

Do quality labels change how much we like a product? Evidence from honey consumers

Mijenjaju li oznake kvalitete koliko nam se proizvod sviđa? Dokazi iz istraživanja potrošača meda

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ABSTRACT

This study analyses the joint effects of sensory attributes and quality labels on consumer perception and purchase intention of acacia honey on the Croatian market. Three honey samples (with EU organic label (ORG), with national "Proven Quality" label (PQ) and unlabelled (NL)) were evaluated under blind and informed conditions using a four-stage sensory protocol. A linear mixed-effects model was used to assess the influence of treatment conditions and honey labelling on hedonic perception and purchase intention. Label information significantly impacted consumer responses, particularly for PQ honey, where the visual and sensory informed conditions increased hedonic scores by 0.47 and 0.40 points, respectively ($P < 0.001$). The predicted mean for purchase intention (3.631) exceeded that of hedonic liking (3.482), and strong correlations were observed between the two. *Honey category X treatment* interaction effects showed that the label's influence varied by honey samples, with ORG and NL honeys showing lower gains due to negative interaction terms. Demographic factors, such as gender and frequency of honey consumption, also influenced the responses. These results underline the effectiveness of certified labels, particularly "Proven Quality," in improving consumer evaluation and support the use of quality certification and informative labelling as strategic tools to improve consumer confidence and market competitiveness.

Keywords: honey, product perception, sensory analysis, food certification, mixed effects model, consumer behaviour

SAŽETAK

Ova studija analizira zajednički učinak senzorskih svojstava i oznaka kvalitete na percepciju potrošača i namjeru kupnje bagremovog meda na hrvatskom tržištu. Tri uzorka meda (s oznakom ekološki proizvod EU (ORG), s oznakom „Dokazana kvaliteta“ (PQ) te bez oznake (NL)) ocijenjena su u slijepim i informiranim uvjetima korištenjem četvero stupanjskog senzorskog protokola. Za procjenu utjecaja tretmana i oznake meda na hedonističke ocjene i namjeru kupnje korišten je linearni model sa slučajnim efektima. Informacija o oznaci meda značajno utječe na ocjene potrošača, osobito kod PQ meda, jer su hedonističke ocjene u tretmanima s informacijom bez kušanja i s kušanjem veće za 0,47 odnosno 0,40 bodova ($P < 0,001$) u odnosu na ocjene bez informacije za ovaj med. Predviđena srednja vrijednost za namjeru kupnje (3,631) bila je viša od one za hedonističku ocjenu (3,482), a između njih je utvrđena snažna korelacija. Interakcijski efekti tretmana i vrste oznake meda pokazali su da se utjecaj razlikuje s obzirom na oznaku meda, pri čemu je za ORG i NL medove utvrđen manji rast ocjena zbog negativnih interakcijskih učinaka. Demografski čimbenici, poput spola i učestalosti konzumacije meda, također su utjecali na ocjene medova. Dobiveni rezultati naglašavaju učinkovitost certificiranih oznaka, osobito oznake „Dokazana kvaliteta“, u poboljšanju potrošačke percepcije te potvrđuju važnost primjene oznaka kvalitete kao strateških alata za povećanje povjerenja potrošača i tržišne konkurentnosti.

Ključne riječi: percepcija proizvoda, senzorna analiza, certifikacija hrane, model s fiksnim efektima

INTRODUCTION

In recent years, growing consumer awareness of food quality, sustainability, and production methods has significantly influenced purchasing decisions, particularly in the context of traditional and natural products such as honey. Honey is not only valued for its taste and nutritional properties, but also for its perceived health benefits (Kardas et al., 2024; Mascarello et al., 2024). Its sensory characteristics—such as flavour, odour, texture, and colour—are largely shaped by its botanical and geographical origin, which directly influences consumer acceptance (Starowicz et al., 2021). Therefore, consumer expectations regarding honey are shaped not only by its sensory characteristics but also by non-sensory attributes such as production methods, geographic origin, and quality labels.

To help consumers navigate the complex landscape of food choices, producers and policy-makers increasingly rely on certification systems and quality labels. These labels—such as organic certification or protected designation of origin—serve as tools to signal product authenticity, sustainability, and compliance with specific quality standards. Numerous studies have shown that such information can significantly affect consumer preferences, willingness to pay, and even sensory perception (e.g. Aprile et al., 2012; Bissinger and Herrmann, 2021).

