Consumers' willingness to buy innovative traditional food products: the case of Extra-Virgin Olive Oil extracted by ultrasound

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Highlights

- Willingness to buy extra-virgin olive oil extracted by ultrasound is investigated
- About half of those interviewed were willing to buy the product
- The best predictor of willingness to buy is the perception of the product's high quality

Abstract

Innovation is fundamental for all agri-food companies to increase competitiveness, however the industrial process of extra virgin olive oil (EVOO) has changed very little over the last few decades. As it is a traditional food product (TFP), the main obstacle to innovation is precisely its traditional nature. According to the literature, any innovation regarding TFPs should be considered in terms of the specific product, and that market success mainly depends upon the perceptions and traits of consumers. The present study tested the willingness of consumers to buy an innovative EVOO obtained by ultrasound extraction (*ultrasonic EVOO*) through an ordered logit model. The major insight from our study is that consumers who are the most willing to buy the product are those who formed a positive quality perception after being introduced to the key characteristics of the new product. In addition, its acceptability seems to be higher for consumers who prefer EVOO with a fruity and not sweet taste, for consumers who attach great importance to the taste of food and with a higher than average educational level. This predominant role of perception in the acceptance of innovative TFPs should thus be researched further.

Keywords:

extra virgin olive oil, traditional food product, innovation in tradition, ultrasound, consumers' willingness to buy

1. Introduction

Olive oil is one of the most important food products of Mediterranean countries in terms of both the production and consumption. Spain, Italy, and Greece, produce 72% and consume 48% of the world's olive oil (FAO, 2017). In this study, we focus on extra virgin olive oil (EVOO), which is the highest quality olive oil. As it is strictly linked to the gastronomic heritage of the Mediterranean and is characterized by minimum processing and particular sensory properties, EVOO can be considered as a traditional food product (TFP) (Guerrero et al., 2009; Vanhonacker et al., 2010).

Despite the widely recognized advantages of innovation for the competitiveness of firms operating in global food markets, the EVOO industrial process has changed very little over the last few decades. The last major revolution in the olive oil technology was the introduction of the horizontal centrifuge, coupled with the malaxation machine (Amirante et al., 2010).

There are several factors that inhibit the introduction of further EVOO innovations, however the main obstacle seems to be its embedded traditionality (i.e. strict adherence to traditional methods of production). In fact, tradition and innovation are almost opposite concepts (Guerrero et al., 2012), thus the introduction of innovation in TFPs is more problematical compared to other agri-food products (Almli et al., 2011b; Guerrero et al., 2009). At a general level, because TFPs are mainly appreciated by consumers for their naturalness and particular sensory properties, the innovation of TFPs may be accepted provided that it does not harm the naturalness and does not change the sensory profile of the product (Vanhonacker et al., 2013). In addition, because the hedonic features attached to TFPs seem to lower consumers' perception of the healthiness and nutrition of such products (Pieniak et al., 2009), innovations aimed at improving the healthiness and nutritional profile of TFPs are more easily accepted by consumers, as long as they do not change the other characteristics of the products (Almli et al., 2011a).

Several studies have also highlighted the possibility of targeting the innovation of TFPs at specific clusters of consumers. In general, consumers who seem to best appreciate the innovation of TFPs have been portrayed as being middle-aged to elderly, foodies, ethnocentric and attached to familiar foods (Vanhonacker et al., 2010). While, a heterogeneity in consumer acceptance has been found by Guerrero and others (2009), who detected an increased openness in females and urban consumers. Innovations that enhanced the nutritional value of TFPs mostly attracted consumers who were particularly interested in the healthiness of food (Almli & Hersleth, 2013). Furthermore, innovations in TFPs seem to be best accepted by the habitual consumers of a specific product (Vanhonacker et al., 2013).

