

## Article

# Italian Consumer Preferences for Eucalyptus Honey: An Exploratory Study

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**Abstract:** The growing concern for environmental issues has underlined the need to promote sustainable consumption and production. Taking into consideration the three pillars of sustainability, honey should be seen as an important food from a sustainability perspective. Among honey varieties, the eucalyptus one is becoming increasingly popular with people for its aroma and the plant's therapeutic properties. However, the beekeeping sector in Italy does not yet have sufficient knowledge and understanding of consumer needs with a view to increasing earnings. This paper aimed to analyze the drivers that make people pick eucalyptus honey and tries to investigate which extrinsic and intrinsic quality attributes affect consumer behavior. Data came from an online survey of 403 Italian honey consumers. An ordered Probit model was applied. The results show that consumers consider the taste, viscosity, therapeutic properties, brand reputation, variety, geographical indication, Italian origin, and organic certification of honey as the most important factors that drive the consumption of eucalyptus honey. The findings of the study should help the beekeepers and provide them with the right tools of communication, such as quality or sustainability labeling, thereby increasing their competitiveness.



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**Keywords:** consumer behavior; eucalyptus; extrinsic and intrinsic quality attributes; honey; ordered probit model; Italy

## 1. Introduction

The United Nations have recently adopted a strategy for reaching 17 Sustainable Development Goals (SDGs) of the Agenda 2030 [1], which are a call for action to all countries to promote the economic growth while protecting the environment. In this framework, the UN's Sustainable Development Goal 12 is to establish responsible consumption and production. The SDG 12 is focused on economic growth, reducing environmental impacts, increasing resource efficiency, and promoting sustainable lifestyles. In other words, sustainable consumption and production can contribute substantially to poverty reduction and the transition toward low-carbon and green economies [1]. In light of this, sustainable food choices give an opportunity to combine sustainability issues with public health concepts [2], and honey should be seen as an important food from a sustainable and nutritional perspective [3–8]. In fact, it is a natural food widely used as a sweetener [6], and it has been defined as a healthy product due to its therapeutic properties [9] so much so that it has been introduced into the Mediterranean diet [10]. According to the European Commission, honeybee colonies are essential for agriculture and the environment, and beekeeping contributes to the development of rural areas [11]. Moreover, beekeeping takes place in all European countries and is characterized by diverse beekeeping practices. In 2021, the European Union was the second largest honey producer after China, with 218,000 tons per year, while according to ISMEA [12] in 2020, 18,000 tons of honey were produced in Italy. At the consumption level in 2020, the average per capita annual consumption in Europe was 0.60 kg, while in Italy it was 0.50 kg.

The increasing importance of honey among foods has pushed several researchers to study the factors influencing consumer behavior [9,13–16]. In fact, honey is popular among consumers for its various nutritional aspects [17]. Floral honeys can be multifloral and monofloral [6]: in the first case, the honey comes from various plant species, while in the second case, honey is made from the nectar of a single species. The most prevalent honeys are multifloral ones, although monofloral honeys are attracting people's interest due to the opportunity of finding in them some therapeutic characteristics of the plants [6]. In fact, according to some authors [7], plant health properties can be found in honey, too. For this reason, the interest in monofloral honeys has increased thanks to their nutritional and therapeutic characteristics [6]. In particular, eucalyptus honey is a monofloral honey that has become popular with people thanks to its aroma and also as a consequence of the medicinal properties of the species [18]. Thanks to the wide use of eucalyptus for many purposes and its important role in mitigating climate change [19,20], its cultivation has been extended to many geographical areas around the world, and thus the production of eucalyptus honey has been favored. In fact, eucalyptus honey comes from Australia, South America [21,22], India [23], North Africa [24], and Europe [25]. In Italy, even though there are more than 100,000 ha planted with eucalyptus and black locust [19,20,26], according to the 2021 ISMEA report [27], eucalyptus honey is produced in low quantities.

