



## How quality labels shape consumer behavior: a study on orange preferences

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### ABSTRACT

This study investigates how quality labels influence consumer perceptions and preferences for citrus products, using the Arancia Rossa di Sicilia PGI as a case study. Based on data collected from a representative sample of Italian consumers, the analysis combines exploratory factor analysis and analysis of variance. Results identify three latent constructs explaining the total variance: “authenticity and origin”, “trust and certification” and “tangible features”. The analysis of variance revealed significant associations between knowledge of quality labels and willingness to pay more for quality-labeled products. Surprisingly, origin did not emerge as a significant factor. Overall, this study contributes original insights of the complex dynamics influencing consumer behavior in the orange market and provides actionable recommendations for producers, consortia, and policy-makers seeking to enhance the effectiveness of labeling schemes and communication strategies in the fresh produce sector.

### 1. Introduction

The agri-food industry is an important sector of the global economy [1] and plays a crucial role in meeting the food needs of an increasingly large and diverse global population [2]. Within this context, the issue of agri-food product quality is receiving increasing attention [3]. Among the many strategies to ensure the quality of agri-food products [4,5], the implementation of quality labels and certifications of geographical origin is an important approach [6–8]. Such certifications, particularly those protected under the European Union’s quality schemes, are often perceived as tools to support transparency and authenticity in food production [9] and are generally considered influential in shaping consumer purchasing decisions [10]. However, this perceived credibility warrants critical examination. Although consumers often associate labels such as Protected Geographical Indication (PGI) with trust, quality, and regional identity [11,12], this assumption may not hold universally, especially in light of recent regulatory and market dynamics. In this context, this research aims to investigate consumers’ perceptions and preferences for quality branded agri-food products, with a particular focus on the “Arancia Rossa di Sicilia PGI” (Blood Orange of Sicily PGI) produced in Italy. The PGI (Protected Geographical Indication) label is synonymous with quality and authenticity,

guaranteeing origin from the Sicilian region and meeting strict production standards [13].

More generally, the PGI certification system gives the PGI products official recognition at the European level, certifying the geographical origin of the product and ensuring that strict quality and production criteria are met [14]. Through this certification system, local producers guarantee consumers the purchase of a genuine fruit, grown according to sustainable agriculture practices and in full respect of local traditions [15]. The Arancia Rossa di Sicilia PGI represents an internationally recognized agri-food excellence, appreciated for its unique organoleptic characteristics and its millennial history linked to the Sicilian territory [16] (see Fig. 1).

However, in recent years, the concept of a quality label for fruit and vegetables may have undergone a significant change and lost some of its relevance. This change could be since the quality label has traditionally mainly indicated the origin of the product, an information that has been required by law since 2013 [17,18]. In this context, the indication of origin imposed by the legislation could be perceived as trustworthy and, consequently, the recognized value of the quality label, such as the PGI, could be reduced. This is not the case for processed products, where the quality label continues to indicate strict compliance with a specific production process. In fact, while studies on quality labels are abundant

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[19,20], research focusing on PGIs for fresh fruits and vegetables in this new context is more limited. Specifically, a clear gap persists in understanding the contemporary drivers of consumer preference for a fresh PGI product whose primary certified attribute (origin) is now often a mandatory requirement. This study directly addresses this gap by focusing on the Arancia Rossa di Sicilia PGI. To our knowledge, the study by Selvaggi et al. [21] represents one of the first dedicated explorations of consumer perceptions of Arancia Rossa di Sicilia PGI. Their qualitative focus groups provided initial, exploratory evidence that the PGI label is valued by consumers as a guarantee of Italian origin, taste, and compliance with production standards. However, as a small-scale, qualitative study based on a limited convenience sample, its findings, while valuable for identifying the research area, are not generalizable and lack the statistical power to decipher the complex factors driving consumer behavior. Our research builds upon this foundation by implementing a robust quantitative methodology with a representative sample. This allows us to move beyond general attitudes and provide a detailed, data-driven analysis of the key factors influencing purchase decisions, thereby offering actionable insights with significant scientific and practical value. The novelty and primary contribution of this work are threefold. First, it provides an up-to-date analysis of consumer perception for a fresh PGI product in a market where origin labeling is compulsory, testing whether the certification still carries independent weight. Second, it moves beyond a generic assessment to identify the latent factors that truly underpin consumer decision-making in this specific context. Third, it explicitly investigates the relationship between consumer knowledge of the PGI label itself and the importance attached to various product attributes, a nuanced interaction not examined in prior literature on this product.

