



Article

Effect of Pulp Pigmentation Intensity on Consumer Acceptance of New Blood Mandarins: A Cross-Cultural Study in Spain and Italy

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Abstract: One of the current objectives of different citrus breeding programmes is obtaining new pigmented mandarins. This study investigates to what extent consumer preferences, expectations and purchase intention are affected by the appearance of new mandarins, specifically pulp pigmentation intensity. Four hundred consumers from both Italy and Spain (800 in all) participated in the study. In each country, half were informed about the healthy properties of the anthocyanins responsible for red pulp colouration, while the other half were not. Italians more readily accepted new mandarin varieties than Spaniards, which was linked to them being more familiar with blood oranges. In Italy, both slight- and medium-pigmented mandarins were well-accepted. Spanish consumers preferred the slight-pigmented variety. The most intense pigmented varieties were not well-accepted in either country. Health-related information positively affected Spaniards' consumer response but did not modify that of Italians. A halo effect was detected in Spain, where health-related information positively affected mandarin appearance liking and its expected taste liking. Consumer perception that new varieties were unnatural was identified as a consumption barrier, mainly in Spain. Blood orange familiarity and health claims are revealed as conditioning factors for consumer response to pigmented mandarins. Interventions should be made to inform consumers that these varieties are obtained by conventional breeding and not by transgenic technology. Future studies should evaluate consumer response to other sensory characteristics, such as odour, taste and texture.

Keywords: health claim; familiarity; natural; first choice; purchase intention; consumption barrier



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1. Introduction

In recent years, mandarin production has significantly increased, while other citrus fruits such as orange have remained stable [1]. Mandarins have a unique flavour that has attracted consumers' attention worldwide [2]. One of the reasons for their good position in markets has been breeding seedless and easy-to-peel [3,4]. Thus, breeding programmes have been key for mandarin success in markets by providing the consumer with more convenient fruit of high sensory quality [5–7].

One of the current objectives of mandarin breeding programmes is responding to the increasing demand for healthier foods. Thus, breeding programmes have focused on obtaining new red-pigmented varieties by crossing classic mandarin with blood orange varieties such as 'Moro' or 'Tarocco' [8,9]. These blood mandarin hybrids are rich in anthocyanins, which confer them their reddish colouration [9,10]. Anthocyanins are well-known for their antioxidant properties. They have been reported to help to prevent diabetes, heart disease and viral activity, and have promising anticancer properties [11,12]. Indeed, the anthocyanin content of pigmented mandarins enhances their healthy character compared to traditional unpigmented ones, since the high antioxidant capacity of anthocyanins helps to neutralise the free radicals generated in different biological processes, thus exerting a protective effect against oxidative damage at the cellular level [11,12].

The first red mandarin breeding programme was established in Italy [13], where most blood oranges originate and have a long-standing tradition in markets. In fact, a recent study with data from four countries (Italy, Spain, China and Mexico) has revealed Italy as the country with the greatest consumption of blood oranges, where 76% of the study's participants stated being habitual consumers of this kind of orange [14].

More recently, another programme to obtain pigmented mandarins has been established in Spain [15], where blood oranges are currently being introduced on markets and the consumption rate is still low at around 17% [14]. A range of new red varieties has been bred in the last few years at the Valencian Institute for Agricultural Research (IVIA) (Valencia, Spain) and is being evaluated.

As previously mentioned, anthocyanins are responsible for the red colouring of pigmented citrus fruit flesh. This means that the more intense the pulp pigmentation, the higher the concentration of healthy compounds [16,17]. A priori, it could be thought that the more intensely pigmented new varieties are, the better they will be from a commercial point of view. However, it has been shown that the presence of unfamiliar colours in food may result in consumers mistakenly anticipating their properties, which might negatively impact product acceptance. This effect has been observed in vegetables with atypical colours such as blue potatoes [18] and red carrots [19]. In new kiwifruit and apple varieties, the presence of red colouration on the flesh has led consumers to consider the product to be unnatural [20,21]. So, despite the red pigmentation of new mandarin varieties being linked with healthier properties, it may negatively impact consumer perception and choice. This possibility means having to conduct studies to anticipate consumer response to these new mandarin varieties that present an unusual aspect.

Consumer studies such as those mentioned above may reveal valuable information for variety selection processes in breeding programmes. Moreover, identifying consumption barriers can help the industry to take measures to mitigate them. Indeed, nutrition and health claims have proven effective techniques for providing information to consumers that can help them to make better choices [22–24].

It is important to consider that all consumer response-related aspects are influenced by their cultural background [14,25,26]. Cross-cultural studies allow differing patterns among consumer populations to be identified, which can help breeders and industries to adapt their products depending on their destination market. According to Jamir et al. [27], familiarity with similar products may be crucial for explaining cultural differences in a new product's acceptance.

Taking all this into account, the objective of this study was to evaluate if the pulp pigmentation intensity of new red mandarin varieties affects consumer preferences, expectations and purchase intentions. The study was conducted in Italy and Spain to evaluate the effect of consumer familiarity with other pigmented citrus fruit, i.e., blood oranges. It also investigated the effect on participants' decisions of providing them with information about the healthy properties of pigmented mandarins.

