



Contents lists available at ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

Taste matters more than origin: An experimental economics study on consumer preferences for native and foreign varieties of walnuts

Maria Raimondo^{a,*}, Daniela Spina^b, Mario D'Amico^b, Giuseppe di Vita^b,
Giovannibattista Califano^a, Francesco Caracciolo^a

^a Department of Agricultural Sciences, University of Naples Federico II, Via Università, 100, 80055 Portici, Naples, Italy

^b Department of Agriculture, Food and Environment (Di3A), University of Catania, Via S. Sofia 98-100, 95123 Catania, Italy

ARTICLE INFO

Keywords:

Information effect
Experimental auction
BDM
Italy
WTP

ABSTRACT

The purpose of the present study is to provide empirical evidence on consumer acceptance of native and foreign varieties of walnuts, identifying how information on the variety's origin and taste affects consumer preferences in Italy. Through an artefactual experiment, the willingness to pay for three packages of walnuts weighing 350 g each—representing one native variety (Sorrento) and two foreign varieties (Chandler and Hartley)—was assessed. The study findings revealed that both information on the origin of the variety and taste significantly affect consumers' willingness to pay for different walnut varieties, with taste having a stronger impact. While information about the variety's origin reduces consumers' preferences for foreign varieties (i.e., Chandler and Hartley), after tasting the walnuts, the willingness to pay for the foreign and internationally grown variety (i.e., Hartley) increases. By considering both information and taste effects, the willingness to pay increases for both native (i.e. Sorrento) and foreign varieties, showing the highest premium price for the Chandler variety, which is foreign but locally grown. The results of this study contribute to the discussion on the importance of taste versus information in the preference for a food product. Additionally, it enhances the discussion on the consumers' perception of allochthonous varieties cultivated in their own country. This latter aspect is particularly crucial since there will be a growing interest in cultivating allochthonous varieties in the near future.

1. Introduction

In response to the ongoing globalization of food trade and the distance that food travels (Meyerding et al., 2019) local food systems have gained significant attention from the market, institutions,¹ and the general public (Thilmany et al., 2021). As highlighted by numerous studies, consumer concerns regarding standardized products and growing skepticism towards global markets have led to an increased demand for locally-grown products and traditional foods (Meyerding et al., 2019; Gracia and Gómez, 2020). This trend reflects a broader transformation in consumer behavior towards more ethical, health-conscious, and eco-friendly consumption choices. This transformation can be attributed, in part, to an increased focus on origin, which is mainly perceived by consumers as integral to food quality, authenticity, and territorial identity (Lorenz et al., 2015; Reddy and van Dam, 2020);

Contributing factors include personal attitudes towards supporting local agriculture and economies (Zhang et al., 2020), as well as the influence of personal health and environmental motivations on food choices (Caracciolo et al., 2019; Gauthier et al., 2022).

However, the introduction of foreign cultivars and the subsequent replacement of traditional varieties in agricultural systems has not slowed down. This trend is primarily driven by the ongoing specialization of agricultural production systems, the standardization of production practices, the need to increase yields, and the uncertainty due to climate change (Bellon et al., 2020; Mezei et al., 2021; Oliveira and Oliveira, 2022). This raises questions about whether native varieties are perceived as integral to local food systems and how the introduction of foreign varieties grown locally could modify consumer perceptions of local products. This is particularly relevant in Italy, where the present research is being conducted, and where foreign cultivars have been

* Corresponding author.

E-mail address: maria.raimondo@unina.it (M. Raimondo).

¹ The EU Farm to Fork Strategy (2020) by the European Commission recognizes local food systems as more resilient compared to global ones. The Commission aims to enhance the resilience of regional and local food systems by supporting efforts to reduce reliance on long-distance transportation (source: https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en).

<https://doi.org/10.1016/j.foodqual.2024.105106>

Received 24 July 2023; Received in revised form 29 October 2023; Accepted 9 January 2024

Available online 12 January 2024

0950-3293/© 2024 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

increasingly introduced over several years to supplant traditional varieties (Boncinelli et al., 2016).

While previous literature has demonstrated considerable research interest in both local and foreign food products² (Fernández-Ferrín et al., 2018; Fernández-Ferrín and Bande-Vilela, 2013), there is a lack of substantial evidence regarding consumers' perceptions and acceptance of locally grown food systems incorporating the cultivation of foreign varieties. Indeed, consumers face a personal challenge in balancing between preserving local traditions and embracing global culinary influences (James, 2002). The integration of foreign varieties into local food systems presents a dilemma. On one hand, there is a desire to support and uphold local agricultural heritage, promoting traditional varieties that have been cultivated in the region for generations (Rahnama, 2017). This preference for traditional or locally grown varieties is evident among consumers in certain food products (Di Vita et al., 2022) and may arise from the cultural heritage, familiarity, or a desire to support local agriculture (Panzone et al., 2016; Borrello et al., 2022). On the other hand, there is a growing interest in exploring new flavors and textures that come with the introduction of foreign varieties (Verbeke and Poquiqui Lopez, 2005).

Therefore, there is a significant gap in the literature when it comes to understanding consumer perceptions and acceptance of products derived from foreign varieties grown locally. Consequently, this study aims to address this gap and shed light on the consumers' perceptions, preferences, and acceptability of traditional varieties compared to foreign varieties in locally grown products. To achieve this objective, an experimental auction using the Becker-DeGroot-Marschak (BDM) method, combined with a consumer test, has been implemented with the participation of a convenience sample of Italian consumers. The experiment is centered around dried walnut packages from three distinct varieties: Sorrento, Chandler, and Hartley.

In our study settings, the "Sorrento" variety represents a native cultivar that is grown within the same region of participants (Campania region, Southern Italy), emphasizing its close proximity to the consumers. This variety serves as a compelling proxy for local, traditional cultivars, especially given that the Sorrento walnut is recognized under the Slow Food Presidia initiative (Mariani et al., 2022). On the other hand, the Chandler variety is a foreign cultivar but is grown locally, providing an interesting comparison between locally grown but foreign options. Lastly, the Hartley variety is a foreign cultivar that is not grown locally, offering a benchmark for consumer preferences towards completely foreign food products.