In pursuing the attempt to fill these gaps, this study aims to answer three key research questions. First, we ask which characteristics are perceived as most relevant of oranges, Arancia Rossa di Sicilia PGI and quality labeled products according to consumers, in order to understand the attributes that most influence their purchasing choices (RQ1). Second, it aims to examine the extent to which PGI certification influences consumers' perceptions of the characteristics of this product, thus assessing the effectiveness of the quality label (RQ2). Finally, we aim to explore the existence of a possible relationship between knowledge of the PGI label and the importance attached to specific product characteristics, to understand how familiarity with the certification system

may shape consumers' preferences (RQ3). Based on these research questions and the reviewed literature, two main hypotheses were formulated. The first hypothesis postulates that the guarantee of Sicilian origin is perceived as the most important characteristic of the Arancia Rossa di Sicilia PGI (H1). The second hypothesis suggests that consumers attach greater importance to organoleptic characteristics, such as taste and appearance, than to production characteristics, such as adherence to consortium criteria, highlighting a possible prevalence of sensory attributes in purchasing choices (H2). To address these objectives, Exploratory Factor Analysis (EFA) will be employed to uncover latent factors that explain consumer perceptions and preferences related to the food products under study [22–24]. In addition to the EFA, the Analysis of Variance (ANOVA) will be used to assess the dependence of the importance attached to criteria such as product origin, price, and appearance on purchase intention, thereby elucidating the drivers of consumer evaluation [25,26].

By integrating these analytical methods and addressing these research questions and hypotheses, this study fills a significant gap in the existing literature, providing a more comprehensive understanding of the dynamics that characterize the Arancia Rossa di Sicilia PGI market and of the importance of various product attributes and explores the relationships between knowledge of the PGI and Arancia Rossa di Sicilia PGI label and purchasing preferences. This approach offers valuable insights for stakeholders involved in the production chain and for institutions responsible for the protection and promotion of quality labeled agri-food products.

## 2. Materials and methods

The study was designed as a quantitative, cross-sectional research aimed at analyzing Italian consumers' perceptions, attitudes, and preferences toward Arancia Rossa di Sicilia PGI and quality-labeled agri-food products. The research followed a three-stage methodological framework: (1) Study design and questionnaire development, (2) Data collection through an online survey, and (3) Data processing and statistical analysis. This structure ensured a rigorous and replicable approach to investigating the relationships between variables and consumer perceptions, while maintaining consistency with established methods in consumer behavior research. The overall workflow is summarized in Fig. 2.



**Fig. 1.** Fruit of Arancia Rossa di Sicilia PGI with the evidence of the PGI quality label. (Source: official website of the Campisi Citrus company)