Other studies have shown that consumer acceptance of innovation in TFPs also depends on the type of product and innovation (Guerrero et al., 2009), however the results have been controversial. Almli and others (2011a) estimated a low probability of success in introducing a specific innovation for a traditional French cheese (Epoisses) and a traditional Norwegian cheese (Jarlsberg). Conversely, the introduction of an organic production for Pecorino Romano cheese (Napolitano et al., 2010), the enrichment of Omega-3 in mozzarella cheese (Vecchio et al., 2016) and the extended shelf life of Canestrato di Moliterno cheese (Pilone et al., 2015) appeared to be successful. Hersleth and others (2011) tested the acceptance of several innovations for a traditional dry-cured ham and found different degrees of acceptance for the attributes in different groups of consumers. In particular, the highest acceptance was found for consumers mainly characterized by an openness to new foods. Similar results were obtained by Fenger and others (2015), who partially overcame

the problem of consumers' reluctance to accept innovation by adding storytelling to the description of new meat products.

Many studies have also investigated consumer preferences for EVOO, distinguishing between traditional and non-traditional countries (e.g. Boncinelli et al., 2017; Roselli et al., 2016). Some focused on the increasing importance of the health benefits derived from consuming EVO oils (Roselli et al., 2017), however to the best of our knowledge no study has analysed consumers' willingness to buy an EVOO with process innovations.

This study investigates consumers' willingness to buy an innovative EVOO obtained by ultrasound extraction (hereby defined as ultrasonic EVOO). The application of ultrasound is one of the most promising new technologies that can be applied to the extraction of EVOO with several significant advantages in terms of technical efficiency (e.g. higher yield extraction), healthiness (higher content of polyphenols with antioxidant effects), and sensory profile (less bitter and pungent taste than conventional products (Amirante & Clodoveo, 2017), as is specified in detail in the next section. Despite these advantages, consumers could not accept this innovation in a TFP such as EVOO. Because the majority of products incorporating innovations fail to gain any success on the market (Dijksterhuis, 2016), it is fundamental to consider the point of view of consumers during the early stages of innovation, in order to prevent new products from failing with the subsequent waste of resources (van Kleef et al., 2005).

A consumer survey was carried out in Apulia in southern Italy, where there is a wide production of EVOO and per capita consumption of olive oil is very high (16 kg/year per capita) (Coldiretti, 2016; ISMEA, 2017). Specifically, a web-based questionnaire was administrated to a sample of 961 EVOO consumers.

The article is organized as follows. Section 2 describes the main features of the ultrasonic EVOO and its extraction process. Section 3 reports the methodology employed (data, empirical model and estimation). Section 4 discusses the results obtained. Section 5 summarizes the findings and highlights the main practical implications for the introduction of the ultrasonic EVOO on the market.

2. Brief description of the innovative extraction process

Despite the plethora of scientific studies aimed at increasing the quality of EVOO and the efficiency of the extraction plants, the industrial process common to all categories of olive oil has changed very little over the last 20 years (Amirante et al., 2008; Clodoveo et al., 2014).

Currently, the extraction process is not continuous, unless the industrial plants use a series of malaxation machines working in parallel. This system guarantees the continuity of the process without interrupting the activity of the machines upstream and downstream of the malaxer. However, the malaxation phase still represents the "bottleneck" of the entire extraction process, and involves significant economic investment (Clodoveo, 2012). Academic and industrial researchers have been searching for a technological solution for the development of innovative virgin olive oil extraction plants (Clodoveo et al., 2015). Many emerging technologies have recently been developed (Clodoveo & Hbaieb, 2013). Of these, ultrasound extraction (Figure 1) seems to be the most promising due to its mechanical and slightly thermal effects, which do not increase energy and water needs compared to the conventional processes.