Walnut cultivation in Italy has experienced a significant decline (Di Piero et al., 2022). In response to this trend, there has been a shift towards cultivating foreign walnut varieties, particularly Californian cultivars, while the cultivation of the native Sorrento walnut variety has been restricted to traditional areas and practices (Romano et al., 2022).

Given these circumstances, the present study aims to assess participants' willingness to pay (WTP) for the three types of walnut varieties mentioned earlier, namely Sorrento (local), Chandler (foreign but locally grown), and Hartley (foreign and not locally grown). Through this assessment, the study aims to provide empirical evidence on the relative value and acceptance of native and foreign varieties within locally grown products, identifying how information on varieties and taste experiences shape consumer WTP and acceptability. More broadly, this study hypothesizes that differences in WTP may reveal the importance consumers place on traditional and foreign varieties in local productions, and that taste might also play a role in this context.

The remainder of the paper is organized as follows: In Section 2, the background of the study is provided along with a brief description of the

case study and research questions. Section 3 refers to the description of the sample as well as the explanation of the experimental procedure while results are described in Section 4 and discussed in Section 5. Conclusions are finally summarized in Section 6.

2. Study background

2.1. Case study

The cultivation and consumption of walnuts have a global presence (Ares and Brauer, 2004; Di Piero et al., 2022). As of 2020, China has emerged as the largest producer of walnuts worldwide, accounting for over 50 % of the total production, followed by the United States and the European Union (FAOSTAT³). In Italy, the walnut cultivation area spanned across 4,670 ha in 2019, ranking twelfth globally, with a total production of 10,800 tons (FAOSTAT). Walnuts are grown throughout the entire Italian peninsula (Romano et al., 2022). Among the various walnut ecotypes in Italy, the Sorrento variety holds significant prominence, primarily cultivated in the Sorrento Peninsula and surrounding areas of Campania (Foroni et al., 2005). The name "Sorrento" originates from its original cultivation region, where walnuts were interplanted with citrus trees in the lowlands and were co-cultivated with grapes, olives, and raisins on the terraced hillsides. The Sorrento walnut has a long-standing history in the area and was already cultivated and highly esteemed during Roman times, as evidenced by archaeological sites in Herculaneum and Pompeii. Currently, the Sorrento walnut is recognized under the Slow Food Presidia initiative (Mariani et al., 2022) and referred to as the Sorrento Peninsula Walnut (Romano et al., 2022).

In recent times, consumers have become increasingly aware of the nutritional benefits of dried fruits in general, as well as the positive impact of a healthy diet on their well-being (Ni et al., 2022). Walnuts, in particular, are renowned as a significant source of antioxidants and anti-inflammatory substances, offering a rich array of polyphenols such as phenolic acids, flavonoids, tannins, and other beneficial phytochemicals. Consequently, walnuts have been hailed as a "superfood" and are highly recommended for inclusion in daily diets (Romano et al., 2022). This surge in popularity has led to an almost twofold increase in worldwide walnut consumption over the past decade (FAOSTAT; Di Piero et al., 2022).

However, during the last few years, walnut cultivation in Italy has experienced a significant decline (Di Piero et al., 2022). This decline has resulted in Italy becoming one of the top five net importing countries for walnuts, according to FAOSTAT data. Furthermore, due to the higher productivity of Californian cultivars compared to the Sorrento variety (Solar and Štampar, 2003), the cultivation of the Sorrento walnut variety has been largely replaced by foreign varieties (Romano et al., 2022). In this context, exploring consumer acceptance of foreign walnut varieties—whether they are locally grown or entirely imported—is particularly relevant.

2.2 Research questions

While there is abundant literature focusing on local food systems and the consumer preferences for local production, there is a noticeable gap in the literature concerning consumer preferences for food products derived from native/traditional varieties, as well as for foreign varieties that are locally grown.

Indeed, the existing literature provides evidence that 'native/traditional varieties' are important elements of local food systems (Enthoven and Van den Broeck, 2021). These varieties play a critical role in sustaining the resilience of agricultural systems (Mijatović et al., 2013) and in valorizing local markets by offering products with unique characteristics, as underscored by Goland and Bauer (2004). While the terminology of 'local' and 'foreign' is often predicated on geographical origin, from a consumer perspective, it might also carry connotations related to

² It is important to note that there is no single, universally accepted definition of "local food" in the literature (Feldmann and Hamm, 2015). This term encompasses a variety of considerations that extend beyond physical distance, including social, economic, and environmental factors (Brown, 2003).

³ <https://www.fao.org/statistics/en/>.

cultural heritage, and territorial identity (Enthoven and Van den Broeck, 2021)⁴. A recent investigation by Borrello et al. (2022) found that Italian consumers primarily interpret the Protected Designation of Origin certification for extra virgin olive oil — which employs local olive varieties— as a form of cultural heritage promotion. This notion is particularly salient in Italy, where organizations like the Slow Food movement have been instrumental in reviving and preserving agricultural cultural heritage through the market valorization of local varieties as well (Fontefrancesco and Corvo, 2019).

In this context, information on a product's origin acts not merely as a search attribute but as a credence attribute as well, guiding consumers in forming perceptions about quality (Galletto et al., 2021; Schott et al., 2022). The place of origin can also evoke emotions based on consumers' past experiences and familiarity with the territory, thereby affecting product preferences (Verlegh and Steenkamp, 1999). The stronger and more favorable the territorial associations, the greater the preference for such products (Caporale et al., 2006). Thus, numerous studies demonstrate that consumers tend to prefer local food products due to their perceived ecological friendliness, freshness, safety, and health benefits compared to imported products (Jensen et al., 2019; Onozaka et al., 2016; Bond and Feagan, 2013; Pearson et al., 2011). However, it remains less clear how information about a variety's native or foreign origin affects consumer preferences, serving as a reinforcement factor in consumer perception of local production, and whether this origin information holds greater influence than sensory attributes (e.g. taste) in shaping consumers' purchasing decisions.