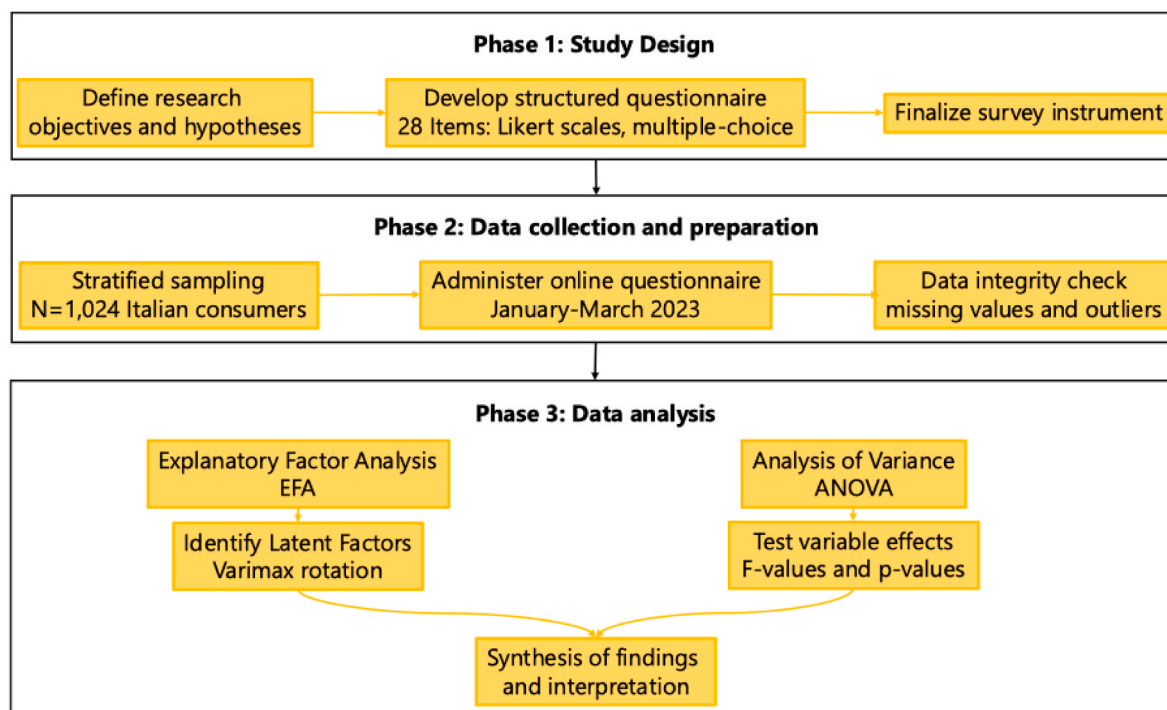


Fig. 2. Research workflow.  
(Source: own elaboration)

### 2.1. Survey design

This research employs a quantitative approach, utilizing a structured survey to collect data suitable for statistical analysis. The questionnaire took about 15 min to complete and was structured with a total of 28 items, including dichotomous, multiple-choice, and Likert-scale questions. The Likert-scale questions utilized a 5-point scoring system, where respondents indicated their level of agreement or preference. In order to facilitate the understanding of the data analyzed, Table 1 presents the processed Likert scale questions analyzed by ANOVA, while Table 2 shows the question selected for the EFA.

### 2.2. Data collection

Data collection was conducted between January and March 2023. A structured online questionnaire was administered by a professional marketing agency to a representative sample of Italian consumers primarily responsible for household food purchases ( $N = 1024$ ), ensuring that responses reflected actual decision-makers in food consumption. A stratified random sampling method was adopted to ensure demographic representativeness of the national population in terms of gender, age group, and geographic region to ensure demographic representativeness of the national population. This approach facilitated efficient data gathering while maintaining sample quality and minimizing selection bias.

The questionnaire was designed in accordance with established best practices in consumer preference research and was pretested for clarity and reliability before deployment. Participation was voluntary, and informed consent was obtained electronically from all respondents prior to questionnaire completion. The data collection protocol fully complied with national ethical standards and the General Data Protection Regulation (GDPR) 2016/679. All data were collected anonymously and handled in strict compliance with applicable privacy regulations, ensuring the confidentiality and protection of personal information throughout the research process.

### 2.3. Data processing

Once the data were collected, an ANOVA and EFA were developed to process the information provided on the different variables considered in the consumer questionnaire. Prior to analysis, data were checked for completeness, outliers, and normality. Missing values were minimal and handled using listwise deletion. The integration of quantitative and modeling approaches has proven essential in agriculture and environmental research contexts to ensure methodological robustness and to capture the complexity of natural and human systems [27,28]. The data processing of the conducted ANOVA analysis was performed according to standardized protocols for statistical data analysis [29–31]. First, data integrity was checked to identify any missing values or data entry errors. Next, data exploration was conducted to assess the distribution of variables and identify any deviations from normality or the presence of outliers. Once the data exploration phase was completed, ANOVA analysis was applied. The independent variables (factors) and the dependent variable (outcome) were specified for the analysis. The independent variables included the different categories of factors studied, such as origin of the oranges, price, appearance of the product, etc. The importance attached to the quality label was used as the dependent variable. Next, F-values, p-values and other relevant statistical parameters were calculated to evaluate the effect of the independent variables on the importance of the quality label.

Finally, the interpretation of the results obtained was carried out by evaluating the effect of the independent variables on the importance associated with the quality label and by discussing the implications of the results obtained in the context of the promotion and promotion of the Arancia Rossa di Sicilia PGI.

Data analysis using EFA aims to identify latent classes or hidden factors that can explain the variability observed in the data: the identification of these elements can help to simplify the understanding of the underlying structure of the data and to identify any patterns or relationships between the measured variables. In fact, EFA reduces the dimensionality of the data by identifying a smaller set of latent variables, called factors, that explain the maximum variance in the original