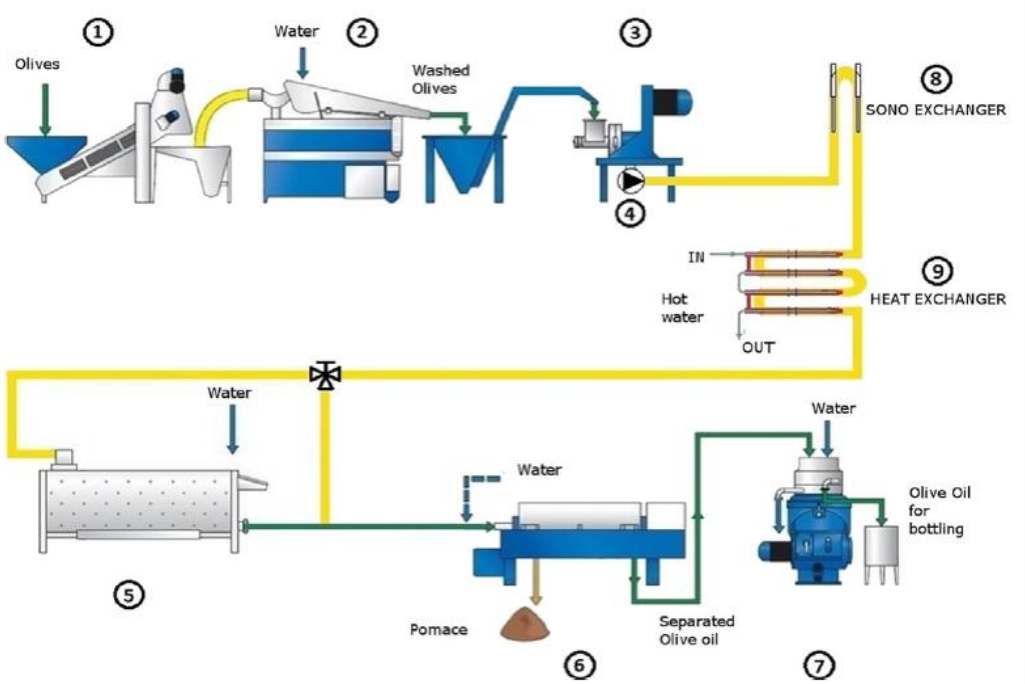

Figure 1. Modified olive oil extraction process (Amirante & Clodoveo, 2016)

Note: 1. reception stage; 2. washing stage; 3. crushing stage; 4. pump; 5. malaxing stage; 6. separation stage; 7. clarification stage; 8. ultrasonic probes; 9. heat exchanger.

Ultrasound extraction has several advantages due to the mechanical and thermal processes involved (Almeida et al., 2017; Bejaoui et al., 2016; Jiménez et al., 2007). The ultrasound technology induces the rupture of cell walls, recovering the oil and minor compounds trapped in the uncrushed olive tissue, increasing the working capacity of the extraction plant and, at the same time, reducing the process time (Clodoveo, 2013). The chemical and organoleptic evaluation of the product, performed according to Regulation No 61/2011, confirmed that the quality parameters comply with the extra virgin olive oil category (Clodoveo et al., 2017). In addition, its tocopherol, carotenoid, and phenolic content was higher than in a conventional product. The significant increase in polyphenols in the sonicated oils can also be attributed to the effect of ultrasound on the activity of polyphen oloxidase, the main enzyme responsible for the phenol oxidation (Clodoveo et al., 2016). Finally, according to the panel test results reported by Clodoveo et al. (2017), the EVOO obtained by treating the olive paste with ultrasound was characterized by a more “harmonic” taste than those obtained with the traditional method, with the former being perceived as less bitter and pungent but more fruity.

3. Materials & Methods

3.1 Data collection

The data were collected through an online-based questionnaire developed through the Google platform. The sample was selected through snowball sampling, which was adopted due to the lower incidence of social desirability bias in the respondents, which is usually prevalent in other types of interviews; albeit it is not easy to reach a good representativeness of the sample (Szolnoki & Hoffmann, 2013). The sample selection was

also restricted to households from Apulia (Italy), due to the prominence of this area in both the production and consumption of EVOO within the Italian scenario (Coldiretti, 2016; ISMEA, 2017), hence consumers are likely to have a high familiarity with the product.

First, the survey investigated consumers' buying habits in relation to EVOO. Then, some questions assessed the preferences in relation to the different sensory dimensions, with a fruity, bitter and sweet taste characterizing the sensory profile of EVOO. In this case, sensory dimensions are especially important, as the new product will be slightly different compared to conventional products. In particular, we asked respondents how important for them each sensory feature characterizing EVOO was.

- "For you, how important is it that the EVOO you consume is fruity?" (Fruity_preference)
- "For you, how important is it that the EVOO you consume is sweet?" (Sweet_preference)
- "For you, how important is it that the EVOO you consume is bitter?" (Bitter_pungent_preference)

Next, some questions focused on the profile of respondents according to their general food habits and preferences. Lacking an appropriate scale devoted to the innovation of TFPs, we put together insights from the literature with a selection of relevant items from existing scales (Pieniak et al., 2009).