2. Materials and Methods

2.1. Consumer Sample

Four hundred people of each nationality, all of legal age, participated in this study. Spanish participants were recruited in Valencia (Spain) and its surroundings, while Italian participants were recruited in Palermo (Sicily) and its surroundings. They were recruited by several approaches: student mailing lists of the two institutions, intercepting pedestrians in the street to invite them to participate in the study, and snowball recruitment (word-of-mouth) through which participants were requested to invite family, friends and/or colleagues to participate. The inclusion criterion was to be a consumer of citrus fruit (at least once a week during the season). The proportion of men and women was similar in both countries, with around 60% women. Participants were aged between 18 and 62 years in Spain, and between 18 and 60 in Italy. Recruitment was conducted in both

countries to obtain a balanced percentage of young adults (18–30 years), middle-aged adults (31–50 years) and adults aged over 50 years.

Participation was entirely voluntary. Participants were asked to complete a questionnaire in the Sensory Rooms of the IVIA (Spain) and at the Università degli Studi di Palermo (Italy). The questionnaire was designed online and was accessed via tablets. Consent indicating voluntary participation was obtained from all the participants. To this end, at the beginning of the questionnaire, they were shown the following statement: “If you agree to participate and us to employ your answers for this study, please click next”. Once the participants had finalised the questionnaire, they received a gift for taking part.

2.2. Samples

Four images of mandarins were used (Figure 1). One was a classic mandarin with orange pulp. The other three were images of red-pigmented mandarins with different degrees of pulp pigmentation intensity (slight, medium and intense). The objective of this study was to evaluate the pulp pigmentation effect. Therefore, to avoid bias due to external appearance, images were edited in such a way that the three pigmented varieties looked very similar externally.

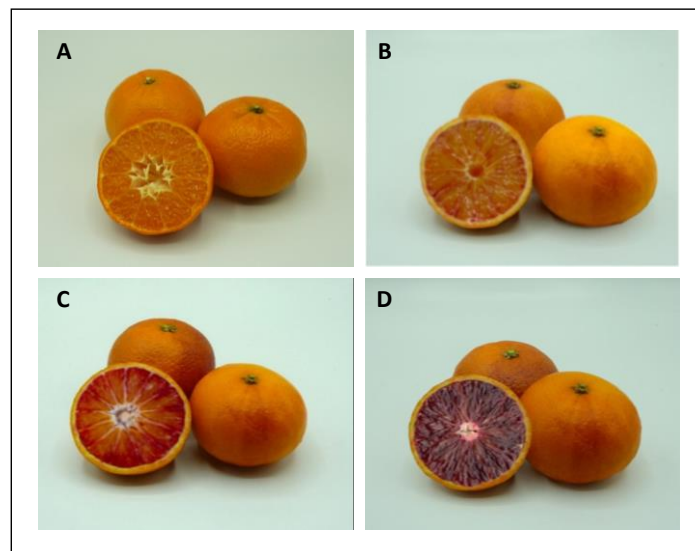


Figure 1. Pictures of normal (A), slight (B), medium (C) and intense pigmented (D) mandarins shown in the questionnaire.

2.3. Questionnaire Design

2.3.1. Presentation of the Study

After obtaining the participants’ consent, the study methodology was explained to them. This section served to divide the participants into “Uninformed” and “Informed” ones so that of the 400 Spanish and 400 Italian participants, half were informed about the health properties of pigmented mandarins and half were not.

For this reason, the study was presented in two different ways. On the one hand, the Uninformed group was shown the following text: “We are going to show you images of four mandarin varieties. Of them, you will see new varieties with red flesh. We want to know your opinion. Please answer the questions we ask you in each case”. On the other hand, the Informed group received information about the healthy properties of the pigmented varieties: “We are going to show you images of four mandarin varieties. Of them, you will see new varieties with red flesh. These varieties have natural antioxidant compounds that give them their reddish colouring. We want to know your opinion. Please answer the questions we ask you in each case”.

The order in which images were presented was balanced to avoid any order effect.

2.3.2. Consumer Choice

The participants were shown the four mandarin images at the same time and were asked about their first and last choices using the following questions: (1) “Which of these mandarins would you choose?”; (2) “Which of these mandarins would you not choose? (Which would be your last option)”. To answer them, they used a drop-down box with the four mandarin options.

2.3.3. Naturalness and Healthiness Perception

In this part of the questionnaire, consumers were presented with images of the four mandarins one at a time. For each mandarin, the participants’ perception of naturalness and healthiness was investigated. To this end, the participants were asked to indicate their level of agreement or disagreement with the following statements on a 7-point Likert scale (1 = “Not at all”; 7 = “Very much”) [28]: ‘I think these mandarins are natural’, and ‘I think eating these mandarins is good for my health’.

2.3.4. Acceptance and Purchase Intention

After responding to the question about the naturalness and healthiness perceptions, the participants were asked to score their liking of both appearance (“How much do you like the way these mandarins look?”) and expected taste (“How much do you think you would like these mandarins?”) on a 7-point hedonic scale (1 = “dislike/will dislike very much” and 7 = “like/will like very much”) [29].

They were also asked about their purchase intention (“Would you buy these mandarins?”). The participants answered on a 5-point scale ranging from 1- “I would definitely not buy them” to 5- “I would definitely buy them” [30].