**Table 1**  
Importance of characteristics for agriculture products and Arancia Rossa di Sicilia PGI.

Question (Q)	Items	Variable coding
Q1. <i>Arancia Rossa di Sicilia PGI is listed in the Register of Quality Products labeled PGI. In your opinion, how important are the following product characteristics in obtaining this quality label? Use a scale of 1 to 5, where 1 means "not relevant" and 5 means "very relevant".</i>	<ol style="list-style-type: none"> <li>Adherence to national production standards, such as in the use/banning of specific chemicals</li> <li>Passing of quality controls at different stages of production</li> <li>Genuineness and healthiness of the product</li> <li>Better and intense flavor than products in the same category without the quality label</li> <li>Adherence to production criteria established by consortia</li> <li>Healthy and inviting appearance</li> </ol>	<p>National production standards</p> <p>Quality controls</p> <p>Genuine and healthy</p> <p>Better taste</p> <p>Consortium's production criteria</p> <p>Healthy appearance</p>
Q2. <i>How much do you agree with each value attributed to Arancia Rossa di Sicilia PGI oranges? To answer, use a scale from 1 to 5, where 1 means "strongly disagree" and 5 means "strongly agree".</i>	<ol style="list-style-type: none"> <li>Guarantee of Italianity</li> <li>Guarantee of origin from Sicily</li> <li>Guarantee of compliance with national production standards</li> <li>Guarantee of passing quality controls at all production stages</li> <li>Guarantee of a better and intense flavor</li> <li>Guarantee of the product's seasonality, natural ripeness and right time of harvest and consumption</li> </ol>	<p>Guarantee of Italianity</p> <p>Guarantee of Sicilian origin</p> <p>Guarantee of national standards</p> <p>Guarantee of quality controls</p> <p>Guarantee of better taste</p> <p>Guarantee of seasonality</p>
Q3. <i>Referring to agriculture products in general, could you indicate how much you agree with each statement? Use a scale of 1 to 5, where 1 means "strongly disagree" and 5 means "strongly agree".</i>	<ol style="list-style-type: none"> <li>Quality labeled agri-food products are more expensive than unlabeled products.</li> <li>I prefer a quality labeled agri-food product regardless of the price.</li> <li>I pay more attention to the quality/price ratio of agri-food products.</li> <li>When buying agri-food products, I look for larger quantities at lower prices.</li> <li>Quality labeled agri-food products are more reliable.</li> <li>Quality labeled agri-food products are harder to find.</li> <li>Quality labeled agri-food products are sold in small and plastic packaging.</li> <li>I don't pay attention to the quality label when I buy agri-food products.</li> </ol>	<p>Quality labeled more expensive</p> <p>Quality labeled despite the price</p> <p>Quality/price ratio</p> <p>Large quantity low price</p> <p>Quality labeled more reliable</p> <p>Quality labeled hard to find</p> <p>Quality labeled small quantity and plastic packaging</p> <p>Ignore quality label</p>

data. After factor extraction, Orthogonal Varimax (Kaiser) rotation was applied to improve factor interpretation as it is a technique that seeks to maximize the variance of factor loadings by simplifying the factor structure and making the relationship between variables and the extracted factors clearer [32,33]. This helps to improve the interpretability of the results. Once the factors were extracted and rotated, they were interpreted according to the factor loadings of the variables on each factor. The factor loadings indicate the strength, or direction, of the relationship between each variable and the extracted factors. Variables with high loadings on a particular factor are considered to be strongly associated with that factor. This interpretation was also supported by the characteristics and information contained in the variables themselves. The significance of the factors was assessed by the eigenvalues and the proportion of variance explained by each factor. The eigenvalues indicate the amount of variance explained by each factor, with higher eigenvalues indicating greater importance of the factor in explaining variance in the data. The proportion of variance explained provides an indication of the total amount of variance in the data that was explained

**Table 2**  
Consumer orange purchasing criteria.

Question	Items	Variable coding
<i>How important do you personally consider each criterion when buying oranges? Use a scale of 1 to 5, where 1 means "not important" and 5 means "very important".</i>	<ol style="list-style-type: none"> <li>Seasonality of the product</li> <li>Italian origin of the product</li> <li>The price of the product</li> <li>Appearance of the product</li> <li>How the product will be used (sliced or in juice)</li> <li>The advice of your trusted greengrocer</li> <li>Quality label</li> </ol>	<p>Seasonality</p> <p>Origin from Italy</p> <p>Price</p> <p>Appearance</p> <p>Use</p> <p>Advice of greengrocer</p> <p>Quality label</p>

by all the factors extracted.

The results were then carefully analyzed to check the consistency and reliability of the extracted factors and to identify any outliers or implausible results. Calculations were performed with the statistical software *Stata SE*® version 17.0 (Stata Corp LLC, College Station, TX, USA), which provides specific tools for ANOVA and EFA. All data were processed using the appropriate functions of the software, and the results were interpreted according to standard procedures and methodological guidelines established in the scientific literature [34].