At least for certain products such as wine, consumers are familiar with foreign varieties like Chardonnay and Syrah (Mezei et al., 2021) and appear to appreciate new or 'trending' flavors that come with the introduction of international varieties into local food systems (Boncinelli et al., 2016). Moreover, Scozzafava et al. (2016) found that taste plays a more significant role than information about varieties, as evidenced by a higher WTP for local wine blended with international varieties. Similarly, Botelho and colleagues (2017) indicated that sensory attributes primarily account for differences in WTP for traditional and non-traditional varieties of apples and pears in Portugal.

Therefore, based on the existing literature, there is an opportunity to contribute to scientific understanding by examining consumers' preferences and acceptability for walnuts derived from native versus foreign varieties, whether they are grown locally or abroad, using both information and taste-based assessments.

Accordingly, the current study addresses the following two research questions:

RQ1: Does information about the origin of the walnut variety influence consumer preferences?

RQ2: Does taste have a greater impact than information on consumer preferences for walnuts?

By answering these questions, our study aims to add nuance to this body of work. It examines how consumers' perceptions of the 'localness' of varieties intersect with their willingness to accept or reject foreign cultivars, thereby clarifying the often-complex interplay between taste and origin.

3. Materials and methods

3.1. Study sample

The study involved a random convenience sample of 150 participants, regular consumers of dried fruits (including walnuts), and above

the age of 18 years.⁵ The sample size was set at 150 to satisfy a level of effect size f^2 equal to 0.25 (paired t -test), achieving a statistical power of 0.90 and alpha of 0.05, according to the a priori power analysis⁶ conducted in G*Power 3.1 (Faul et al., 2009). The sample was recruited through email invitations and word-of-mouth referrals. The email invitations clearly communicated the purely scientific nature of the experiment, the estimated duration of the session (approximately 45 min), and the general topic of the study (food purchases). A calendar of experimental sessions was provided in the email to assist participants in choosing a session that suited their availability. A total of fifteen experimental sessions were organized, comprising fourteen sessions with ten individuals and one session with eight individuals. The participants, aged between 19 and 59 years, had an average age of 23 years (standard deviation of 6.04). Among the participants, 56% were women. The subsequent section will provide a comprehensive description of the entire experimental procedure.

3.2. The study procedure

Consumer preferences for different walnut varieties were assessed using an experimental auction within a non-hypothetical setting. The experiment followed a within-subject design. Three packages of walnuts of 350 g were used in the experiment: one containing the Sorrento walnuts (a native variety locally grown), one containing the Chandler walnuts (a foreign variety locally grown), and one containing the Hartley walnuts (a foreign variety, internationally grown). To investigate individuals' monetary preferences for the analyzed products, the study utilized the Becker-DeGroot-Marschak mechanism (BDM) as an incentive-compatible experimental elicitation technique. BDM is commonly used in food marketing research, particularly in non-hypothetical contexts, to determine the value of products (Galletto et al., 2021; Borrello et al., 2022). The choice of BDM for this study was based on its high participant comprehension and its ability to accommodate varying numbers of participants across experimental sessions. In the full-bidding BDM, each participant submits a bid representing their maximum WTP for all the products being sold. These bids are compared to a randomly drawn price from a uniform distribution. If a participant's bid is equal to or higher than the drawn price, they purchase the product at that price. Conversely, participants who bid below the drawn price do not make the purchase. Rational participants aim to offer their exact maximum WTP, as both excessively high and low bids are equally penalized. The procedure included six main steps, described in Fig. 1, and was repeated in each of the fifteen sessions.

Once participants were welcomed to the laboratory, each individual was assigned to a designated workstation equipped with a computer. Subsequently, a unique identification code was provided to ensure complete anonymity, along with a paper-based informed consent. Participants completed the consent form and received a participation fee of 10 euros as compensation for their time. They were instructed not to communicate with each other during the experiment and to express their opinions freely. Then, the overall procedure of the experiment was thoroughly explained. To familiarize participants with the BDM mechanism, they underwent training simulations using a chocolate bar. Once everyone understood the mechanism, a short, computerized questionnaire was administered in the fourth phase to gather socio-demographic information on participants as well as on their general food purchasing and consumption habits. The actual BDM mechanism was then conducted in three rounds, during which participants provided their WTP for each round. During the first round of the study, participants were

⁴ Consumer understanding of what constitutes 'local' or 'foreign' is often multifaceted and can diverge significantly from historical or botanical realities. This study does not focus into what 'local' or 'foreign' means for consumers, instead, it focuses on how consumer perceptions of these terms, accurate or not, influence their willingness to pay and preferences.

⁵ Participants were not pre-informed about walnut varieties or surveyed on prior preferences for local types.

⁶ A post-hoc analysis was conducted once the estimates were obtained, indicating that the minimum effect size in our study was approximately $f^2 = 0.22$. The statistical power of our sample was determined to be 0.86.