In the last questionnaire section, consumers’ familiarity with blood oranges was investigated. For this matter, consumers were asked about their level of blood orange consumption using three response options: “I have never tried them”, “I have tried them, but I do not usually eat them” and “I usually eat them when they are available on the market”. Those participants who selected the first and second options were classified as “Unfamiliar” since they were not habitual consumers, while those who selected the third option were classified as “Familiar”.

Finally, consumers were asked about their gender and age.

The final questionnaire was originally produced in Spanish by the Spanish research group and underwent a pilot trial with consumers ($n = 10$) to check for errors, ambiguity, the logical flow of questions and completion time. It was subsequently translated into Italian by a bilingual researcher.

The protocol and procedures used in this study were revised by the Scientific Directorate of the IVIA, which stated waiver consent. All the articles of the Declaration of Helsinki and EU 2016/679 Regulation on the protection of natural persons regarding personal data processing and on the free movement of such data were met.

2.4. Data Analysis

To analyse the data from the choice tests and the purchase intention question, the percentage of consumers who selected each response option was calculated. The comparison of the k proportion-test (procedure of Marascuilo and chi-cuadrado, $p < 0.05$) was used to compare the frequency of choice of the different mandarins.

For each country and consumer type (Informed, Uninformed), ANOVA analyses were performed to evaluate the effect of pulp pigmentation intensity on the naturalness and healthiness perceptions, and on the liking of both appearance and expected taste ($p < 0.05$). ANOVAs ($p < 0.05$) were also carried out to determine the effect of the participants’ age, provided information, nationality and familiarity with blood oranges on consumer response. All the analyses were performed with Statgraphics Centurion XVI.

3. Results

3.1. Consumer Choice

Figure 2 shows the results of consumers' first mandarin choice. Irrespective of the country and the Uninformed or Informed condition, the first choice of most consumers was the normal mandarin. However, a clear effect of nationality, information and pulp pigmentation was observed when analysing the results in detail. When Spanish consumers were Uninformed, 28% of them indicated any of the pigmented mandarins as their first choice, and the slight-pigmented variety was the most frequently selected of them. When information about the content of antioxidant compounds was provided, 10% fewer Spaniards chose normal mandarins as their first option, which resulted in around 40% of consumers selecting any of the new pigmented varieties. The slight-pigmented mandarin remained the preferred one by the Informed consumers.

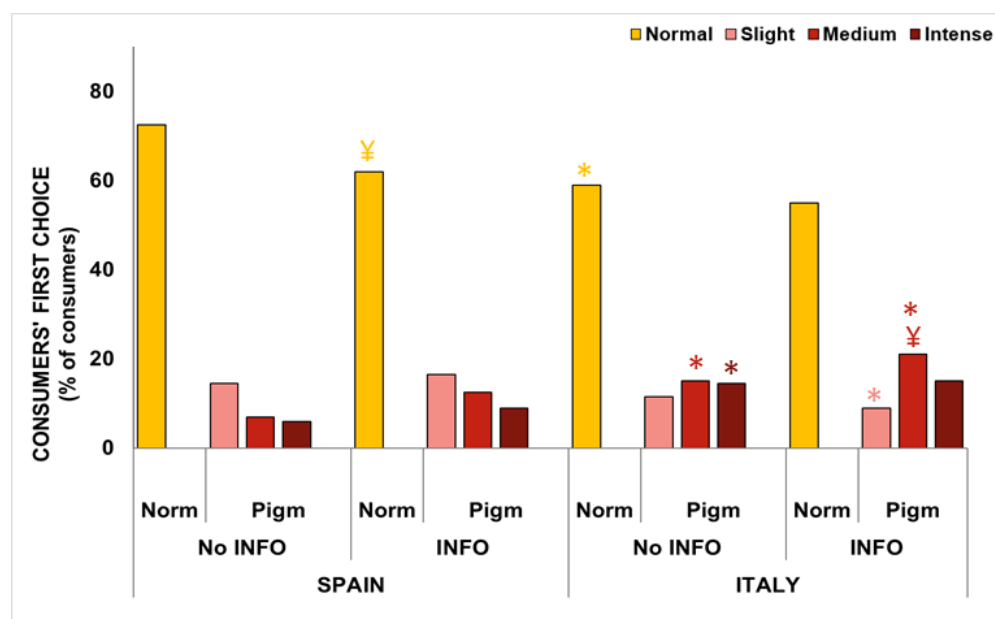


Figure 2. Percentage of consumers from Spain and Italy who indicated each mandarin type (normal-, slight-, medium- and intense-pigmented varieties) as their first choice. The Informed consumers (Info) received information about the antioxidant properties of the pigmented mandarins. ¥ indicates significant differences between the percentage of informed and uninformed participants in each of the countries who selected a specific type of mandarin. * indicates significant differences between the percentage of Italians and Spaniards who selected a specific type of mandarin under the same condition of information.

A different pattern was detected in Italy. For the Uninformed condition, more Italians (40%) reported pigmented mandarins as their first option than Spaniards (28%). Italians showed more interest in the more intensely pigmented varieties compared to Spaniards, and the effect of providing information was not so marked in Italy. The percentage of Informed consumers who chose any of the pigmented mandarins very slightly increased with respect to the Uninformed ones and was mainly associated with the medium-pigmented mandarins being selected more.