### 3. Results

#### 3.1. Socio-demographic characteristics

Overall, the sample analyzed represents a wide range of individuals characterized by differences in gender, age and area of residence, allowing for a comprehensive overview of Italian consumer perceptions and preferences regarding Arancia Rossa di Sicilia PGI.

As shown in Table 3, the sample analyzed for the study includes individuals of both sexes, with a balanced gender distribution. The percentage of female participants is 51.5 %, while the percentage of male participants is 48.5 %. In terms of age, the sample is divided into five age groups, ranging from less than 24 years old to 65 years old and over, allowing a comprehensive view of the perceptions of the consumers belonging to them. The most represented age group is the 35–44 y.o. with 31.5 % of participants, followed by the 25–34 y.o. (24.6 %). The remaining age groups, 45–64 y.o. and over 65 y.o., show a balanced distribution within the sample. In terms of area of residence, the sample includes individuals from three Italian geographic macro areas in a balanced manner with 35.0 % of participants coming from the North, 32.5 % from the Centre and 32.5 % from the South and Islands.

#### 3.2. Purchasing habits

As shown in Table 4, a significant proportion of participants purchase oranges at least once or twice a week (58.9 %) and consuming

**Table 3**  
Socio-demographic characteristics of participants.

Variable	n.	%
<i>Gender</i>		
Female	527	51.5
Male	497	48.5
<i>Age</i>		
25-34 y.o.	252	24.6
35-44 y.o.	323	31.5
45-54 y.o.	240	23.4
55-64 y.o.	192	18.8
≥65 y.o.	17	1.7
<i>Geographic area of residence</i>		
Northern Italy	358	35.0
Central Italy	333	32.5
Southern Italy and Islands	333	32.5

them with similar frequency (76.7 %). Most respondents prefer to buy and consume oranges during the winter months (75.8 %). The results suggest a slight predominance of consumption of blond oranges (56.9 %) over blood oranges (43.1 %). Moreover, most of the sample (58.6 %) indicated that they consume oranges primarily as fresh fruits rather than as juice.

### 3.3. Associations between consumer purchase criteria and knowledge of quality labels

Table 5 shows that ANOVA results revealed several significant associations between consumers' purchase criteria and perceptions of quality labeled oranges and their knowledge of quality labels.

From the purchase criteria of quality labeled oranges emerges a statistically significant difference in the importance attributed to the preference for a quality labeled products, regardless of price ( $p < 0.01$ ) and to the statement that quality labeled agriculture products are mainly sold in small quantities and in plastic packaging ( $p < 0.01$ ). In addition, the importance of better taste ( $p < 0.05$ ), adherence to production criteria established by consortia, and typical ( $p < 0.05$ ) and unique product characteristics that remain the same over time ( $p < 0.1$ ), show a trend towards significance.

Knowledge of the Arancia Rossa di Sicilia PGI logo is significantly associated with the perception that PGI products are more expensive ( $p < 0.05$ ), that they are mainly sold in small quantities and in plastic packaging ( $p < 0.05$ ), and that they guarantee the seasonality and natural ripening of the product ( $p < 0.05$ ). A significant association is also observed with the guarantee of having passed a strict quality control ( $p < 0.1$ ) and national production standards ( $p < 0.1$ ).

Finally, in terms of knowledge of the PGI logo in general, the importance attached to adherence to the consortia's production criteria emerges as the most significant ( $p < 0.01$ ). In addition, knowledge of the PGI logo is significantly associated with and healthy and inviting appearance of the product ( $p < 0.05$ ), the perception that quality label products are more expensive ( $p < 0.05$ ), adherence to national production standards ( $p < 0.1$ ), and the guarantee of a better and more intense flavor and taste ( $p < 0.1$ ).