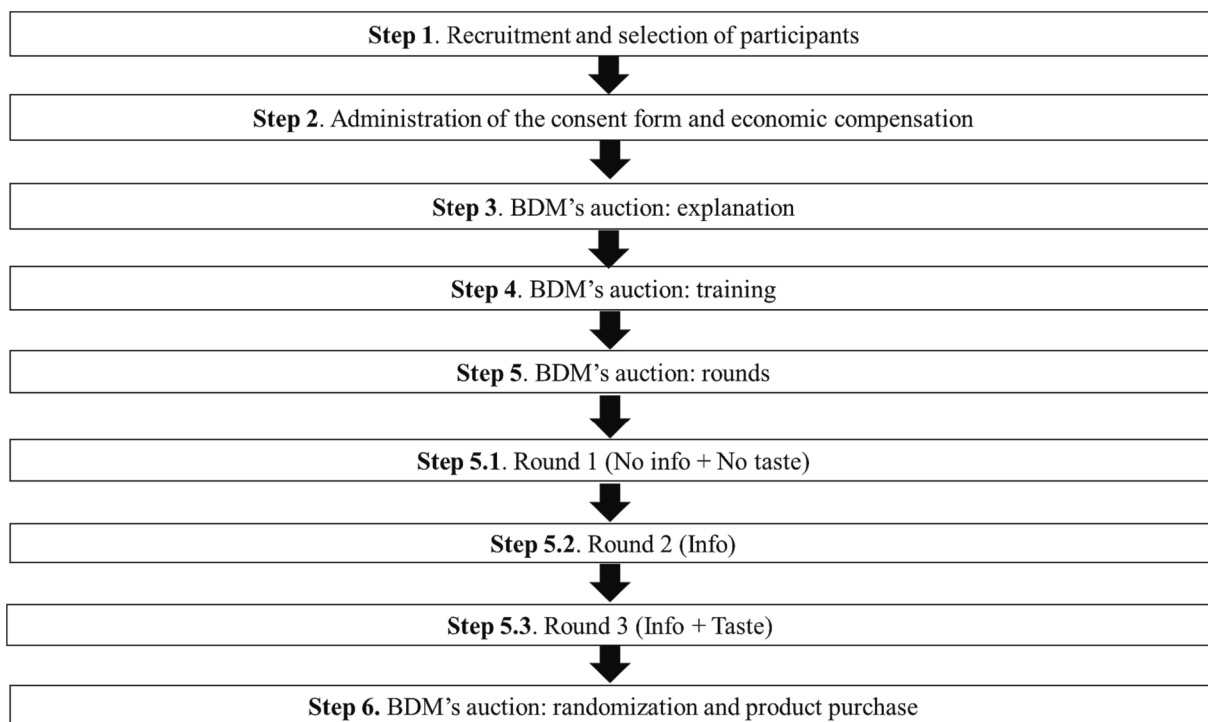


Fig. 1. Flowchart of the experiment.

presented with the opportunity to indicate their bids for each package of 350 g of walnuts. In this initial round, participants were not provided with any information or given the chance to taste the walnuts. Their bids were based solely on visual inspection of the package (**round 1: no taste; no information**). In the second round, participants received information on different walnut varieties, (**round 2: information**) providing their WTP. Participants were shown a package filled with walnuts and its corresponding label for a few minutes. They were informed that the flag on the label represents the country of origin of the variety, while the map indicates the country of cultivation for that specific variety. To ensure that participants noticed these details, they were emphasized on the label and read aloud by the experimenter. The information provided to participants is represented in Fig. 2.

In the third and final round, participants had the opportunity to taste all three varieties before expressing their WTP for each type of walnut (**round 3: information and tasting**). This round ensured that participants had a comprehensive experience with all the walnuts before providing their evaluations. To prevent any potential order effects, the order of presentation (and tasting) of walnuts varied across experimental sessions. Then, one round, one product, and one price were randomly drawn as per bidding, and a package of walnuts was purchased by the winner. To ensure the integrity of the experiment and prevent collusion

between participants, no form of communication was permitted among the bidders during the auction. This measure aimed to maintain the independence and authenticity of participants' bids and responses.

4. Results

The mean WTP values for the three different walnut alternatives are presented in Table 1 and visually represented in Fig. 3. Table 2 reports the estimated effects of Information, Taste, and Information and Taste combined on the WTPs.

In the first round (*no taste; no information*) participants indicated

Table 1
Mean of Willingness To Pay for each variety of walnuts in each round (€).

Round	Description	Sorrento	Chandler	Hartley
1st	No Info No Taste	2.04 ^a	2.33 ^b	2.18 ^c
2nd	Info	2.13 ^a	2.14 ^a	2.06 ^a
3rd	Info and Taste	2.26 ^a	2.48 ^b	2.43 ^b

Note: Different letters (a, b, c) indicate statistical significance within each row at 5% significance level. Sorrento: Native variety + grown locally; Chandler: Foreign variety + grown locally; Hartley: Foreign variety + internationally grown.

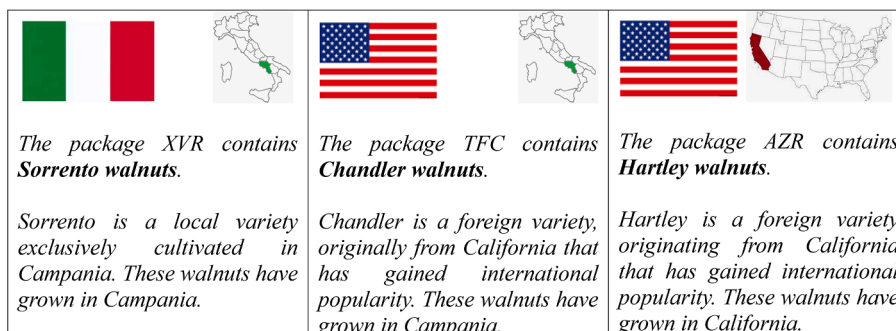


Fig. 2. Information provided to participants.

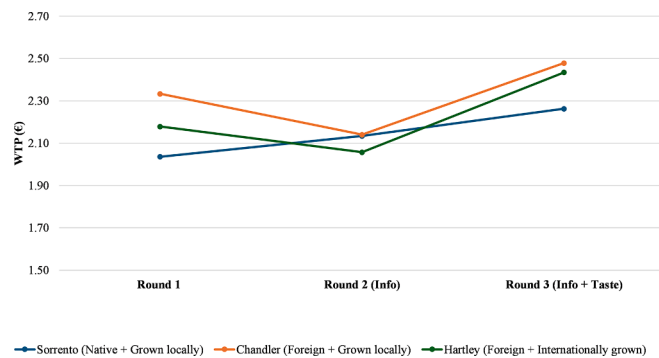


Fig. 3. Graphical representation of the mean values of WTP expressed for each round.

Table 2

Mean values of Info, Taste, and Info and Taste effect for each variety of walnuts (€).