In order to assess the respondents' health concerns and interests in healthy eating we selected the following relevant items from Pieniak et al. (2008):

- "Health means a lot to me" (*Health_1*);
- "I care about health" (*Health_2*);
- "Health is very important to me" (*Health_3*);
- "It is important to me that the food I eat on a typical day is good for my physical and mental health" (*Health_4*);
- "It is important to me that the food I eat on a typical day keeps me healthy (*Health_5*)";
- "It is important to me that the food I eat on a typical day is nutritious (*Health_6*)".

The importance that respondents attached to the taste of food was measured with relevant items from Roininen et al. (2001):

- "I reward myself by buying something really tasty" (*Taste_1*);
- "It is important to me to eat delicious food on weekdays as well as weekends" (*Taste_2*);
- "When I eat, I concentrate on enjoying the taste of food" (*Taste_3*).

The openness to new foods was then investigated with relevant items from the "Food Neophobia Scale" (Pliner & Hobden, 1992) and from the "Food Technology Neophobia Scale" (Cox & Evans, 2008):

- "I am constantly sampling new and different foods" (*Openness_1*);
- "The benefits of new food technologies are often grossly overstated" (*Openness_2*).

The influence of extrinsic cues was assessed with items from the relevant literature (Brunsø et al., 2002; Cheung et al., 2014; Grunert, 2005):

- "I care about the information on food labels" (*Label*);
- "The brand is very important for my food choices" (*Brand*);
- "Advertising has an influence on my food choices" (*Advertising*).

At this point, respondents were asked to imagine a common shopping situation where the innovative product is regularly sold in the usual EVOO channels of distribution: "*Imagine yourself in the place where you usually do your shopping, and you find an EVOO with the indication on the label - EXTRACTED BY ULTRASOUND – answer the following questions, giving your immediate reactions to this product".* Firstly, respondents were asked to express their opinion on the perceived quality of the product:

- "In your opinion, does this product possess different quality features compared to those extracted with conventional methods?" (Perceived_quality)

This variable identified whether a positive quality inference for the innovative product was registered. In particular, the answers followed an ordinal ranking:

[1] The quality is lower than the traditional product
[2] The quality is the same as the traditional product
[3] The quality is higher than the traditional product.

Respondents' willingness to buy the ultrasonic EVOO was then measured, through the following question:

- "Would you be willing to buy ultrasonic EVOO?" (willingness_to_buy)

The answers were categorized into five options with an increasing level of willingness to buy the product (ordinal ranking):

[1] *I am not willing to buy this product;*

[2] *I am not willing to buy the product, but I plan to look for more information about it;*

[3] *I would be willing to buy the product if the price was lower than the product I usually buy;*

[4] *I would be willing to buy the product at the same price as the product I usually buy;*

[5] *I would be willing to buy the product at a higher price than the product I usually buy.*

At the end, various demographics were collected: in particular, we asked for details regarding the household responsible for purchasing (such as age, sex and education).

A total of 961 EVOO consumers took part in the survey. The survey was completed, on average, in 5 minutes.

3.2 Preliminary analysis

The sample was composed by 961 EVOO consumers. The average age of respondents was 39 and the majority were female (55.4%). The average size of the households was between three and four people. Almost 45% of the sample had a university or postgraduate educational level and about 68% had a monthly family income of up to € 3,000.

According to EVOO buying habits, the majority of respondents bought EVOO once or twice a year (54%), mostly through direct channels such as mills or farms (73%), in containers of 3 litres or more (78%), at a price of less than 7 €/litre (70%). In addition, for the majority of households within the sample, EVOO was the main source of fat in the diet, beside the use of minor quantities of other edible oils (see Table 1).