When Spanish consumers were asked to indicate which mandarin would be their last option under the Uninformed conditions, most (60%) selected the most intense-pigmented variety (Figure 3). The least frequently mentioned pigmented mandarins were the medium-pigmented ones (18%), followed closely by the slight-pigmented ones (20%). The provided information had a slight effect on consumers' last choice. Thus, knowing about anthocyanin's healthy properties led to the percentage of consumers who selected the most pigmented variety as their last option to be slightly lower.

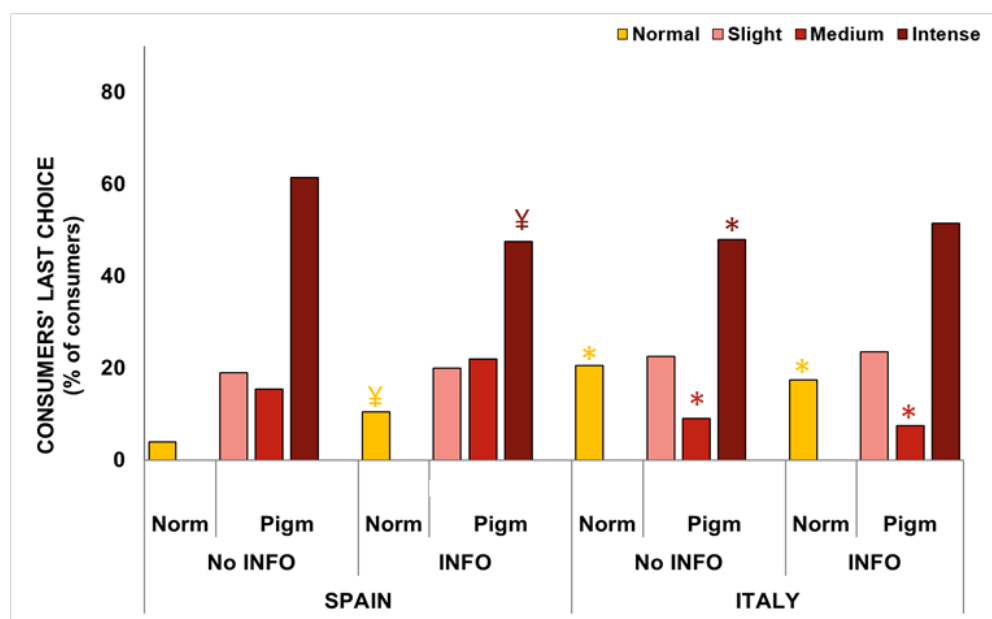


Figure 3. Percentage of consumers from Spain and Italy who indicated each mandarin type (normal-, slight-, medium- and intense-pigmented varieties) as their last choice. The Informed consumers (Info) received information about the antioxidant properties of the pigmented mandarins. ¥ indicates significant differences between the percentage of informed and uninformed participants in each of the countries who selected a specific type of mandarin. * indicates significant differences between the percentage of Italians and Spaniards who selected a specific type of mandarin under the same condition of information.

For Italy, the provided information had no effect on their last mandarin choice. The percentage of Italians who indicated the normal variety as their last choice was higher (20%) than in Spain (4%). Of the pigmented varieties, the most intense-pigmented one was by far the most frequently indicated as the last option, which is in concordance with that detected in Spain. Once again, the medium-pigmented variety was highlighted for being the least frequently chosen one. In fact, less than 10% of the Italian Informed consumers indicated this variety as their last option, which is an even percentage lower than that observed for normal mandarins.

3.2. Purchase Intention (PI)

Figure 4 shows the results of consumers' purchase intention (PI) depending on mandarin pigmentation under the Informed and Uninformed conditions. When Spanish consumers did not receive information about the properties of the new varieties, they indicated a higher PI for the normal cultivar (83% were willing to buy and 9% perhaps would buy) than for the pigmented varieties. Of the pigmented ones, Spanish consumers were most interested in the slightly-pigmented mandarins, with 68% of consumers indicating that they would buy them or perhaps would do so. The medium- and intense-pigmented varieties were less interesting to consumers.

Informing consumers about the beneficial properties of pigmented mandarins led to an increase in Spaniards' PI. This information resulted in around 20% more consumers showing an interest in buying the three pigmented varieties. The pattern of pulp pigmentation preferences remained unchanged for the Uninformed ones, i.e., the slight-pigmented variety was that with the highest PI, followed by the medium- and the intense-pigmented ones.

When the test was performed in Italy with the Uninformed consumers, the PI for the pigmented varieties was higher in all three cases compared to the results for Spain. Italians showed more interest in the slight- and medium-pigmented varieties, with PI at around

80% (60% willing to buy and 20% perhaps willing). In fact, PI was similar to that of the normal variety. They indicated lower PI for the intense-pigmented variety.

Unlike that observed in Spain, the information provided about new varieties had no noticeable effect on the Italian consumer PI.