	Sorrento	Chandler	Hartley
Round 2 – Round 1 (Info effect)	0.09 ^a	-0.19* ^b	-0.12* ^b
Round 3 – Round 2 (Taste effect)	0.13* ^a	0.34*** ^b	0.37*** ^b
Round 3 – Round 1 (Info and Taste effect)	0.23*** ^{ab}	0.15** ^a	0.26*** ^b

Note: * $p < .10$; ** $p < .05$; *** $p < .01$; Different letters (a, b, c) indicate statistical significance within each row at 5% significance level. Sorrento: Native variety + grown locally; Chandler: Foreign variety + grown locally; Hartley: Foreign variety + internationally grown.

their initial WTP values based on visual inspection alone. Sorrento had a lower WTP value (2.0€) compared to Chandler (2.3€) and Hartley (2.2€). These initial WTP values might suggest that participants' preferences were influenced by factors other than information or taste.

In the second round (*information*), participants were provided with information about the origin of the varieties, and their WTP values were measured again. Chandler's WTP value decreased by -0.2€ and Hartley's WTP value decreased by -0.12€, suggesting that the information on the foreign origin of the varieties had a negative impact on participants' preferences. On the other hand, Sorrento's WTP value did not significantly increase after information about the origin.

In the third round (*information and tasting*), participants had the opportunity to taste the walnuts in addition to receiving information. This had a significant positive impact on participants' preferences. Sorrento's WTP value increased by 0.13€, indicating that participants found its taste appealing and were willing to pay more for it. Moreover, Chandler's WTP value experienced a substantial increase of 0.34€, highlighting the high value placed on the taste of the foreign variety grown locally. Similarly, Hartley's WTP value significantly increased by 0.37€, indicating a greater preference for the taste of the foreign variety grown in California.

Considering the overall effect of information and taste experiences (Round 3 - Round 1), Sorrento's WTP value increased significantly by 0.23€, suggesting that the combined influence of information and taste positively impacted participants' preferences for the native variety. Chandler's WTP value increased by 0.15€, indicating that taste experiences played a moderate role in enhancing participants' preference for the foreign variety grown locally. Hartley's WTP value also saw a significant increase of 0.26€, highlighting the influence of taste experiences on participants' preference for the foreign variety grown in California.

In summary, these findings revealed the intricate relationship between information, taste experiences, and participants' preferences, as reflected in their WTP values. Taste experiences played a major role in shaping participants' preferences for the different walnut varieties, with both the native and foreign varieties experiencing significant increases

in WTP values due to taste experiences. This might suggest that participants highly valued the taste qualities of the foreign varieties, regardless of their origin or whether they were locally grown.

5. Discussion

This study focused on the consumer's preferences for three different walnut varieties, one native (Sorrento) and two foreign (Chandler and Hartley), identifying how information on varieties and taste experience shape consumer WTP and acceptability.

The results of this study show that informing consumers about the origin and cultivation location of walnut varieties can indeed influence their preferences (RQ1). Specifically, when such information was provided, the WTP for the Chandler and Hartley (foreign varieties) decreased, while the WTP for the Sorrento variety (a native variety locally grown) remained unaffected. Interestingly, even though the impact on WTP for the Sorrento variety was not statistically significant, the information about its origin still played a role in rewarding the native product compared to foreign varieties. This finding is consistent with previous research papers (Brown, 2003; Novotorova and Mazzocco, 2008; Shi et al., 2016), which consistently show a significant consumer interest in purchasing locally-grown food. Furthermore, in line with our findings, Botelho and colleagues (2017), emphasized that providing general information to consumers may increase (or decrease) their WTP for food products. Looking at the type of information, specifically the origin of the variety, more similarities could be found with studies on wine, where the WTPs for international varieties vs autochthonous varieties were compared (Scozzafava et al., 2016; Boncinelli et al., 2016; Mezei et al., 2021). Indeed, our result is in agreement with Boncinelli and colleagues (2016) and with Scozzafava and colleagues (2016), who found higher values of bids for wines produced with native varieties compared to the international ones, even greater than 34% (Scozzafava et al., 2016). A more recent study on tomatoes (Adegbola et al., 2019) has identified young urban women prefer tomatoes from local varieties to imported ones. Our finding is also in agreement with Palma and colleagues (2015) who found that information on the origin of the varieties of pecans increases the consumers' WTP for native vs imported varieties. This may occur because consumers perceive products from native/traditional varieties as high-quality and healthy food (Di Vita et al., 2022). Moreover, a premium price for products from traditional varieties may also occur to support and protect agrobiodiversity (Rahnama, 2017) or to protect farmer's revenue and the environment if, as in our case, the product is also locally grown (Brown, 2003). Another plausible explanation, given that Sorrento is a Slow Food presidium variety, could be that consumers, upon learning about the product's origin, prefer the traditional variety in order to indirectly safeguard and perpetuate local cultural values and heritage over time (Borrello et al., 2022). In this specific case, the information about the Sorrento variety could have also influenced consumer preferences by evoking emotions based on their direct (or indirect) knowledge and experience with the territory, since Sorrento is a well-known tourist destination worldwide (Verlegh and Steenkamp, 1999). Additionally, the current study revealed that once walnuts are tasted, the WTP increases for all varieties with a higher preference for the Chandler and Hartley varieties, respectively. A certain degree of variability in consumers' perception of the taste of walnuts of different varieties is also found in Di Pierro and colleagues (2022) and earlier in Colarić et al. (2006). Moreover, our result emphasized the importance of taste (compared to the information on the origin of variety) for increasing consumer satisfaction. Indeed, despite the information on native variety matters, the taste experiences seemed to carry more weight in influencing consumers' perceptions and preferences (RQ2). This finding is in agreement with some previous studies (Botelho et al., 2017; Schott et al., 2022). In particular, in addition to the findings of Schott et al. (2022), our study demonstrates that in the case of walnuts, while information about the localness of a variety is important, taste matters more, thus