The perception that quality label products are more expensive is the

**Table 4**  
Participants purchasing habits for oranges.

Variable	n.	%
<i>How often do you buy oranges?</i>		
1-2 times a week or more	603	58.9
1 time every two weeks to 1 time per month	336	32.8
1 time every 2/3 months	57	5.6
1 time every 6 months	28	2.7
<i>How often do you consume oranges?</i>		
1-2 times a week or more	785	76.7
1 time every 2 weeks to 1 time every month	161	15.7
1 time every 2-3 months	54	5.3
1 time every 6 months	24	2.3
<i>When do you buy and consume oranges?</i>		
Spring	67	6.5
Summer	49	4.8
Fall	132	12.9
Winter	776	75.8
<i>Given 100 the total oranges you consume in the seasons you indicated, to what extent do you consume blond oranges and to what extent blood oranges? (Give the value as a %, the total of the two options should give 100 %)</i>		
Blond		56.9
Blood		43.1
<i>Given 100 oranges that you consume in total during the seasons you indicated, to what extent do you consume oranges in segments and to what extent as juice? (Give the value as a %, the total of the two options should give 100 %)</i>		
Fresh fruit		58.6
Juice		41.4

**Table 5**  
ANOVA of consumers' purchase criteria and perceptions in relation to quality labeled oranges and their knowledge of quality labels.

Variable	Quality label purchasing criteria for oranges	Knowledge logo Arancia Rossa di Sicilia PGI	Knowledge of PGI logo
<i>Q1</i>			
National production standards	0.5496	0.8771	0.1122*
Quality controls	0.3804	0.1031*	0.4380
Genuine and healthy	0.3011	0.2489	0.6957
Better taste	0.0276**	0.9518	0.3913
Consortium's production criteria	0.0646*	0.2113	0.0012***
Healthy appearance	0.1002*	0.2040	0.0440**
<i>Q2</i>			
Guarantee of Italianity	0.4597	0.6408	0.2522
Guarantee of Sicilian origin	0.7727	0.5623	0.7547
Guarantee of national standards	0.4909	0.1511*	0.3075
Guarantee of quality controls	0.8280	0.0339**	0.5260
Guarantee of better taste	0.0621*	0.3173	0.0620*
Guarantee of seasonality	0.2704	0.0293**	0.7524
<i>Q3</i>			
Quality labeled more expensive	0.1259*	0.0034**	0.0252**
Quality labeled despite the price	0.0000***	0.0986	0.7571
Quality/price ratio	0.1444*	0.5694	0.9257
Large quantity low price	0.6579	0.5139	0.9217
Quality labeled more reliable	0.5915	0.8508	0.8416
Quality labeled hard to find	0.3550	0.7125	0.2946
Quality labeled small quantity and plastic packaging	0.0002***	0.0207**	0.2961
Ignore quality label	0.1714	0.3630	0.1737

\*, \*\*, and \*\*\* denote significance at 10 %, 5 %, and 1 % levels, respectively.

only variable that show a statistically significant association in all three cases analyzed. Other variables show significance in more than one case are: the perception that quality labeled products are mainly sold in small quantities and in plastic packaging, importance attached to adherence to the production criteria established by consortia, the relevance of the healthy and inviting appearance of the product and the guarantee of a better and more intense flavor and taste. These multiple associations suggest that these characteristics play a particularly important role in consumer perceptions and decisions about agriculture products with quality labels, particularly for Arancia Rossa di Sicilia PGI.

### 3.4. Attributes that drive purchase decisions

The EFA performed with Varimax orthogonal rotation shows the presence of three distinct factors, interpreted on the basis of the factorial loading coefficients, as shown in Table 6. The factors represent sets of related variables that reflect different criteria used by consumers when purchasing oranges. To assess the sampling adequacy for EFA, the Kaiser-Meyer-Olkin (KMO) test was performed. The overall KMO measure was 0.77, indicating a good degree of common variance among variables [35].

The first latent construct (Factor 1) includes the variables "Seasonality of the product" and "Italian origin of the product", with respective factor loadings of 0.5518 and 0.5261. These variables are related to the authenticity of the product and its origin, which is why the factor is

**Table 6**  
EFA using orthogonal (Varimax) rotation: factor loadings.

Variable	Factor1	Factor2	Factor3	Uniqueness
Seasonality	0.5518			0.6190
Origin from Italy	0.5261			0.6135
Price			0.3653	0.8386
Appearance			0.3900	0.6905
Use		0.3216		0.7194
Advice of greengrocer		0.4952		0.7104
Quality label		0.4902		0.6835

Loadings greater than |0.3| are presented and used for interpretation.