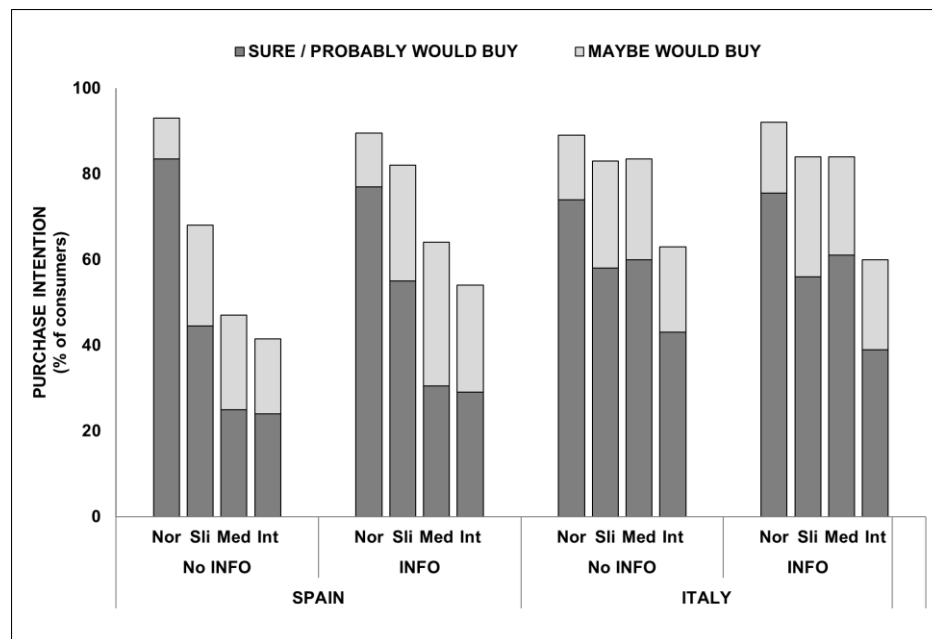


Figure 4. Purchase intention of Spaniards (SP) and Italians (IT) for mandarins with different pulp pigmentation intensities (normal, slight, medium and intense). The Informed consumers (Info) received information about the antioxidant properties of the pigmented mandarins.

3.3. Consumer Perception and Expected Liking

Figure 5 shows consumers' responses when asked to score on a Likert scale the variety's 'naturalness' and 'healthiness'. Acceptance based on liking the mandarins' appearance and their expected taste when eaten is also shown. As Figure 5A illustrates, the Spanish Uninformed group perceived pigmented varieties to be less natural and healthy than normal ones, especially those with more intense pigmentation. Regarding their appearance acceptance and their expected taste liking, the pigmented varieties also obtained lower scores than the normal variety. Clear differences were revealed among the new varieties depending on the degree of pigmentation because the more intense pigmentation was, the less attractive its appearance and the less they expected to like their taste. Of the three pigmented ones, the slight-pigmented mandarin was highlighted as being the most visually liked and generated the better-expected taste.

When Spanish consumers were informed about the beneficial properties of the pigmented varieties, their 'healthy' perception significantly increased for the three red mandarins. The liking scores for appearance and expected taste also rose in association with the provided information (Figure 5B).

The results from the test performed in Italy with the Uninformed consumers (Figure 5C) showed that they gave higher scores for the pigmented varieties compared to Spaniards (Figure 5A). Thus, the scores of the three pigmented varieties came closer to those of the normal one in Italy than in Spain. Another remarkable difference to appear between countries was that Italians gave the same scores to the slight- and medium-pigmented varieties for all the evaluated aspects, which was not observed in Spain. Interestingly enough, Italians considered that irrespective of pigmentation intensity, the three red varieties were equally healthy. The main effect of pigmentation intensity was detected for the acceptance evaluation since the intense-pigmented variety was the least liked in appearance terms and was also expected to be the least liked when eaten.