Although these dynamics are relevant across different food categories and markets, they are particularly important in the honey sector, where concerns about food fraud, mislabelling, and adulteration are widespread (Pavliček et al., 2022; Mesić and Juračak, 2022; Čuljak, 2017; Jerman, 2021).

Croatia provides a useful case study to illustrate these trends. With an average annual honey production of 7,335 tonnes (SD=2133.46) in the period 2014-2023 (Croatian Bureau of Statistics), and around 9,300 active beekeepers, the domestic market is characterized by a strong presence of small-scale producers, increasing imports, and growing interest in quality assurance schemes.

It is estimated that the average honey production per hive in Croatia is between 18 kg for hobby beekeepers and 41 kg for full-time beekeepers (Croatian Beekeepers Federation, 2024; Svečnjak et al., 2008). As the number of hives and production per beekeeper is low, the majority (3/4) sell honey directly, while around 1/3 of beekeepers use wholesalers (Ministry of Agriculture, Forestry and Fisheries, 2019). Annual honey exports from Croatia fluctuate at around 400 tonnes, while honey imports increased from 330 tonnes to 1,700 tonnes in the period 2013-2018. Per capita consumption of honey is around 2 kg, and the self-sufficiency rate of honey production is around 80 % (Ministry of Agriculture, Forestry and Fisheries, 2024).

To stand out from the growing competition and protect themselves from unfair trading practices, local producers are increasingly using various quality labels. This study focuses on two quality labels for honey: the EU organic label and the "Proven quality" label (original title in Croatian: "Dokazana kvaliteta", hereinafter PQ).

The EU organic label indicates to consumers that the product meets the certified organic production standards established at the European Union level. Organic products are generally associated with lower environmental impacts, particularly regarding soil fertility, biodiversity, and the preservation of natural resources such as nutrients and energy. Compared to conventional farming, organic production is considered more environmentally and climate-friendly, and it supports agricultural adaptation to climate change. Additionally, the absence of synthetic pesticides and mineral fertilizers is often cited as a health-related advantage of organic products (Reeve et al., 2016; Reganold and Wachter, 2016; Tuomisto, 2012).

In Croatia, the certification of domestic agricultural and food products is supported through a national quality scheme introduced by the Ministry of Agriculture. As part of this system, the "Proven Quality" label is awarded to products that meet defined production specifications and hold a valid certificate of conformity (Official Gazette, 18/2020). This label assures consumers that the product

is of verified high organoleptic quality, produced using local raw materials and traditional recipes and methods.

Currently, 18 honey producers in Croatia hold the PQ label, while 9 are certified under the EU organic scheme (European Commission, 2025; Ministry of Agriculture, 2025). Although interest in such quality labels among beekeepers is growing, their impact on consumer preferences and purchasing decisions remains largely unexplored.

While the Croatian context illustrates these issues on a national scale, the implications of quality labels for honey consumer behaviour are relevant internationally.

Several studies have investigated consumer preferences for honey more broadly. Vapa-Tankosić et al. (2020) investigated consumer preferences and willingness to pay for organic and local honey in the Republic of Serbia and found that health claims, taste, and environmental concerns were the most influential factors. Oravec and Kovács (2019), using sensory experiments, revealed that the demand for honey is significantly influenced by the organoleptic properties of the product and the price, and for certain consumer segments by the production area and honey packaging. Cosmina et al. (2016) analysed the preferences of Italian honey consumers and identified origin, price, organic certification, surrounding landscape, and the level of crystallization as the most influential product characteristics. Yeow et al. (2013) found that product quality, consumer health, brand and price influence the intention to buy honey. Sanzo et al. (2001) found that consumers perceive branded honey to be of higher quality than generic honey. These findings confirm that honey preferences are shaped by both sensory (e.g. taste, texture) and non-sensory (e.g. origin, production technology, health benefits, label, price) product attributes.

Information about non-sensory product attributes is not only important for shaping preferences and influencing consumer choice but also affects how consumers perceive the sensory characteristics of food (Kos Skubic et al., 2018a; Stolzenbach et al., 2013; Cerjak et al., 2011; Cerjak et al., 2010). This effect is particularly pronounced in the case of traditional products, which are

often promoted through information about their origin and production methods (Caporale et al., 2006). Kallas et al. (2017) found that consumers perceived local honey as being of higher quality than non-local honey. Similarly, Apaolaza et al. (2017) demonstrated that the presence of an organic label significantly alters the sensory perception of wine, with consumers reporting a greater liking for wines labelled as organic compared to those without such a label.