named “Authenticity and origin”. The variable “Seasonality” has a uniqueness level of 0.6190, while “Origin from Italy” has a similar value of 0.6135, indicating that both attributes are partially explained by this factor but maintain some independence. The second factor is characterized by the variables “Trusted greengrocer’s advice” (0.4952) and “Quality label” (0.4902). They show moderate loadings on this factor, suggesting that they influence consumer choice. The variable “Product use” (0.3216) is also included in this factor, with a high uniqueness value (0.7194), indicating that it is influenced to a lesser extent than the other variables. This factor represents the elements that contribute to consumer trust in the product, including the advice of an expert (greengrocer) and the presence of a quality label, which is why it is called “Trust and certification”. Finally, the third factor includes the variables “Price” has the highest factorial load (0.8386), followed by “Appearance” (0.6905) associated with each-other in a unique dimension that was termed as “Tangible features”, as they are immediately evaluable and tangible features of the product. The uniqueness of “Price” (0.3653) is relatively low, indicating that price is well explained by the factor itself, while “Appearance” has a higher uniqueness value (0.6905), reflecting greater independence of this variable.

All individual KMO values were above the recommended threshold of 0.70, confirming the suitability of the data for EFA.

#### 4. Discussions

The results of the ANOVA and EFA provide valuable insights into the complex mechanisms shaping consumers’ perceptions and factors influencing their purchasing decisions regarding Arancia Rossa di Sicilia PGI and, more generally, quality labeled products. The discussion is structured around the three research questions that guided this study.

- **RQ1.** Which characteristics are perceived as most relevant for oranges, Arancia Rossa di Sicilia PGI, and quality-labeled products?

The ANOVA results reveal that consumers attach the highest importance to sensory and visual attributes, such as taste and healthy appearance, over purely procedural or institutional attributes like adherence to consortium production criteria. This confirms our second hypothesis (H2) and aligns with prior literature emphasizing the dominance of intrinsic product cues in shaping consumer preferences [36,37].

These findings are consistent with international studies highlighting the role of sensory expectations and visual perception in food evaluation [38–40]. The significant role of packaging perception further suggests that consumers’ quality judgments extend beyond intrinsic features to include symbolic and visual design cues [41], reinforcing the idea that extrinsic signals often serve as heuristics in complex decision-making contexts.

From a practical perspective, this implies that marketing strategies for PGI products should move beyond emphasizing geographic origin alone, highlighting instead a multidimensional set of quality signals, such as production standards, sensory quality, and authenticity, capable of conveying tangible and intangible product value [42].

- **RQ2.** To what extent does PGI certification influence consumers’ perceptions of the characteristics of Arancia Rossa di Sicilia PGI?

The results demonstrate that awareness of the PGI logo significantly correlates with perceptions of higher price and stricter production standards, confirming that the certification effectively communicates added value and quality assurance. This supports previous evidence showing that EU quality labels positively influence perceived quality and willingness to pay [19,43].

However, contrary to expectations and the first hypothesis (H1), neither Italian nor Sicilian origin emerged as significant discriminants of perception. This outcome suggests that for a well-established product such as Arancia Rossa di Sicilia PGI, the origin may have become a baseline expectation rather than a distinguishing attribute.

Interestingly, the perception that quality-labeled products are often sold in small, plastic packaging highlights a potential misalignment between consumers’ expectations of sustainable quality and market practices [44–46]. This insight underscores the need for policy interventions and industry initiatives to integrate environmental considerations into the communication and presentation of PGI-certified goods.

- **RQ3.** Is there a relationship between knowledge of the PGI label and the importance attached to specific product characteristics?

The EFA identified three latent constructs underlying consumer decision-making: Authenticity and origin, Trust and certification, and Tangible characteristics. These factors jointly explain consumers’ preference formation. The first factor confirms that authenticity and origin remain central to consumer perceptions, particularly when linked to seasonality and local identity [47,48]. The second factor reveals the dual role of formal (quality labels) and informal (trusted greengrocer) sources of trust, echoing findings from Ellison et al. and Nie et al. [20,49], who emphasize that trust mechanisms operate at multiple cognitive levels in food evaluation.

Moreover, the inclusion of “intended use” within the trust and certification factor indicates that functional motivations, such as whether oranges are intended for juice or fresh consumption, can shape the relative weight of quality cues [50,51]. This finding highlights the dynamic and context-dependent nature of consumer quality assessment, suggesting that marketing communication should adapt to different consumption contexts.

##### 4.1. Implications for all stakeholders

The findings of this study carry significant practical implications for a broad range of stakeholders involved in the production, distribution, and marketing of Arancia Rossa di Sicilia PGI and similar quality-labeled agri-food products. For producers, the demonstrated importance of not only geographical origin but also stringent adherence to consortia production criteria and distinctive organoleptic properties underscores the necessity to maintain and communicate high-quality standards consistently. Producers should thus prioritize transparent production practices and highlight unique sensory attributes to differentiate their products in competitive markets.