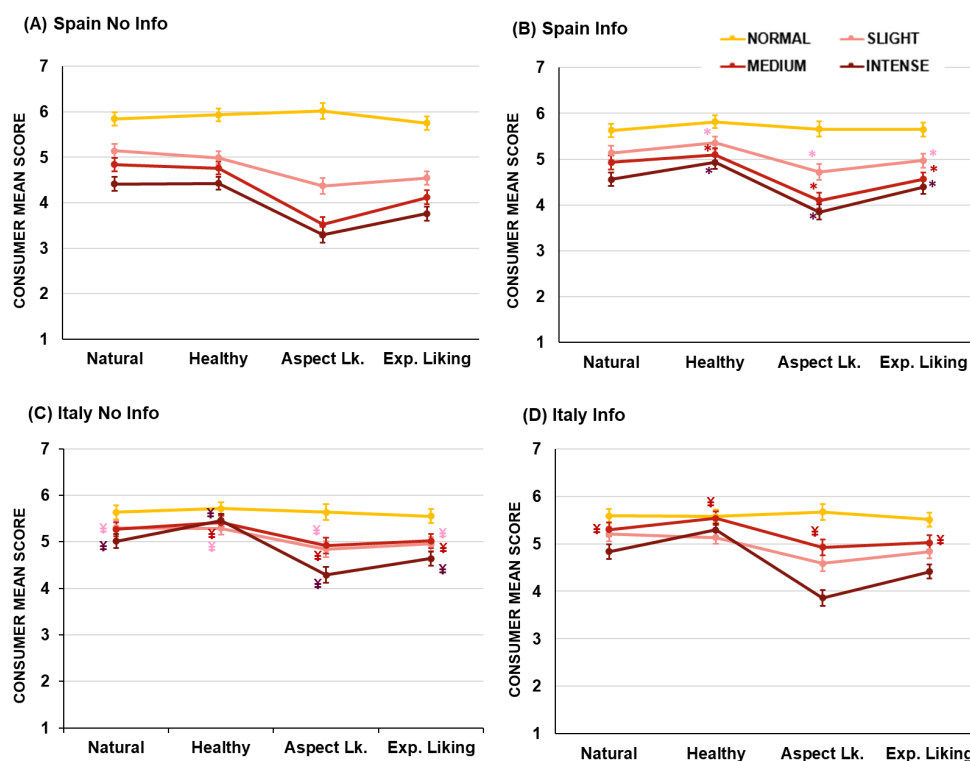


Figure 5. The mean scores of consumer perceptions of the natural and healthy characters (7-point Likert scale), and the liking of appearance and expected taste liking (7-point hedonic scale), of mandarins with different pigmentation intensities. In the four figures, vertical bars depict the LSD intervals when evaluating the pigmentation intensity effect on the scores for each aspect. * denotes significant differences between the Uninformed and Informed consumers from a specific country, i.e., when comparing the results between Figure (A) and (B), and between Figure (C) and (D). † indicates significant differences between Spaniards and Italians under a specific condition (Informed or Uninformed), i.e., when comparing the results of Figure (A) and (C) and those of Figure (B) and (D) (LSD test, p -value = 0.05).

When information about the antioxidant properties of anthocyanins was provided to the Italian consumers, no remarkable changes in their perception and expectations of the different varieties were observed (Figure 5D).

A comparison between the data from the Informed consumers from Spain (Figure 5B) and Italy (Figure 5D) revealed differences in how they perceived the medium-pigmented variety. For all the evaluated aspects, Italians gave higher scores than Spaniards.

A more thorough analysis of the data to determine if participants' perception depended on their age revealed that irrespective of the country and conditions, there were no differences among age groups for any of the four evaluated aspects (data not shown).

As our results seemed to corroborate the initial hypothesis of a cultural effect associated with Italians being more familiar with blood oranges possibly resulting in a more positive response, we wished to go one step further and evaluate the effect of familiarity on both countries. To this end, an ANOVA was performed by comparing the response of those consumers who stated not normally eating blood oranges and those who indicated that they did; that is, the 'Unfamiliar' and 'Familiar' participants from each country (Table 1). The first result worth mentioning in this regard was the percentage of participants from each country who were familiar with blood oranges: 16% in Spain and 72% in Italy. This result confirmed the interest in including these two countries in the study to evaluate the familiarity effect at the country level.

Table 1. Effect of familiarity with blood oranges on consumer perceptions of the natural and healthy character, and on the liking of appearance and expected taste (Ex. Liking), of mandarins with different pigmentation intensities. * indicates significant differences between the Familiar and Unfamiliar consumers for a specific pigmentation intensity according to the LSD test (p -value = 0.05).

		NORMAL		SLIGHT		MEDIUM		INTENSE		
		Fam.	Unf.	Fam.	Unf.	Fam.	Unf.	Fam.	Unf.	
SPAIN	NO INFO	Natural	6.1	5.8	5.7	5.0 *	5.8	4.6 *	5.2	4.2 *
		Healthy	6.1	5.9	5.3	4.9	5.6	4.6 *	5.1	4.3 *
		Aspect L.	6.1	6.0	5.1	4.2 *	4.9	3.2 *	4.8	3.0 *
		Ex. Liking	6.0	5.7	5.1	4.4 *	5.4	3.8 *	4.9	3.5 *
	INFO	Natural	5.7	5.6	5.4	5.1	5.6	4.8 *	5.3	4.5 *
		Healthy	5.9	5.8	5.1	5.4	5.5	5.0	5.3	4.9
		Aspect L.	5.8	5.6	4.5	4.8	4.4	4.0	4.7	3.7 *
		Ex. Liking	5.9	5.6	4.8	5.0	5.3	4.5 *	5.5	4.2 *
ITALY	NO INFO	Natural	5.7	5.5	5.4	5.0 *	5.4	4.9 *	5.2	4.6 *
		Healthy	5.7	5.8	5.4	5.0 *	5.6	5.0 *	5.7	4.9 *
		Aspect L.	5.5	6.0 *	5.0	4.5 *	5.2	4.3 *	4.6	3.4 *
		Ex. Liking	5.5	5.7	5.1	4.5 *	5.3	4.2 *	5.1	3.5 *
	INFO	Natural	5.6	5.6	5.2	5.3	5.3	5.2	4.9	4.7
		Healthy	5.6	5.6	5.1	5.1	5.6	5.3	5.4	4.9 *
		Aspect L.	5.5	6.1 *	4.7	4.3	5.2	4.2 *	4.3	2.7 *
		Ex. Liking	5.4	5.7	5.0	4.5 *	5.4	4.1 *	4.8	3.4 *

Familiarity with blood oranges did not affect Spaniards' evaluation of traditional unpigmented mandarins (Table 1). However, the Italians who were familiar with blood oranges gave a lower liking score for the appearance of traditional mandarins than those who were Unfamiliar. When evaluating the slight-pigmented mandarin, the effect of familiarity became evident mainly for the Uninformed consumers. In both countries, the scores for naturalness, and the liking of both appearance and expected taste, given by the Unfamiliar consumers were significantly lower than those received from the Familiar ones. In addition, familiarity also had an effect on Italians' healthiness perception.