Table 1. Respondents' buying habits

How often do you buy extra virgin olive oil?	**#**	**%**
Once or twice per year	515.0	53.6
More than twice per year but not monthly	224.0	23.3
Monthly	222.0	23.1
Do you also buy other vegetable oils (e.g. seed oils)?		
No, not at all	378.0	39.3
Yes, but to a lesser extent	547.0	56.9
Yes, many	36.0	3.7
Where do you usually buy extra virgin olive oil?		
Large-scale retailer (hypermarket, supermarket, minimarket, discount)	133.0	13.8
Specialty shop (e.g. gourmet shop, wine shop)	27.0	2.8
Mill or farm	701.0	73.0
More than 1 channel (large-scale retailer and other channels)	100.0	10.4
In what format do you usually buy extra virgin olive oil?		
≤0.50 L	8.0	0.8
0.75 or 1 L	201.0	20.9
3 - 5 L	522.0	54.3
> 5 L	230.0	23.9
What is the price you usually pay to buy extra virgin olive oil?		
< 4 €/L	85.0	8.8
4 - 7 €/L	584.0	60.8
7 - 10 €/L	277.0	28.8
> 10 €/L	15.0	1.6

As shown in Table 2, the respondents reacted almost equally to the idea of buying ultrasonic EVOO, with 49% of the sample stating they were not willing to buy the product (answers 1 and 2) and 51% stating that they were willing to (answers 3, 4 and 5).

Table 2. Frequency of the willingness to buy ultrasonic EVOO

		#	%
Would you be willing to buy ultrasonic EVOO?			
[1]	*I am not willing to buy this product;*	97	10.2
[2]	*I am not willing to buy the product, but I plan to look for more information about it;*	374	38.9
[3]	*I would be willing to buy the product if the price was lower than the product I usually buy;*	82	8.5
[4]	*I would be willing to buy the product at the same price as the product I usually buy;*	325	33.8
[5]	*I would be willing to buy the product at a higher price than the product I usually buy.*	83	8.6

The descriptive statistics of the other items in the questionnaire then helped to profile the respondents in this study. In their view, on average, the most important element for food choice was its healthiness (see Table 3). What subsequently influenced the food choice was the taste of food. Of the extrinsic elements, label was the most important (average value 5.59 out of 7), followed, respectively by brand (average value 3.91 out of 7) and advertising (average value 2.50 out of 7).

Table 3. Frequency of the items collected in the questionnaire

Variable*	Mean	Std. Dev.	Min	Max
Health_1	6.31	1.27	1	7
Health_2	6.19	1.33	1	7
Health_3	5.95	1.35	1	7
Health_4	6.42	1.22	1	7
Health_5	6.16	1.33	1	7
Health_6	5.72	1.48	1	7
Taste_1	6.04	1.35	1	7
Taste_2	5.76	1.47	1	7
Taste_3	5.23	1.60	1	7
Label	5.59	1.56	1	7
Brand	3.91	1.79	1	7
Advertising	2.50	1.52	1	7

** Likert scale from 1 to 7 where 7 means higher level of importance*

In order to explain the determinants of the willingness to buy ultrasonic EVOO, we performed, first, a factor analysis on the items shown in table 4. The factor loadings confirmed that the items actually converged into four latent variables. The first factor is composed of all the elements characterizing consumers concerned about general and food-related health and who are also those most prone to read labels: we define this latent

variable as "*Health*". The second factor summarizes the importance that consumers attach to the taste of food. This factor can be summarized by the latent variable "*Taste*". The third factor includes consumers openness to new foods and food technologies , which we define as "*Openness*". The forth factor describes the joint influence played by the extrinsic cues (i.e. label, brand and advertising) that can be summarized in the latent variable "*Extrinsic*". There were no significant cross-loadings harming the salient effects depicted by the whole matrix.

Table 4 – Rotated Factor Loadings

Variable	*Health*	*Taste*	*Openness*	*Extrinsic*	Uniqueness
Health_1	**0.8667**	0.2645	0.0399	0.0539	0.1744
Health_2	**0.8779**	0.2602	0.0328	0.0626	0.1567
Health_3	**0.8839**	0.1336	-0.0071	0.0883	0.1931
Health_4	**0.857**	0.3064	0.0525	0.0316	0.1679
Health_5	**0.8929**	0.2171	0.058	0.0257	0.1515
Health_6	**0.8466**	-0.0135	-0.0134	0.0739	0.2775
Label	**0.6107**	0.12	0.2753	0.0741	0.5314
Taste_1	0.5304	**0.6895**	0.0837	0.0189	0.2359
Taste_2	0.3179	**0.8651**	0.1072	0.0734	0.1336
Taste_3	0.1309	**0.8733**	0.0592	0.1601	0.1912
Openness_1	0.0228	0.1024	**0.8175**	0.1372	0.3018
Openness_2	0.2243	0.2799	**0.6132**	0.212	0.4504
Brand	0.1514	0.1515	0.0772	**0.8124**	0.2883
Advertising	-0.0654	0.0406	0.2257	**0.8175**	0.2748