Notwithstanding the interesting features of eucalyptus honey, as the references suggest [3–6,18], the beekeeping sector in Italy lacks clear knowledge of consumer needs [28]. In particular, the people's preferences for eucalyptus honey in Italy is largely unknown. In fact, at an Italian level, a few studies [9,14,17] have been conducted to understand the most important factors of honey influencing consumer behavior; however, there are no studies on the acceptance of eucalyptus honey among Italians. For these reasons, the study aimed to analyze what drives people to choose eucalyptus honey and to try to analyze which extrinsic and intrinsic quality attributes affect consumer behavior. From an empirical point of view, this study wants to supply a contribution to the current literature by providing insights on consumer-specific perceptions about eucalyptus honey. In addition, the present study provides empirical findings that farmers should benefit to support agricultural incomes from the perspective of diversifying agriculture.

## 2. Materials and Methods

### 2.1. The Questionnaire

The survey was performed through a structured questionnaire, which was implemented in the Italian language using Google platform. The online survey was left active for three months (January–March 2022). Moreover, it had 7 pages, three parts, and 10 min as the estimated time to complete it. This study did not need approval from the ethics committee, and it followed Italian national law (d.lgs. 196/2003) together with modifications to the EU Regulation, as it happens in some studies about consumer behavior (see, e.g., [29]). Before participating in the survey, people were informed by researchers about the scientific idea behind the survey. Moreover, all information made available for the research was handled in a confidential way, and the respondents' identities were unnamed.

The questionnaire was split into three sections called: (1) food behavior and honey consumption; (2) eucalyptus honey and its quality determinants; (3) sociodemographic characteristics.

Following some studies [9,30–32], the first section of the questionnaire regarded both respondent perception of the impact of food on health and environment and their preferences. In more depth, respondents were asked to express an opinion about "Aspects you pay attention when you consume food" using a ten Likert-point scale with growing degrees of appreciation (i.e., 1 totally disagree and 10 totally agree). In addition, people were asked to answer questions about their choices about honey (e.g., frequency of consumption, type of honey, and places of purchase of honey) [32] and their opinion about some statements, such as "Honey is a product that can be consumed at any age", "Honey is a traditional food", "Honey is a local product, traditionally produced by beekeepers", "Honey available

in supermarkets has a lower quality than that produced by traditional beekeepers”, “It is difficult to find good quality honey”, “Honey is an expensive product”, “Honey is a luxury product”, “Honey is a product whose consumption can lead to gaining weight or even obesity” [32].

The second section, was aimed at the respondents’ attitude toward eucalyptus honey and its quality determinants [9,32]. In particular, respondents were asked to express if they consumed eucalyptus honey in the past and if they pay attention to honey price in the choice process [9]. Moreover, consumers were asked to express their interest toward some quality attributes of eucalyptus honey (such as color, taste, variety, viscosity, therapeutic properties, brand, organic certification, geographical indication, and Italian origin) [9,13,33].

The last section was focused on questions about socioeconomic information of the respondents (gender, age, nationality, educational level, geographic area of residence, and annual income) [9,32,33]. The questionnaire was distributed via e-mail and social media, as it happens in many studies about consumer behavior [30,31,34].

## 2.2. Participants

To participate in the survey, people had to fulfill specific requirements: be an Italian consumer of eucalyptus honey, be responsible for the food shopping, and be older than 18 years of age. From an original sample of 418 respondents, 15 consumers were later eliminated from the study due to missing data, resulting in a final sample of 403 consumers of honey.

## 2.3. Model Specification

Given that the dependent variable (i.e., the monthly frequency of honey consumption) showed an ordinal categorical character, an ordered Probit model was applied [35]. In particular, the model was:

$$Y^* = \beta' X_i + \varepsilon_i \quad (1)$$

where  $Y^*$  is the monthly frequency of honey consumption;  $X_i$  is a vector of data, and  $\varepsilon_i$  is the stochastic error term. The frequency of eucalyptus honey consumption shows itself in ordinal categorical character, which could be coded as 0, 1, 2, . . . ,  $k$ . The response of category  $k$  is thus observed when the underlying continuous response falls in the  $k$ th interval as:

$$\begin{aligned} Y^* &= 0 \text{ if } Y^* \leq \delta_0 \\ Y^* &= 1 \text{ if } \delta_0 < Y^* \leq \delta_1 \\ Y^* &= 2 \text{ if } \delta_1 < Y^* \leq \delta_2 \end{aligned} \quad (2)$$

where  $\delta_i$  ( $i = 0, 1, 2$ ) are the unobservable data, which will be assessed along with other data in the ordered Probit model. When a coefficient is included in the model,  $\delta_0$  is normalized to a zero value [36], and hence only  $k - 1$  additional data are estimated with  $\delta_s$  [35]. The probabilities for each of the observed ordinal response, which in this research had 3 replies (0, 1, 2) will be:

$$\begin{aligned} \text{Prob}(Y = 0) &= P(Y^* \leq 0) = P(\beta' X_i + \varepsilon_i \leq 0) = \Phi(-\beta' X) \\ \text{Prob}(Y = 1) &= \Phi(\delta_1 - \beta' X) - \Phi(-\beta' X) \\ \text{Prob}(Y = 2) &= \Phi(\delta_2 - \beta' X) - \Phi(\delta_1 - \beta' X) \end{aligned} \quad (3)$$

where  $\Phi(\cdot)$  is the cumulative normal distribution function such that the sum total of the above probabilities is equal to one. It is important to underline that the marginal effects of  $X$  on the probabilities are not equal to the coefficients [35]. For these reasons, the marginal probabilities could be calculated from the Probit model as [35,36]:

$$d\text{prob}(Y_k)/dX_k = [\Phi(\delta_{k-1} - \beta' X_k) - \Phi(\delta_k - \beta' X)] \beta \quad (4)$$

where  $\phi(\cdot)$  is the normal density function;  $\delta_k$  is the threshold  $k$  coefficient, and  $X_k$  is the  $k$ -the explanatory variable (i.e., each variable regarding the extrinsic and intrinsic quality at-

tributes of eucalyptus honey and/or each variable regarding the socioeconomic information of the sample). The dependent variable was the monthly frequency of honey consumption, and it is subdivided into three levels of consumption: Low, (i.e., honey consumption less than two times per month); Medium (i.e., between three and four times per month); and High (i.e., honey consumption higher than four times per month).

Moreover, the marginal effects were considered by measuring the changes in probability of the frequency of honey consumption following an unit change in the independent variable (i.e., each variable regarding the extrinsic and intrinsic quality attributes of eucalyptus honey and/or each variable regarding the socioeconomic information of the sample).

All analyses were performed with R Studio version 3.6.2 [37].

### 3. Results

Considering the 403 respondents, 71.22% were women, while men accounted for 28.78% of the samples (Table 1). Most consumers (27.30%) were aged between 18 and 24 years old, followed by people between 25 and 29 years of age (17.62%). A total of 55% of the respondents had a low education level, and 40.45% of the consumers earn a monthly income of up to EUR 1300, followed by 39.95% of respondents with a monthly income in the range of EUR 1300–2000. Moreover, 44% of the sample lives in a village (with less than 5000 inhabitants), followed by about 40% of the respondents who come from little towns (5000–30,000 inhabitants). Table 2 shows the monthly frequency of honey consumption. It is important to observe that 43% of the sample consume honey more than four times per month (High), followed by about 32% of the respondents, who consume honey less than twice per month (Low). Finally, the majority of the consumers (58.56%) buy honey directly from beekeepers (Table 3) followed by 38.21% of the respondents who buy it in supermarkets.

**Table 1.** The sample characteristics.

Variables	Items	No.	%
Gender	Male	116	28.78
	Female	287	71.22
	<b>Total</b>	<b>403</b>	<b>100.00</b>
Age	18–24	110	27.30
	25–29	71	17.62
	30–34	55	13.65
	35–39	26	6.45
	40–44	31	7.69
	45–49	30	7.44
	50–54	39	9.68
	55–59	19	4.71
	≥60	22	5.46
	<b>Total</b>	<b>403</b>	<b>100.00</b>
Education	Low level	222	55.09
	High level (University degree and/or Ph.D.)	181	44.91
	<b>Total</b>	<b>403</b>	<b>100.00</b>
Monthly income (EUR)	<1300	163	40.45
	1300–2000	161	39.95
	2001–2700	41	10.17
	2701–3400	12	2.98
	3401–4100	9	2.23
	4101–4800	17	4.22
	>4800	0	0.00