The familiarity effect was more evident in the evaluation of the medium- and intense-pigmented varieties. The scores given by the Unfamiliar consumers for the four evaluated aspects were affected by familiarity, and in such a way that the Unfamiliar consumers with blood oranges perceived red mandarins to be less natural and healthy, and they liked their appearance less and gave a lower liking score to expected taste than the Familiar consumers. A similar pattern was detected in the evaluation made by the Informed consumers.

4. Discussion

Sight is the first sense that helps consumers to anticipate fruit quality. Thus, fruit appearance is a decisive factor in consumer decisions to purchase or not. In recent years, several studies have evaluated the effect of different visual aspects, such as external colouration, gloss, skin dehydration or pulp colour (green/orange colour), on consumer expectations and their choice of traditional mandarins [6,26,31]. Most of these studies, which confirm the importance that consumers attach to fruit appearance, have been based on fruit images because their use allows responses to be obtained from more consumers and cross-cultural evaluations can be made [14,26]. Furthermore, editing images can be very useful for evaluating specific fruit appearance aspects [32,33].

In the present study, the images of pigmented mandarins were edited in such a way that the main difference among varieties was flesh colour. So, we could be sure that the differences among samples were linked with the influence of pulp pigmentation on consumer responses, and without any bias due to other factors, such as fruit size, shape or presence of skin defects.

4.1. Uninformed Consumers' Preferences and Familiarity Effect

Research works have demonstrated that new food with unfamiliar colouring can trigger two types of reactions. Some consumers may be attracted to the new product through their curiosity and desire to try it [21]. Another possible reaction is that atypical colours lead consumers to distrust the product by them generating erroneous expectations, and even rejecting it [19]. The latter reaction is related to the 'neophobia' concept, i.e., the tendency to avoid new food. This tendency seems to originate from the primitive instinct of surviving, which leads humans to avoid unfamiliar foods that can be potentially dangerous. More recently, it has been observed that neophobia can also be generated from the fear of food tasting unpleasant, which creates bad experiences [34].

The results of this study revealed both types of reactions. A significant percentage of participants (28% in Spain and 40% in Italy) indicated one of the pigmented mandarins as their first choice, which implies a positive response to this new product. Conversely, those participants who took a more conservative or neophobic aptitude chose traditional orange-coloured mandarins.

One of the starting hypotheses of this study was that Italians' familiarity with blood oranges could result in a more positive response to new mandarin varieties compared to Spaniards, who are not as familiar with pigmented oranges. Our results corroborated this hypothesis because Italians showed more interest in the pigmented mandarins than the Spaniards. Italians liked the slight- and medium-pigmented varieties, while Spaniards were interested mainly in the slight-pigmented mandarins.

The differences and similarities in Spaniards' and Italians' responses were, to a great extent, explained by their perceptions of naturalness and healthiness, and their scores to both appearance liking and taste expected liking. According to previous studies, all these aspects are strongly affected by familiarity [18,19].

The data from Spain revealed that the more pigmented samples were, the least natural and healthy they were perceived. It would seem, therefore, that the more different the variety from the familiar orange-coloured mandarins, the more Spaniards had doubts about their origin and healthiness. Furthermore, a link was detected between the 'natural' and 'healthy' perceptions, and between them and the liking of appearance and expected taste liking in such a way that the mandarins that Spaniards perceived as being less natural were those that received the lowest scores for being perceived as healthy, and for appearance liking and expected taste liking.

Naturalness has been revealed as an important aspect for consumers from different countries [35], and the interrelation of the naturalness perception with other relevant product perception aspects has been previously observed. Sulistyawati et al. [36] reported a link between the healthiness, nutrition, naturalness and taste perception of dried mango after exploring the response of consumers from different countries in the early product development stage. Moreover, the effect of unfamiliar colourations negatively affected consumers' perceptions of aspects such as naturalness, healthiness or expected acceptance, as herein observed. This falls in line with that reported by Paakki et al. [18], who found that consumers ranked salads made with familiar colour potatoes better for attributes such as healthy, natural and appetising than the same salads containing blue potatoes. In the same line, Schifferstein et al. [19] observed that consumers perceived carrots with atypical colours as being less healthy and attractive than traditional orange-coloured ones.

According to previous studies on novel fruit with atypical colours, such as kiwis and apples with red pulp, people's concern about them being developed by transgenic technology is the main reason why these fruits were perceived as unnatural [20,21]. In a recent study in which Brazilian consumers were asked to evoke the first four words that come to their minds when viewing photos of the blood orange 'Cara Cara', terms related to genetic modifications and 'artificial' received 30% of mentions [37]. In line with the cited studies, our results revealed that consumers mistrusted the naturalness of the new varieties, which may act as a barrier to consuming them, mainly in Spain. Thus, interventions should be made to explain to consumers that these varieties were

obtained by conventional breeding rather than by transgenic technology. According to Jaeger and Harker [20], informing consumers that a novel fruit is not genetically modified may positively impact their willingness to pay. Likewise, Schirmacher et al. [38] reported that adding a 'natural claim' to yoghurt increases PI, which is mediated by brand trust and product attitude. So, one possible intervention to overcome the unnatural perception barrier would be to include a 'natural red pulp' claim on new mandarin packaging or on supermarket panels.