Taken together, previous research clearly shows that both sensory characteristics (such as taste, texture, and crystallization) and non-sensory attributes (such as origin, production method, health-related qualities, and quality labels) play a key role in shaping consumer preferences and choices. However, the extent to which these two types of attributes interact, particularly how information conveyed through labels may influence sensory perception and overall liking, has received limited attention in the case of honey. While some studies have demonstrated that labels such as "organic" can alter sensory perception in other products (e.g. wine), there is still a lack of research specifically addressing this effect for honey. This highlights the need to better understand how quality labels and sensory experience jointly influence consumer acceptance and choice of honey.

In this study, we hypothesize that consumers in the Croatian market will prefer honey with the PQ label and the EU organic label over conventional honey. Therefore, this work aimed to determine whether information about the origin of the product and organic production technology influences the hedonic perception of honey, i.e. whether hedonic evaluations change before and after receiving the information.

Additionally, we investigated whether consumers prefer products with quality labels over the same products without these labels, and whether PQ and EU organic labels increase the purchase intention for honey compared to honey without quality labels.

Furthermore, we analysed the differences in consumers' hedonic preferences under blind and informed conditions, considering respondents' personal characteristics.

METHODOLOGY

Products

In this study, we examined three different acacia honeys from different producers, all produced in the same continental region of Croatia. To ensure the authenticity and quality of the honey, the samples were directly obtained from beekeepers. Prior to sensory evaluation, the honey samples were stored at room temperature for one day.

Among the three honeys, one is organically produced and labelled as organic acacia honey, bearing the EU organic logo (ORG honey). The other two honeys are conventionally produced. Of the latter two honeys, the first carries the national PQ label, while the other is marketed without any quality label (NL honey). To ensure methodological consistency and minimize possible packaging-related biases in the respondents' evaluation, all three honey samples were packaged in identical transparent jars (Larmond, 1977).

The consumer sample

A face-to-face research was conducted with consumers who include honey in their diet. Participation was voluntary, and individuals were recruited based on their interest and availability.

Potential participants were initially contacted by phone or email to assess their eligibility and, upon confirmation, to schedule a convenient evaluation date. Prior to the session, participants were informed that they would take part in a sensory evaluation of honey. The study was conducted among faculty members and students of the University of Zagreb Faculty of Agriculture. Each participant received a jar of honey as a token of appreciation for the participation.

The final sample consisted of 100 participants, including 66 females and 34 males, aged between 22 and 62 years (mean age = 41.24 ± 10.67 years). Most participants (63%) reported growing up in urban areas, while 37% came from rural backgrounds. All respondents reported having an average or high family income.

Test procedure

The consumer test was conducted in individual booths, each equipped with notebooks running a questionnaire designed using the 1ka software. The questionnaire consisted of three sections. The first section collected data on participants' honey consumption and purchasing behaviour. The second section involved the evaluation of three different acacia honey samples, and the final section gathered respondents' socio-demographic information. The entire survey took approximately 25 minutes to complete.

The central part of the survey, the honey evaluation, was designed to assess whether information about the honey influenced consumers' hedonic preferences and sensory experiences. The evaluation was conducted in four steps (Figure 1).

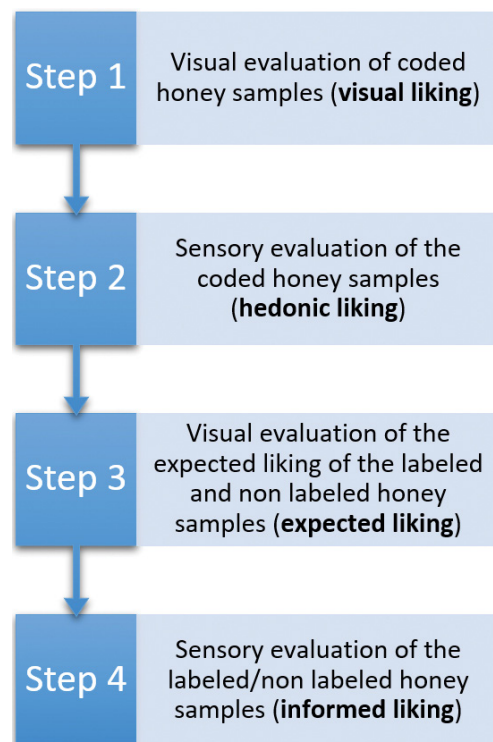


Figure 1. Diagram of honey evaluation in the laboratory

In the first step, the three honey samples were coded with randomly assigned three-digit numbers, following standard sensory evaluation practice (Larmond, 1977; Varela et al., 2010) and simultaneously presented in identical transparent jars. Participants were asked to