From the perspective of retailers and distributors, the revealed influence of trust, particularly through the role of the trusted greengrocer, as well as consumers’ reliance on both formal quality certifications and informal endorsements, suggests that retail staff training and engagement are critical components of effective marketing strategies. Retailers should be encouraged to educate consumers about the significance of PGI labels and the attributes that guarantee product authenticity and quality. Additionally, considering the findings related to packaging perceptions, stakeholders should reassess current packaging approaches. Packaging strategies ought to better align with consumer expectations, emphasizing sustainability and environmental responsibility

to respond to growing eco-consciousness among consumers.

Marketing and communication efforts should therefore adopt a multifaceted approach that combines geographic and production certification information with clear messages about seasonality, authenticity, and sensory qualities, tailored to the intended use of the product (fresh consumption versus processing). Policy makers and consortia may also benefit from these insights by designing targeted educational campaigns to raise consumer awareness and trust, thereby potentially increasing the market share and added value of quality-labeled products. Finally, these results highlight the importance of integrating traditional distribution channels with modern marketing tools, fostering synergies that enhance consumer confidence and purchasing propensity.

#### 4.2. Limitation of the study and future research directions

While this study provides valuable insights into consumer perceptions and purchase drivers for oranges, Arancia Rossa di Sicilia PGI and more in general quality-labeled products, some limitations must be acknowledged, which also pave the way for future research avenues.

Firstly, the high uniqueness values observed in the exploratory factor analysis indicate that important latent variables influencing the complexity behind consumer purchase decisions consumer decision-making may have remained unmeasured or underexplored. Future studies could expand the scope of investigated attributes to include emotional, cultural, and socio-economic factors that might interplay with the identified constructs of authenticity, trust, and tangible characteristics. Additionally, longitudinal data could help capture how these perceptions and purchasing behaviors evolve over time and in response to market or policy changes.

Secondly, the study sample and context may limit the generalizability of the findings. The investigation focused on a specific regional product and Italian consumer group, which may not reflect broader or international consumer behaviors. Future research could extend the analysis to diverse quality-labeled products and geographic areas to validate the robustness of the observed patterns and to examine cross-cultural differences in quality label perception and its influence on buying decisions.

Finally, given the rising importance of sustainability and environmental concerns highlighted indirectly through packaging perceptions, future research should explicitly investigate the role of eco-labels, packaging innovations, and consumer environmental values in shaping willingness to pay and loyalty towards quality-labeled products.

In summary, addressing these limitations in subsequent research will not only deepen academic understanding but will also provide stakeholders with more comprehensive guidance to optimize product positioning, communication strategies, and policy frameworks in support of quality-labeled agri-food markets.

## 5. Conclusions

This study offers important insights into the determinants of consumer perceptions and purchasing behavior toward quality-labeled citrus products. The results highlight that while PGI certification positively influences consumer preferences, its effect depends on complementary factors such as trust, product authenticity, and tangible quality characteristics.

The three main latent dimensions were identified, “Authenticity and Origin”, “Trust and Certification”, and “Tangible Characteristics”, emphasizing that consumer choices are shaped by a multidimensional set of motivations rather than by geographic origin alone. These findings provide a solid empirical basis for developing integrated marketing and communication strategies that combine origin, production standards, and product quality features.

The study adds scientific value by clarifying how quality labels interact with consumer knowledge and perceived value, offering actionable implications for producers, consortia, and policymakers

aiming to enhance the market positioning of certified products. In practical terms, for producers and marketers, communication strategies should adopt a multidimensional approach that shifts the focus from origin alone to a mix including production standards, distinctive sensory attributes, and authenticity cues. For the distribution sector, it is crucial to leverage the role of trusted retailers, investing in their training as product ambassadors who can effectively communicate product quality and certification values. For policymakers, the results highlight the need to rethink packaging strategies to align with consumers’ quality expectations and growing environmental concerns.

However, the research is limited to self-reported data and a single product category, suggesting that future studies could expand to other food sectors and employ experimental or qualitative methods to deepen understanding of consumer behavior.

#### CRediT authorship contribution statement

**Matilde Reitano:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Roberta Selvaggi:** Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Carla Zarbà:** Writing – review & editing, Writing – original draft, Conceptualization. **Marcella Bucca:** Writing – review & editing, Writing – original draft, Conceptualization. **Gaetano Chinnici:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Methodology, Investigation.

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#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Data availability

Data will be made available on request.

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