**Table 1.** *Cont.*

Variables	Items	No.	%
	<b>Total</b>	<b>403</b>	<b>100.00</b>
Place of residence	Village (less than 5000 inhabitants)	178	44.16
	Little town (5000–30,000 inhabitants)	161	39.96
	City (more than 30,000 inhabitants)	64	15.88
<b>Total</b>		<b>403</b>	<b>100.00</b>

Source: Our elaboration on survey data.

**Table 2.** The monthly frequency of honey consumption.

Variables	Frequency	%
Low (less than two times a month)	127	31.51
Medium (between three and four times a month)	102	25.31
High (higher than four times a month)	174	43.18
<b>Total</b>	<b>403</b>	<b>100.00</b>

Source: Our elaboration on survey data.

**Table 3.** Place of purchase.

Variables	Frequency	%
Beekeeper	236	58.56
Supermarket	154	38.21
Internet	13	3.23
<b>Total</b>	<b>403</b>	<b>100.00</b>

Source: Our elaboration on survey data.

Table 4 shows which quality attributes of eucalyptus honey and which socioeconomic information of the sample affect consumer behavior. In particular, the results show that the frequency of honey consumption increases with the rise of all the extrinsic and intrinsic quality attributes of eucalyptus honey except for the color variable, while the frequency of honey consumption decreases with the increase in the age and gender of the sample. Moreover, among the eucalyptus honey attributes, only price was not statistically significant, while among the sociodemographic features of the sample, only education and monthly income were not statistically significant.

According to the findings, the monthly frequency of honey consumption increases with the attention that consumers paid to the taste, viscosity, therapeutic properties, brand reputation, variety, geographical indication, Italian origin, and organic certification of eucalyptus honey. Moreover, the negative sign for the color of the honey reveals that the probability of having a higher frequency of consumption increase among consumers who did not pay attention to the color of the honey. Finally, it is important to observe that the monthly frequency of honey consumption decreases with gender and the increasing age of the respondents, and this result could be due to the fact that in Italy young women show a higher level of appreciation for honey than older people [38].

The calculation of marginal effects (Table 4) evaluated the probability of having a high incidence of honey consumption among the quality attributes of honey. In particular, the results show that the taste of eucalyptus honey had the biggest impact on the probability of having a high honey consumption (1.92 times), followed by viscosity (1.45 times), variety (1.43 times), geographical indication (1.33 times), and therapeutic properties (1.31 times). Finally, among the socioeconomic information of respondents, only age and gender had a significant impact on the probability of having a high frequency of honey consumption with marginal effects of 1.77 times and 1.45 times, respectively.

**Table 4.** Findings of the model.

<b>Ordered Probit Regression Model</b>					
					Observations = 403
					Log-Likelihood: 428.0291
					McFadden's R <sup>2</sup> : 0.601
					AIC: 880.0582
Frequency of consumption	Coef.	Std. err.	t value	Pr(>  t )	Marginal effects
price	−0.031	0.029	−1.072	0.280	−
color	−0.007	0.040	−0.182	0.050	−1.301
taste	0.048	0.051	0.954	0.033	1.923
viscosity	0.037	0.042	0.871	0.038	1.456
therapeutic properties	0.009	0.039	0.243	0.002	1.311
brand reputation	0.015	0.037	0.409	0.018	1.03
variety	0.036	0.047	0.772	0.044	1.434
geographic indication	0.033	0.046	0.724	0.046	1.333
Italian origin	0.077	0.057	1.353	0.017	0.830
organic certification	0.004	0.040	0.111	0.029	1.142
gender	−0.155	0.072	−1.088	0.020	1.452
age	−0.003	0.088	−1.345	0.022	1.779
education	0.089	0.059	0.823	0.923	−
monthly income	0.099	0.091	0.945	0.245	−
Threshold 1	0.241	0.247	−	−	−
Threshold 2	0.422	0.248	−	−	−

Source: Our elaboration on survey data.