Subsequently, as shown in Table 5, a reliability measurement was performed. The reliability coefficients enable us to assume that the measurement is consistent. For *Health* and *Taste*, we used Cronbach's alpha, while for *Openness* and *Extrinsic,* we performed the Pearson correlation coefficient, as there were two-item scales. These values suggest whether the factors can be used to build latent variables for the explanatory model. This was possible for all the factors, apart from *Openness* whose items seemed to be quite independent one from another and, thus, not an appropriate measure of *neophobia*.

Table 5 – Reliability measurement for each factor

	Health	*Taste*	*Openness*	*Extrinsic*
Reliability	0.9366	0.8636	0.3279	0.5177

3.3 Model specification

The collected data were integrated and combined in an explanatory model showing the predictors of the willingness to buy the ultrasonic EVOO. Since the dependent variable ranges from one to five for the increasing levels of willingness to buy, an ordered probability model can be used (Greene & Hensher, 2010). In particular, we chose the ordered logit model that represents an extended logit model specifically for ordinal data (Winkelmann and Boes 2006). It is based on the following specification:

$$y_w^* = \beta' x_w + \varepsilon_w,$$

where: $E[\varepsilon_w | x_w] = 0$ ε_i i.i.d. Logistic (0,1); w = 1,...,W. (1)

The term y_w* represents the willingness to buy the ultrasonic EVOO. The term x_w represents the explanatory variables and ε_w is the stochastic term. The ε_i has a standard logistic distribution.

The explanatory variables used in the model are those coming from the factor analysis (*Health*, *Taste*, *Openness, Extrinsic*), taste preferences (*Fruity_preference, Sweet_preference, Bitter_pungent_preference*), the perceived quality of ultrasonic EVOO (*Perceived_quality*), and demographic (education).

The model was estimated using the Stata software version 14, in a stepwise procedure that selects the most representative model.

4. Results

The model estimation enabled us to examine consumers' willingness to buy innovative TFPs, as influenced by their individual characteristics and traits. Table 6 reports the estimation results.

Table 6. Estimation results: ordered logistic regression

Variables	Coef.	p-value	Std. Err.	Odds Ratio
Health	0.05	0.426	0.063	
Taste	**0.17**	0.009	0.063	1.18
Extrinsic	-0.07	0.281	0.063	
Fruity_preference	**0.13**	0.000	0.036	1.14
Sweet_preference	**-0.08**	0.041	0.038	0.93
Bitter_pungent_preference	0.03	0.371	0.033	
Perceived_quality	**1.19**	0.000	0.095	3.28
Education	**0.14**	0.049	0.071	1.15

#obs: 961
Note: the significant coefficients are highlighted in bold

The coefficients relative to each variable show which elements might influence the willingness to buy ultrasonic EVOO. The most important element that increases the consumer willingness to buy ultrasonic EVOO is the perception that this new technology might actually improve the quality of the product (+1.19). The trait of assigning great importance to the pleasant taste of food also increases the likelihood to buy the innovative product (+0.17). Regarding the demographics, education seems to play a role: respondents with a higher education were more willing to buy the ultrasonic EVOO (+0.14). No significant effect was found for the food-related health concerns of consumers or by assigning importance to the extrinsic attributes of products. In terms of the sensory properties of EVOOs, liking a fruity taste increases the willingness to buy the new product (+0.13), while the opposite is valid for the respondents who showed a preference for a sweet taste (-0.08); thus, no significant effect was found for the preference for a bitter and pungent taste of the EVOO.

5. Discussion and conclusions

The analysis of the literature highlighted that the innovation of traditional food products (TFPs) should be considered at the narrow level of the individual product, and that the market success of the innovation mainly depends upon the perceptions and traits of consumers.