highlighting the importance of experience attributes when examining consumer preferences. Comparing the info-taste effect for different varieties of apples and pears, Botelho and colleagues (2017) found the strongest power of organoleptic aspects (e.g., taste) in explaining the WTP expressed by consumers, preferring foreign varieties of apples and pears to the traditional ones. The lower WTP increase expressed for the native variety after tasting could be explained as a sort of negative disconfirmation, which occurs when the experience is worse than the expectations, thus leading to dissatisfaction (Deliza and MacFie, 1996). Similar results have been found in Caporale et al. (2006) as well as in Laureati et al. (2013). In the first study, the information on the origin of the extra-virgin olive oil generates a negative disconfirmation in consumers (Caporale et al., 2006) while in the second one (Laureati et al., 2013), the negative disconfirmation is caused by the information on the organic production process of yogurt. Conversely, the so-called positive disconfirmation could have occurred when respondents tasted foreign varieties of walnuts (especially the Hartley variety that is foreign and internationally grown). In such cases, the experience matters much more than the expectations caused by the information provided before tasting them (Deliza and MacFie, 1996), thus showing a higher WTP after tasting walnuts. Similarly, Iaccarino and colleagues (2006), who analyzed the effect of information of origin on three different *soppressata* salami, found a positive disconfirmation for the industrial product, compared to the traditional salami.

5.1. Study implications

The empirical evidence of this research adds to the scientific debate about the balance between taste and information, shedding light on the role of information on origin and taste in shaping consumer preferences for native and foreign varieties. Furthermore, it enriches the dialogue concerning how consumers view foreign varieties grown within their own country. This aspect is especially significant because there is expected to be an increasing interest in cultivating foreign varieties in the coming years. Moreover, results from this study add to the scientific evidence insights on the importance of both credence and experience attributes and their effect on consumers' preferences. Furthermore, findings on the acceptability of foreign varieties can have practical implications as well. Future strategies and campaigns could be developed to enhance the consumption of native or foreign varieties. For instance, in order to promote the consumption of native varieties of walnuts (in that specific case the Sorrento variety), could be beneficial to provide the consumer the possibility to taste the product and also give information about the variety's origin and the place of cultivation. Conversely, providing information on the origin and place of cultivation of a foreign walnut variety could be detrimental to its purchase. Instead, incentivizing consumers to buy and taste the product, for example by offering in-store tastings or attractive discounts for home tasting, could be more successful. In such cases, experiential attributes will play a crucial role in prompting consumers to make repeat purchases. Moreover, since consumers have shown a higher preference for the locally grown foreign variety, it indicates that information regarding the place of cultivation matters much more than the origin of the variety to consumers. Therefore, it is crucial to provide information on the place of cultivation, even when dealing with an international crop variety. The latter aspect is particularly important to address the consumption of other foreign varieties introduced in agriculture as they are more adaptable to the consequences of climate change.

5.2. Study limitations and future research

The current study is not free from some limitations. Firstly, the sample used was a convenience sample, which limits the generalizability of the results: Despite efforts to ensure the sampling characteristics of the auctions were relevant (e.g., limited to walnut consumers), the recruitment method relied on conveniently available participants within

the Campania region. Secondly, it is well-known that consumer preferences may differ between laboratory settings and real-market conditions (Harrison and List, 2004). Finally, it is important to emphasize that, given the nature of the experiment (within-subjects), it is not possible to rule out that at least some of the overall increase observed for the "taste effect" may be due to an increase in participants' appetite in the last round. However, it appears to be unlikely that the "taste effect" is entirely dependent on hunger, as the effects observed differ for the Sorrento variety compared to the other two. Following Falk and Heckman (2009), future research can integrate both laboratory and field experiments to address the primary objections and limitations of experimental auction. Furthermore, upcoming studies may delve into consumer preferences for various native walnut varieties in Italy using a representative population, examining factors that influence preferences for native versus foreign walnut varieties, including socio-demographic characteristics, cultural and psychological factors, also *a priori* checking the consumer knowledge of the investigated varieties. Additionally, the effects of both credence attributes (e.g., information) and experience attributes (e.g., taste) could be explored for other food products in which foreign varieties have been recently introduced into agriculture.

6. Conclusions

The process of market globalization, coupled with the challenges posed by climate change, has led to the introduction and diffusion of crop varieties from foreign countries, which are classified as foreign, international, or non-autochthonous. Some studies have demonstrated that consumers do not have a consistent response towards foreign varieties and that acceptability of international varieties can change after tasting and information on origin (Botelho et al., 2017; Scozzafava et al., 2016). In this scenario, it is interesting to contribute to this scientific debate by examining walnuts, whose consumption has been increasing in Italy in recent years. This study aims to assess, through an experimental auction, participants' WTP for three types of walnut varieties: Sorrento (native, locally grown), Chandler (foreign, locally grown), and Hartley (foreign, internationally grown) using the BDM experimental auction method, combined with consumer tests. Findings revealed that both information and taste have a significant influence on participants' preferences for different walnut varieties. Interestingly, the taste tends to encourage the preference for the Hartley variety, which is foreign and internationally grown, while information about the variety's origin rewards the Sorrento variety, which is native and locally grown. However, it should be noted that the Chandler variety, which is foreign but locally cultivated, is more strongly influenced by the combined effect of information and taste. Thus, while information decreases consumers' preferences for foreign varieties (RQ1), the taste has a greater impact on shifting consumers' preferences towards such varieties (RQ2).

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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.foodqual.2024.105106>.