visually evaluate the colour of the honeys and provide an overall liking score for each sample. The order of sample presentation was randomized across participants.

In the second step, the same honey samples were tasted. All three samples were served simultaneously, each in a small plastic container accompanied by a wooden stick. The corresponding jars were displayed in front of the respondents to allow visual identification of each sample. Participants were instructed to smell and then taste each honey sample, rating the following attributes: odour, flavour and overall liking. The tasting order matched the order used in the visual evaluation. Water was provided between samples to cleanse the palate.

Following the tasting, the honey samples were removed from in front of the participants, and they were then asked to rate their familiarity with the EU organic logo and the national PQ label.

In the third step, the honey samples were presented back to the participants along with their respective labels. However, the participants were not informed that these were the same samples previously evaluated under blind conditions. They were then asked to reassess their overall impression of each sample, taking into account both the visual appearance and the label information.

Finally, in the fourth step, participants tasted the labelled honey samples using the same procedure as in the second step.

In all four stages of the evaluation, participants rated the honey samples using a 5-point hedonic scale commonly used in consumer research in Croatia (Cerjak et al., 2011), where 1 = dislike very much, 2 = dislike, 3 = neither like nor dislike, 4 = like, and 5 = like very much.

The sensory evaluation was conducted over three consecutive days in the Laboratory for Sensory Analysis of Agri-Food Products at the University of Zagreb Faculty of Agriculture.

Data Analysis

In this study, we applied a linear mixed-effects model to determine how information conditions (treatment) and honey types influence consumer preferences. This modelling approach accounts for repeated measures within individuals and allows us to include both fixed effects (such as treatment, honey type and demographics) and random effects (individual variability) to better capture the structure of the data and improve the precision of the estimates.

Mixed-effects models have become increasingly valuable in sensory and consumer research, especially for dealing with repeated measures and individual variability in product evaluations. This modelling approach is particularly relevant for experimental designs in which each participant evaluates multiple products under different conditions, as in the present study on honey preferences (Booth, 2008; Verbeke et al., 2009; Meilgaard et al., 2015).

Gelman and Hill (2007) argue for multilevel modelling to estimate effects at both the individual and group level and emphasise its suitability for repeated and hierarchical data. Their work supports the use of random effects to account for participant-specific baseline situations in preference studies. Similarly, Rabe-Hesketh and Skrondal (2022) provide detailed guidance for implementing such models in Stata, making their text particularly relevant to this analysis using the mixed command.

In consumer research, Van den Bergh, Schmitt, and Warlop (2011) show how mixed models can capture the interaction between treatment effects and individual differences, even in the non-food context. Their work highlights the importance of modelling within- and between-subject variation to understand behavioural responses.

From the field of sensory evaluation, Ares and Varela (2017) provide practical recommendations for hedonic testing and emphasise the importance of considering consumer heterogeneity and repeated evaluations.

They recommend the use of mixed-effects models to better estimate treatment effects while controlling for contextual and individual factors.

Since each participant in this study gives an evaluation and purchase intention for three honeys, each under four different treatments, and each of those is recorded separately, we are dealing with a repeated-measures (within-subject) setup. That means the observations are nested within individuals. We modelled participants' ratings and purchase intentions for honey using similar multilevel linear mixed-effects models with the following fixed and random effects:

$$Y_{ij} = \beta_0 + \sum_k \beta_{1k} \cdot treat_{jk} + \sum_t \beta_{2t} \cdot honey_{jt} + \sum_{k,l} \beta_{3kl} \cdot (treat_{jk} \cdot honey_{jt}) + \sum_m \beta_{4m} \cdot gender_{im} + \sum_n \beta_{5n} \cdot freqv_{in} + \sum_p \beta_{6p} \cdot place_{ip} + \sum_q \beta_{7q} \cdot income_{iq} + \beta_8 \cdot age_i + u_i + e_{ij}$$

where:

- Y_{ij} is the rating (score) or purchase intention given by individual i for honey-treatment combination j
- $treat_{ij}$ is a dummy variable for each treatment category (visual, sensory, visual informed, and sensory informed)
- $honey_{ij}$ is a dummy variable for each honey type (PQ, ORG, NL)
- $gender_p$, $freqv_p$, $place_p$, and $income_i$ are categorical variables describing the individual
- age_i is a continuous variable representing the individual's age
- $u_i \sim N(0, \sigma_u^2)$ is the random intercept for individual i , accounting for individual-specific baseline preferences
- $\varepsilon_{ij} \sim Ni(0, \sigma^2)$ is the residual error term.

We conducted the multilevel mixed-effects linear models fitting in STATA for Windows (StataCorp, 2023). First, we run the full models as given in the expression (1), while in the second run, we kept only the factors with significant effects and fitted the models again. Based on the results of the second run, we performed post estimations to get differences in predicted means of hedonic score and purchase intention for each treatment within each honey type.

RESULTS

The main characteristics of the participants' panel are listed in Table 1. There were more female than male participants, mainly middle-aged, from urban environments and medium-income families, who eat honey at least once a week.

Table 1. Socio-demographic characteristics of participants

Socio-demographic characteristics and honey consumption	Levels	Frequency (%)
Gender	Male (1)	34
	Female (2)	66
Age	<25	10
	25-40	36
	41-55	43
	>56	11
Place of growing up	Urban	63
	Rural	37
Family income level	Low	0
	Neither high nor low	64
	High	32
	Very high	4
Honey consumption frequency	Every day	29
	At least once a week	38
	At least once a month	20
	Less often	13

By comparing the results for hedonic liking and purchase intention for honey, we found a strong correlation between these two variables. The correlation coefficient between hedonic liking and purchase intention is $r = 0.7388$ ($P < 0.05$).

After verifying that the assumptions for mixed-effects models are met, we first run full models for (1) hedonic liking score and (2) purchase intention. Both models are based on 1,200 observations collected from 100 respondents. Each respondent provided 12 liking scores and 12 purchase intention ratings corresponding to three

honey types across four information conditions. Factors treat, honey, gender, freqv, and treat x honey interaction are found to have a significant impact on the honey liking scores. The same factors, except gender, affect the honey purchase intentions (Table 2).

Table 2. Parameter estimates for mixed effects model: honey hedonic score and honey purchase intention

Factors / Levels	Liking score model		Purchase intention model	
	Coefficient (SE)	$P > z $	Coefficient (SE)	$P > z $
treat				
sensory	0.19 (0.094)	0.044	0.05 (0.113)	0.662
visual informed	0.47 (0.094)	0.000	0.673 (0.113)	0.000
sensory informed	0.4 (0.094)	0.000	0.485 (0.113)	0.000
honey				
ORG	0.81 (0.094)	0.000	0.762 (0.113)	0.000
NL	0.78 (0.094)	0.000	0.832 (0.113)	0.000
treat#honey				
sensory#ORG	-0.46 (0.133)	0.001	-0.307 (0.16)	0.055
sensory#NL	-0.38 (0.133)	0.004	-0.366 (0.16)	0.022
visual informed#ORG	-0.43 (0.133)	0.001	-0.485 (0.16)	0.002
visual informed#NL	-0.72 (0.133)	0.000	-1.05 (0.16)	0.000
sensory informed#ORG	-0.48 (0.133)	0.000	-0.406 (0.16)	0.011
sensory informed#NL	-0.73 (0.133)	0.000	-0.891 (0.16)	0.000
gender				
Female	0.205 (0.09)	0.023		
freqv				
At least weekly	-0.083 (0.105)	0.427	-0.111 (0.116)	0.341
At least monthly	-0.394 (0.124)	0.001	-0.422 (0.137)	0.002
Less than monthly	-0.056 (0.142)	0.690	-0.082 (0.158)	0.602
_cons	3.482 (0.116)	0.000	3.631 (0.116)	0.000

Note: Reference categories by factors: treat = visual, honey: PQ, gender: male, freqv: daily

The Wald chi-square tests confirmed that the models' predictors significantly help in explaining the variability in liking score and purchase intention levels (Wald chi-square (15) = 174.55, $P = 0.000$ for score model and Wald chi-square (14) = 161.25, $P = 0.000$ for purchase model). According to the random effects estimates, the variance of the random intercepts for individuals is higher for the purchase intention rating than for the liking score (0.17298 vs. 0.1427, respectively), and both variances are significant at 5% level. The residual variance within respondents is 0.4453 for the score model and 0.6468 for the purchase model, indicating the variation in results that is not explained by the factors is higher for purchase intention ratings than for liking scores. The chi-square statistics of 175.82 for the score model and 141.95 for the purchase model, with P -values of 0.000, indicate that random effects significantly improve the models' fits.