#### 4. Discussion

According to an Italian sample, this paper aimed to analyze the consumer drivers in choosing eucalyptus honey and to try to investigate which extrinsic and intrinsic quality attributes affect consumer behavior. The study featured an explorative approach due to the applied recruitment process that led to a non-representative sample of the Italian population. In fact, according to ISTAT (2022) [39], the average Italian is female, has a mean age of approximately 41 years (vs. about 35 years for our sample), and a low education level. Nevertheless, the authors believe that this study offers the opportunity to add some new insights and to propose discussions regarding the topic of consumer preferences and attitudes toward eucalyptus honey. The analysis showed very interesting results with respect to the understanding of both the perceptions of eucalyptus honey and the main drivers of these perceptions.

The sample was composed of a high percentage of females with an average age of about 35 years, with a low education level and a low monthly income (up to EUR 1300). Similar results were reached by Testa et al. [9], who showed an Italian sample composed of a high percentage of females with an average age of about 39.9 years but with a high education level and a high monthly household income. Moreover, in our case, the majority of the respondents live in villages or in little towns, consume honey more than four times per month, and buy it directly from beekeepers. These findings are in line with Cosmina et al. [17], who found that buying honey directly from local beekeepers was widespread among Italian consumers.

According to Oravec et al. [8], the role of information in the decision process is crucial for people, and, in particular, people's perceptions of food attributes (i.e., extrinsic and intrinsic quality attributes) are important aspects of the choice process [40]. The current literature showed different honey consumer studies underlining the existence of different consumer profiles [41,42]. In fact, according to some researchers [13], honey consumers in the Czech Republic were focused on the price and origin of honey, while the perception of quality was mostly related to crystallization features [13]. Arvqnitoyannis and Krystallis [43] found that the Romanian people trust some characteristics of the honey,

such as aroma, color, taste, and texture, while they have low awareness of honey energy content and pay little attention to labels [43]. We reached similar results; in fact, the frequency of honey consumption growth with the increasing importance that consumers give to taste, viscosity, and therapeutic properties of honey, while consumers tend to pay little attention to the color of eucalyptus honey. In particular, findings show that the taste of eucalyptus honey had the biggest impact on the probability of having a high honey consumption. This result is in line with the current literature [44] whereby taste is the most influential variable in the decision to purchase honey. In addition, Ismaiel et al. [45] found that taste, aroma, physical state, and therapeutic properties were the determining factors impacting honey consumption in Saudi Arabia, while in Italy, Testa et al. [9] showed that the medical features of honey were crucial drivers in affecting consumer preferences, followed by income, variety, and taste. It is important to observe that, in our case, income and price were not statistically significant, and this could be due to consumers who, of late, pay attention not only to food price but also to food quality and healthy food during the purchase process [9,46,47]. Other important drivers for the respondents were variety and taste of honey. According to Santos-Buelga and Gonzalez-Paramas [48] the variety of honey depends on many aspects, such as the geographical and botanical origin of the plants. These two points were very important in consumer choices because they influence honey taste [49], one of the main drivers for honey consumption [50,51].

Honey is a beneficial food for health, environment, economy and society, and it could be therefore marketed as a product that can potentially increase the sustainability of the local food systems [3–5,38]. According to Wu et al. [15], consumers demonstrated greater demand for locally produced honey, and according to Cosmina et al. [17], the country of origin and organic features were crucial parameters for consumer behaviors. Likewise, in our case, the frequency of honey consumption increased with the attention that people paid to the geographical indication, Italian origin, and organic certification. Given that certified honeys sold in Italy are labeled with a protected designation of origin (PDO) and are organic [52], our findings should have important implications for marketing. In fact, on the one hand, the attention about the local origin of honey as well its organic cultivation logo might result in an increase in demand [17]. On the other hand, local origin of honey and organic cultivation should offer small producers an interesting opportunity for profitable growth by marketing themselves as an alternative niche market [15]. Similarly, Murphy et al. [53] analyzed some quality attributes of honey as important factors for Irish consumer choices, and they revealed that there was a strong positive preference toward locally produced honey. In addition, they suggested that organic beekeeping can be an important strategy for diversification of product [53]. Similar considerations are made by other researchers [17,54], who found that Italian respondents are interested both in the origin of honey and in organic certification [54], identifying organic cultivation as an important opportunity for Italian beekeeping [17].