References

- Adegbola, Y. P., Ahoyo Adjovi, N. R., Adekambi, S. A., Zossou, R., Sonehekpon, E. S., Assogba Komlan, F., & Djossa, E. (2019). Consumer preferences for fresh tomatoes in Benin using a conjoint analysis. *Journal of International Food & Agribusiness Marketing*, 31(1), 1–21.
- Ares, A., & Brauer, D. (2004). Growth and nut production of black walnut in relation to site, tree type and stand conditions in south-central United States. *Agroforestry systems*, 63(1), 83.
- Bellon, M. R., Kotu, B. H., Azzarri, C., & Caracciolo, F. (2020). To diversify or not to diversify, that is the question. Pursuing agricultural development for smallholder farmers in marginal areas of Ghana. *World Development*, 125, Article 104682.
- Boncinelli, F., Casini, L., Contini, C., Gerini, F., & Scozzafava, G. (2016). The consumer loves typicality but prefers the international wine. *Agriculture and agricultural science procedia*, 8, 236–242.
- Bond, D., & Feagan, R. (2013). Toronto farmers' markets: Towards cultural sustainability? *Journal of Agriculture, Food Systems, and Community Development*, 3(2), 45–60.
- Borrello, M., Cecchini, L., Vecchio, R., Caracciolo, F., Cembalo, L., & Torquati, B. (2022). Agricultural landscape certification as a market-driven tool to reward the provisioning of cultural ecosystem services. *Ecological Economics*, 193, Article 107286.
- Botelho, A., Dinis, I., Lourenço-Gomes, L., Moreira, J., Pinto, L. C., & Simões, O. (2017). The effect of sequential information on consumers' willingness to pay for credence food attributes. *Appetite*, 118, 17–25.
- Brown, C. (2003). Consumers' preferences for locally produced food: A study in southeast Missouri. *American Journal of Alternative Agriculture*, 18(4), 213–224.
- Caporale, G., Policastro, S., Carlucci, A., & Monteleone, E. (2006). Consumer expectations for sensory properties in virgin olive oils. *Food Quality and Preference*, 17(1–2), 116–125.
- Caracciolo, F., Vecchio, R., Lerro, M., Migliore, G., Schifani, G., & Cembalo, L. (2019). Natural versus enriched food: Evidence from a laboratory experiment with chewing gum. *Food Research International*, 122, 87–95.
- Colarič, M., Štampar, F., Hudina, M., & Solar, A. (2006). Sensory evaluation of different walnut cultivars (*Juglans regia* L.). *Acta Agriculturae Slovenica*, 87(2), 403–413.
- Deliza, R., & MacFie, H. J. (1996). The generation of sensory expectation by external cues and its effect on sensory perception and hedonic ratings: A review. *Journal of Sensory Studies*, 11(2), 103–128.
- Di Piero, E. A., Franceschi, P., Endrizzi, I., Farneti, B., Poles, L., Masuero, D., Khomenko, I., Trenti, F., Marrano, A., Vrhovsek, U., Gasperi, F., Biasioli, F., Guella, G., Bianco, L., & Troggo, M. (2022). Valorization of Traditional Italian Walnut (*Juglans regia* L.) Production: Genetic, Nutritional and Sensory Characterization of Locally Grown Varieties in the Trentino Region. *Plants*, 11(15), 1986.
- Di Vita, G., Maesano, G., Zanchini, R., Barbieri, C., Spina, D., Caracciolo, F., & D'Amico, M. (2022). The thin line between tradition and well-being: Consumer responds to health and typicality attributes for dry-cured ham. *Journal of Cleaner Production*, 364, Article 132680.
- Enthoven, L., & Van den Broeck, G. (2021). Local food systems: Reviewing two decades of research. *Agricultural Systems*, 193, 103226.
- Falk, A., & Heckman, J. J. (2009). Lab experiments are a major source of knowledge in the social sciences. *science*, 326(5952), 535–538.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149–1160.
- Feldmann, C., & Hamm, U. (2015). Consumers' perceptions and preferences for local food: A review. *Food Quality and Preference*, 40, 152–164.
- Fernández-Ferrín, P., & Bande-Vilela, B. (2013). Regional ethnocentrism: Antecedents, consequences, and moderating effects. *Food Quality and Preference*, 30(2), 299–308.
- Fernández-Ferrín, P., Calvo-Turrientes, A., Bande, B., Artaraz-Miñón, M., & Galán-Ladero, M. M. (2018). The valuation and purchase of food products that combine local, regional and traditional features: The influence of consumer ethnocentrism. *Food Quality and Preference*, 64, 138–147.
- Fontefrancesco, M. F., & Corvo, P. (2019). Slow Food: History and activity of a global food movement toward SDG2. In F. W. Leal, A. Azul, L. Brandli, P. Özuyar, & T. Wall (Eds.), *Zero Hunger. Encyclopedia of the UN Sustainable Development Goals*. Cham: Springer. https://doi.org/10.1007/978-3-319-69626-3_46-1.
- Foroni, I., Rao, R., Woeste, K., & Gallitelli, M. (2005). Characterisation of *Juglans regia* L. with SSR Markers and Evaluation of Genetic Relationships among Cultivars and the 'Sorrento' Landrace. *Journal of Horticultural Science and Biotechnology*, 80, 49–53.
- Galletto, L., Caracciolo, F., Boatto, V., Barisan, L., Franceschi, D., & Lillo, M. (2021). Do consumers really recognise a distinct quality hierarchy amongst PDO sparkling wines? The answer from experimental auctions. *British Food Journal*, 123(4), 1478–1493.
- Gauthier, A. J., Guertin, C., & Pelletier, L. G. (2022). Motivated to eat green or your greens? Comparing the role of motivation towards the environment and for eating regulation on ecological eating behaviours—A Self-Determination Theory perspective. *Food Quality and Preference*, 99, Article 104570.
- Goland, C., & Bauer, S. (2004). When the apple falls close to the tree: Local food systems and the preservation of diversity. *Renewable Agriculture and Food Systems*, 19(4), 228–236.
- Gracia, A., & Gómez, M. I. (2020). Food sustainability and waste reduction in Spain: Consumer preferences for local, suboptimal, and/or unwashed fresh food products. *Sustainability*, 12(10), 4148.