The data from Italy showed that the greater familiarity of its consumers with blood oranges was reflected by their increased perception that the new pigmented mandarins were natural and healthy. Irrespective of pulp pigmentation intensity, the three new varieties obtained the same scores for these two attributes. However, the most pigmented variety was highlighted for being that which obtained lower scores for liking appearance and expected taste liking. A sensory study conducted by Simons et al. [39], in which consumers evaluated a range of blood orange varieties, showed that the lighter-coloured ones (e.g., 'Cara Cara', 'Tarocco', 'Boukhobza' and 'Shahani') were liked by most consumers. They also presented fewer undesirable sensory characteristics, such as bitterness and sourness, than the most pigmented ones. This could explain why Italian consumers did not expect to like the intense-pigmented variety. Italians were likely to have eaten intense-pigmented blood oranges, and given their association with oranges' taste, these consumers expected undesirable attributes in the most pigmented mandarins.

Before closing this section, it is worth mentioning that the positive effect of blood orange familiarity on consumer response to new mandarins was also corroborated by the participants from each country. Blood orange familiarity strongly affected preferences from not only a cross-cultural perspective but also for individuals.

4.2. Effect of Information on Consumer Preferences

In this study, Spaniards and Italians showed very different responses to the provided health-related information. This information has contributed to increasing Spaniards' perception of the 'healthy' aspect of the new varieties. Moreover, a halo effect was detected, in which the healthiness perception created a favourable impression that increased consumers' liking for the appearance and how much consumers expected to like fruit when tasting the fruit. On the contrary, there were no differences in Italy between the Informed and Uninformed consumers. This result indicates that the provided information was already known by Italians but was new to Spaniards.

The halo effect that the health-related information had on the Spanish consumers who participated in this study has been previously observed when adding health claims on the package of different products. In a study carried out by Fernan et al. [40], the inclusion of 'protein' claims on energy bar labels led consumers to believe that the quantity of other non-claimed nutrients was also bigger. In a similar way, Stoltze et al. [41] demonstrated that the presence of fibre-related claims on breakfast cereal packages led people to make misleading generalisations that cereals were more natural, had higher vitamin content and were of better global quality. There are also reports that show that the inclusion of health claims on packages may have a positive effect on consumer liking when tasting a product [22,42,43].

Different studies into novel foods have shown that the positive effect of adding health benefits information on consumer product perceptions may result in a higher PI and more willingness to pay [44–48]. It has been demonstrated that the nutritional information and health perception of novel foods can reduce food neophobia, especially for those consumers who are more health conscious [48,49]. In agreement with these studies, our data showed that health-related information enhanced Spaniards' inclination to try new mandarins, as reflected by their better PI and a higher percentage of participants who selected them as their first choice. Our results are in line with that reported for blood oranges by Ávila et al., [37] who identified dissemination of the nutritional benefits of the blood varieties

as the main characteristic that should be considered in marketing strategies to promote consumption.

Overall, our data indicate that providing Spanish consumers with information about the healthy properties of new varieties moves their response closer to that of Italians. The long-standing tradition of blood oranges in Italy explains Italians being more aware of the link between red citrus fruit pulp pigmentation and their health benefits. The creation of the IGP 'Arancia Rossa di Sicilia' [50] in 1994 to regulate the commercialisation of the blood oranges grown in Sicily, and to promote their benefits and consumption, has played a crucial role.

It is worth highlighting that natural perception was the only aspect of all those evaluated that was not affected positively by the health information halo detected in Spain. As previously indicated, our results reveal the need to make specific interventions to overcome the unnatural perception barrier.

5. Conclusions

This study offers the first insights into consumer responses to the appearance of new pigmented mandarins, which may be used to create practical interventions that allow this novel fruit to be more readily accepted.

Our study corroborates that cultural background affects how food products are perceived and, thus, consumer behaviour towards them. Blood orange familiarity is revealed as a conditioning factor for consumer response to pigmented mandarins.

The herein obtained information will be useful for both breeders and the citrus industry. The identified consumer rejection of the most intense pigmented varieties can help breeders to set their objectives as regards colouration. Industry can use this information for marketing purposes. From a commercial point of view, a better understanding of how consumer perceptions differ between groups will help traders to implement the most effective interventions according to specific markets.

Consumer perceptions that new varieties are unnatural have been identified as the main barrier. Interventions should be made to inform consumers that these varieties have been obtained by conventional breeding, which is expected to positively influence their response. Evaluating the effect of such information and exploring the best way to convey it to consumers are interesting topics for future studies.

At this point, it is necessary to evaluate consumer responses to other sensory characteristics, such as odour, taste and texture, because the ultimate consumer acceptance of pigmented mandarins will depend on all perceptions, and not only those captured by the eye. Thus, sensory studies should include a selection criterion in current breeding programmes.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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