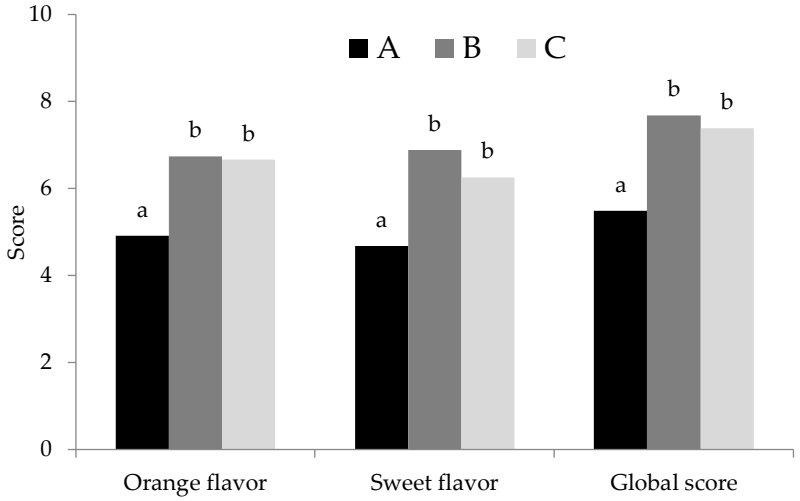

Fig. 6. Sensory acceptability of dehydrated orange juice samples.
Fig. 6. Aceptabilidad sensorial de las muestras de jugos de naranja deshidratados.

When comparing these results with those obtained for the descriptive analysis, it can be observed that both the panel of trained assessors and the consumers identified samples B and C as the ones with the most intense orange flavor. However, as for sweet flavor, the trained panel perceived that samples A and B had a higher degree of sweetness (see Fig. 5), whereas consumers assigned the highest rating to samples B and C (see **Fig. 6**). These differences can be attributed to the fact that consumers may be rating the sweet taste in a more global sense than the trained panel, who should rate the sweet taste as a basic taste sweetness. That is, what the panel qualifies as "sweet flavor" and what the consumer qualifies as "sweet flavor" are two different concepts. On the other hand, the low scoring of sweet flavor and orange flavor for sample A by the consumers could be associated with the low level of acceptance of this producto in terms of global score. It should be noted that sample B, which received the highest global score value, was rated as having the least body by the trained evaluators (see Fig. 4), which could indicate that consumers like the samples more less viscous and with a more balanced flavor.

Regarding the effect of consumers' gender on sensory acceptability, in all cases, no significant differences ($p>0.05$) between the evaluations of men and women were detected for the samples (A, B and C) with the number of consumers involved in this analysis, but these results could vary if a larger number of consumers were considered (Hough *et al*., 2006). Although there is scientific research that shows differences in the ability to perceive sensory attributes depending on gender, for example, the authors Doty and Cameron (2009) state that women are more sensitive to detect, identify and discriminate some odors in relation to men. However, these differences, when present, are usually not large.

4. Conclusion

The descriptive analysis provided a description of the sensory characteristics of the dehydrated orange juices under analysis. Sensory differences could be detected between the samples. Samples B and C were characterized by a greater intensity in orange and acid aroma and orange and acid flavor, samples A and C by a larger body, and samples A and B by exhibiting a greater intensity of the sweet flavor descriptor.

The sensory acceptability test provided information on the liking level of a group of adolescents for different commercial brands of dehydrated orange juices sold under different degrees of sweetness on their labels. The consumers showed higher liking for those samples that had greater intensity of orange flavor and sweet flavor (samples B and C). They also identified the samples labelled "sweet orange" as having a greater degree of sweetness than sample A. It must be noted that no differences were found between the evaluations provided by men and women.

In summary, by relating the results of the studies addressed (QDA and acceptability testing), it is concluded that sweet taste is perceived from a different concept depending on whether the evaluations correspond to trained assessors or consumers. Furthermore, sample B was the one that received the highest global score value according to the sensory test, which could be associated with its greater balance of flavors (orange, sour and sweet) and its lower body according to the results obtained in the QDA. This would indicate the importance of carrying out both studies, given that they provide different and at the same time complementary information.

However, it would be of interest in future sensory studies of dehydrated orange juices to train the members of the QDA panel in the search for more specific descriptors for the attributes appearance, aroma and flavor. Likewise, carry out the sensory acceptability test with a larger number of consumers to obtain more representative results.

Acknowledgment

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Conflict of interest

The authors declare that they have no conflict of interest and have no competing financial interest for the work covered in this paper.

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