- Harrison, G. W., & List, J. A. (2004). *Field experiments*. *Journal of Economic literature*, 42(4), 1009–1055.
- Iaccarino, T., Di Monaco, R., Mincione, A., Cavella, S., & Masi, P. (2006). Influence of information on origin and technology on the consumer response: The case of soppressata salami. *Food Quality and Preference*, 17(1–2), 76–84.
- James, A. (2002). Cooking the books: Global or local identities in contemporary British food cultures? In D. Howes (Ed.), *Cross-Cultural Consumption*. London: Routledge.
- Jensen, J. D., Christensen, T., Denver, S., Ditlevsen, K., Lassen, J., & Teuber, R. (2019). Heterogeneity in consumers' perceptions and demand for local (organic) food products. *Food Quality and Preference*, 73, 255–265.
- Laureati, M., Jabes, D., Russo, V., & Pagliarini, E. (2013). Sustainability and organic production: How information influences consumer's expectation and preference for yogurt. *Food Quality and Preference*, 30(1), 1–8.
- Lorenz, B. A., Hartmann, M., & Simons, J. (2015). Impacts from region-of-origin labeling on consumer product perception and purchasing intention—Causal relationships in a TPB based model. *Food Quality and Preference*, 45, 149–157.
- Mariani, M., Cerdan, C., & Peri, I. (2022). Cultural biodiversity unpacked, separating discourse from practice. *Agriculture and Human Values*, 39(2), 773–789.
- Meyerding, S. G., Trajer, N., & Lehberger, M. (2019). What is local food? The case of consumer preferences for local food labeling of tomatoes in Germany. *Journal of Cleaner Production*, 207, 30–43.
- Mezei, L. V., Johnson, T. E., Goodman, S., Collins, C., & Bastian, S. E. (2021). Meeting the demands of climate change: Australian consumer acceptance and sensory profiling of red wines produced from non-traditional red grape varieties. *Oeno One*, 55(2), 29–46.
- Mijatović, D., Van Oudenhoven, F., Eyzaguirre, P., & Hodgkin, T. (2013). The role of agricultural biodiversity in strengthening resilience to climate change: Towards an analytical framework. *International Journal of Agricultural Sustainability*, 11(2), 95–107.
- Ni, Z. J., Zhang, Y. G., Chen, S. X., Thakur, K., Wang, S., Zhang, J. G., & Wei, Z. J. (2022). Exploration of walnut components and their association with health effects. *Critical Reviews in Food Science and Nutrition*, 62(19), 5113–5129.
- Novotorova, N. K., & Mazzocco, M. A. (2008). Consumer preferences and trade-offs for locally grown and genetically modified apples: A conjoint analysis approach. *International Food and Agribusiness Management Review*, 11, 81–104.
- Oliveira, M. T., & Oliveira, A. A. (2022). Exotic Vs. Autochthonous Grapevine Varieties—A Case Study on Global Warming in Northeastern Portugal. In *Challenges in Agro-Climate and Ecosystem*. IntechOpen.
- Onozaka, Y., Hu, W., & Thilmany, D. D. (2016). Can eco-labels reduce carbon emissions? Market-wide analysis of carbon labeling and locally grown fresh apples. *Renewable Agriculture and Food Systems*, 31(2), 122–138.
- Palma, M. A., Collart, A. J., & Chammoun, C. J. (2015). Information Asymmetry in Consumer Perceptions of Quality-Differentiated Food Products. *Journal of Consumer Affairs*, 49(3), 596–612.
- Panzone, L., Di Vita, G., Borla, S., & D'Amico, M. (2016). When consumers and products come from the same place: Preferences and WTP for geographical indication differ across regional identity groups. *Journal of International Food & Agribusiness Marketing*, 28(3), 286–313.
- Pearson, D., Henryks, J., Trott, A., Jones, P., Parker, G., Dumaresq, D., & Dyball, R. (2011). Local food: Understanding consumer motivations in innovative retail formats. *British Food Journal*, 113(7), 886–899.
- Rahnama, H. (2017). Consumer motivations toward buying local rice: The case of northern Iranian consumers. *Appetite*, 114, 350–359.
- Reddy, G., & van Dam, R. M. (2020). Food, culture, and identity in multicultural societies: Insights from Singapore. *Appetite*, 149, Article 104633.
- Romano, R., De Luca, L., Vanacore, M., Genovese, A., Cirillo, C., Aiello, A., & Sacchi, R. (2022). Compositional and Morphological Characterization of 'Sorrento' and 'Chandler' Walnuts. *Foods*, 11(5), 761.
- Schott, L., Britwum, K., & Bernard, J. C. (2022). Can region labeling alter taste impressions and willingness to pay? A field experiment with chocolate bars. *Food Quality and Preference*, 100, Article 104606.
- Scozzafava, G., Boncinelli, F., Contini, C., Romano, C., Gerini, F., & Casini, L. (2016). Typical vine or international taste: Wine consumers' dilemma between beliefs and preferences. *Recent Patents on Food, Nutrition & Agriculture*, 8(1), 31–38.
- Shi, W., Halstead, J., & Huang, J. C. (2016). *Consumers' Willingness to Pay for Locally Grown Produce: Comparison of New Hampshire and Massachusetts Results*. Boston, Massachusetts 236109: Agricultural and Applied Economics Association.
- Solar, A., & Štampar, F. (2003). Genotypic differences in branching pattern and fruiting habit in common walnut (*Juglans regia* L.). *Annals of Botany*, 92(2), 317–325.
- Thilmany, D., Canales, E., Low, S. A., & Boys, K. (2021). Local food supply chain dynamics and resilience during COVID-19. *Applied Economic Perspectives and Policy*, 43(1), 86–104.
- Verbeke, W., & Poquiqui Lopez, G. (2005). Ethnic food attitudes and behaviour among Belgians and Hispanics living in Belgium. *British Food Journal*, 107(11), 823–840.
- Verlegh, P. W. J., & Steenkamp, J. B. E. M. (1999). A review and meta-analysis of country-of-origin research. *Journal of Economic Psychology*, 20, 521–546.
- Zhang, T., Grunert, K. G., & Zhou, Y. (2020). A values-beliefs-attitude model of local food consumption: An empirical study in China and Denmark. *Food Quality and Preference*, 83, Article 103916.