Since there is no market yet for ultrasonic EVOO, in this study we investigated consumers' willingness to buy the product. At this very early stage, about half of the surveyed consumers stated that they were willing to buy the new product, although only a small portion (9%) stated that they were willing to pay more for it. An econometric model was thus developed to understand which consumer traits could best predict the possible market success of the product.

The major insight from our study is that consumers who are most willing to buy the product are those who formed a positive quality perception after being introduced to the salient characteristic of the new product (extracted by ultrasound). This result is in line with previous studies that assigned a pivotal role to perceptions in the quality judgment of food products (e.g. Grunert, 2005). In turn, perceptions are able to shape expectations, which are also able to influence the subsequent experience of the product (Piqueras-Fiszman & Spence, 2015). This has also been confirmed for the acceptance of innovative TFPs, in which storytelling has been successfully used in describing products, in order to positively influence the perceptions of consumers before the product trial (Fenger et al., 2015). Thus, shaping perceptions in relation to the product seems to be the most powerful element to foster the willingness to buy ultrasonic EVOO. Then, it would be beneficial to further investigate how to positively influence perceptions in order to improve the likelihood of success of these products.

Although the literature suggested that consumers who attach much importance to taste prefer unhealthy foods, in this case they seemed ready to adopt a health-enhanced food. However, our model found no effects for either food-related health concerns or the importance of the extrinsic attributes of products.

Consumers' sensory preferences also played a role in predicting the willingness to buy ultrasonic EVOO. Consumers who showed a preference for fruity EVOO had a higher willingness to buy the new product, while the opposite was true for consumers who preferred EVOO with a sweet taste. Previous studies showed that consumers' preferences for different EVOO sensory profiles are quite heterogeneous (Del Giudice et al.,

2015). Some studies have highlighted that trained consumers, as well as experts, positively value EVOOs with enhanced bitter and pungent features, while consumers with less familiarity with the product mostly prefer fruity and sweet EVOOs (Caporale et al., 2006; Del Giudice et al., 2015; Recchia et al., 2012; Valli et al., 2014). Bitter and pungent features in food are generally not appreciated by consumers mainly due to evolutionary reasons, however exposure and information can affect this preference (Cavallo et al., 2017; Drewnowski & Gomez-Carneros, 2000), which is why experts and trained consumers appear to be able to recognize EVOOs with a higher health potential (Delgado & Guinard, 2011). There is ample evidence that EVOOs with a bitter and/or pungent taste have an increased content in polyphenols (Vitaglione et al., 2013). The opposite is valid for a sweet taste, which is generally considered antithetical to a bitter and pungent taste (Valli et al., 2014). On the other hand, fruity sensory properties in EVOOs are generally appreciated by both experts and trained consumers (Delgado & Guinard, 2011). Thus the effect of taste preferences are mediated by a degree of familiarity and knowledge with the product (Caporale et al., 2006; Cavallo & Piqueras-Fiszman, 2017; Delgado & Guinard, 2011), and, generally, less familiar consumers are less likely to adopt innovations (Del Giudice & Pascucci, 2010).

In terms of demographics, consumers with higher level of education were more willing to buy the ultrasonic EVOO. This is in line with other studies showing that a higher education level can be a predictor of an increased willingness to accept new food products, because more educated consumers tend to process information faster (Costa-Font et al., 2008; Traill et al., 2005; Verbeke, 2005).

These results can be used in developing various marketing indications in order to foster the success of ultrasonic EVOO. Providing extensive and detailed information on the product, especially in terms of its benefits, could be the most important marketing approach for three main reasons: it can be used to highlight the healthy features of the new product, it can increase consumers' familiarity with the product, and it can positively shape their expectations even before trying the product. In addition, the consumers who are most likely to adopt the innovation, at an early stage, are those living in the traditional EVOO producing and consuming areas (as they have a higher degree of familiarity with the product) and in the segments of the population with higher levels of education.

This study also has various limitations. Firstly, the investigation of the possible acceptance of the new product was carried out before a real market has actually been created and, thus, there may be a hypothetical bias in consumers' evaluations. In addition, more sophisticated methods are needed to estimate whether and to what extent consumers are willing to pay more. The study was also based on a sample characterized by a relatively high educational, which may mean that consumers were well knowledgeable about processing techniques. Furthermore, an analysis of a national sample would provide insights that could be extended to a national level.

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