According to a study conducted in Hungary [55], quality, price, and type of honey were the most important drivers when consumers bought honey. Batt and Liu [44] explored the factors driving consumer decisions to buy honey in Western Australia, and they found that brand, origin, and value for money were the most influential attributes in consumer decisions to buy honey. Similarly, Yeow et al. [56] showed that therapeutic aspects, quality of honey, and brand reputation had a positive impact on Asian consumer purchasing behavior. Likewise, in our case, the potential preference for eucalyptus honey might also be driven by customer loyalty to a brand of honey, as it happens in many studies in the current literature about consumer behavior (see, e.g., [30,57]).

Finally, the sociodemographic characteristics of people could also affect consumer decisions to consume honey [9]. In particular, ethnicity [44], age, female sex, high educational level, and income [41,42] influence honey consumption. Some researchers [58] found that high honey consumption was linked to a medium/high income level together with social status of Romanian consumers. In our case, honey consumption decreased with increasing age, and this finding could be due to the fact that in Italy younger people show

a higher level of appreciation for honey than older people [38]. Moreover, gender is an important aspect that drives the frequency of honey consumption [38,41,42]. In fact, in our case, women were more likely to eat honey than other consumers.

## 5. Conclusions

In recent years, the growing concern for environmental issues has emphasized the need to promote sustainable consumption and production. Taking into consideration all dimensions, sustainability has become a priority issue for the United Nations with Agenda 2030, and honey should be seen as an important food from a sustainability perspective. In particular, on the one hand, eucalyptus honey has become popular with people thanks to its medicinal properties; on the other hand, eucalyptus honey play an important role in mitigating climate change. Although beekeeping is an important agricultural and rural activity in Italy, the beekeeping sector in Italy does not yet have sufficient knowledge and understanding of consumer needs with a view to increasing earnings. For these reasons, eucalyptus honey should be an opportunity for beekeeping to diversify the product and acquire a margin to improve earning capacity. Our study provides initial empirical evidence for this opportunity.

According to our findings, the respondents consider the taste, viscosity, therapeutic properties, brand reputation, variety, geographical indication, Italian origin, and organic certification of honey as the most important features shaping the consumption of eucalyptus honey. The increase in consumer awareness underscores the importance of information that helps people make decisions. In the case of consuming eucalyptus honey, Italian origin, geographical indication, and organic certification were particularly preferred. In fact, our results confirm the interest that Italian consumers have in organic and geographical indications; however, we are not able to presume that these results are generally valid for other food products beyond honey. In fact, honey is a niche product, and this aspect could explain the great attention to quality attributes by consumers. In addition, we found that eucalyptus honey consumption is also linked with the Italian origin, and this aspect could be used to develop territorial marketing tools to enhance other niche products offered by territories.

The study has shown once more that consumer behavior cannot be generalized, as there is a significant correlation between sociodemographic aspects of the respondents and the appreciation of quality attributes. In fact, consumption varies according to age and gender, and eucalyptus honey seems to be more appreciated by young women, while old men are the least interested.

Finally, considering that many future challenges related to the eucalyptus honey market might depend on the enhancement of the positive image that this product has, in terms of mitigation of climate change (of eucalyptus species), healthiness, and capacity to support the development of local economies, our findings should drive the actions of honey producers. In other words, our results should help honey producers find the right tools of communication, such as quality or sustainability labeling, with a view to attracting consumers and improving competitiveness.

**Author Contributions:** N.P. contributed to the study design, data collection, data analysis, and writing and revising of the whole manuscript. W.S. and F.L. contributed to the study design. L.P. contributed to the study supervision, project administration, and funding acquisition. All authors have read and agreed to the published version of the manuscript.

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