The predicted means of hedonic liking score for the reference group is 3.482, somewhat lower than for purchase intention rating of 3.631. Female respondents tend to rate honeys higher on the hedonic scale than men. In addition, respondents who eat honey daily give higher liking scores for honeys and have higher intention levels compared to those who eat honey once a month.

In both models, the effect of treatment differs within each honey type, compared to the additive combination of their individual effects. Coefficients are significant ($P < 0.05$) for all treatment/honey type combinations in both models, except for the combination sensory#OR in the purchase model. Given the negative values of the coefficients, the expected scores are lower than what would be predicted from just adding the main effects of the combination elements.

Treatment effects vary by honey type since the positive main effects of treatments are weaker for ORG and NL honeys, due to the negative interaction terms. Even though the main effects of treatment on ORG and NL honeys in both models are positive, the interaction terms

are negative, meaning the added boost from treatment is less than expected for the honey types. For PQ honey, both informed treatments significantly increased hedonic scores compared to the baseline visual condition. Specifically, the visual-informed treatment raised scores by 0.47 points ($P < 0.001$), and the sensory-informed treatment increased scores by 0.40 points ($P < 0.001$). Even the basic sensory treatment showed a modest but significant improvement of 0.19 points ($P = 0.044$). However, there was no significant difference between the two informed treatments ($P = 0.458$), suggesting they were equally effective in enhancing consumer appreciation. These results demonstrate that the national quality label "Proven Quality" can meaningfully improve consumers' perception of PQ honey.

Same as the hedonic score, the purchase intention for the PQ honey increases with informed treatments. The effects are even higher since visually informed treatment rises purchase intention for 0.67 points, and sensory informed for 0.49 points. The interaction terms are negative, and the coefficient of -1.05 for visually informed treatment in NL honey suggests that the effect is even negative.

The post-estimation analysis confirmed the effect of informed treatment on liking scores and on purchase intention (Table 3 and Table 4). Predicted margins of liking scores for PQ honey under uninformed treatments are lower than other honey/treatment combinations. However, increased margins for PQ honey under informed treatments are not different from combinations like ORG/sensory, NL/sensory, NL/visual informed and NL/sensory informed.

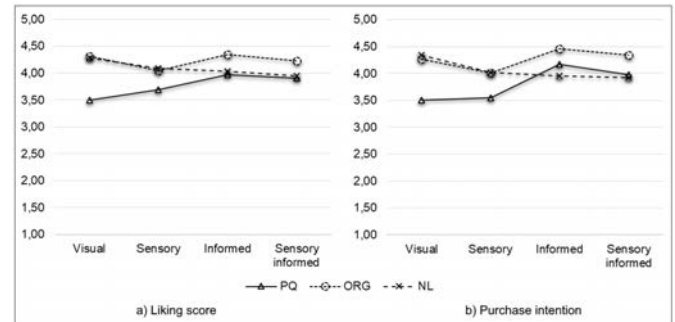
The effect of information in the case of purchase intention is even stronger. Under visual-informed treatment, the purchase intention score for PQ honey is not significantly different from any other combination (Table 4, Figure 2).

Table 3. Post-Estimation for the liking score: predicted scores per combination, honey by treatment (Number of observations = 1,200)

	Margin	95% conf. interval]	
PQ#visual	3.50	3.350	3.650
PQ#sensory	3.69	3.540	3.840
PQ#visual informed	3.97	3.820	4.120
PQ# sensory-informed	3.90	3.750	4.050
ORG#visual	4.31	4.160	4.460
ORG#sensory	4.04	3.890	4.190
ORG# visually informed	4.35	4.200	4.500
ORG# sensory-informed	4.23	4.080	4.380
NL#visual	4.28	4.130	4.430
NL#sensory	4.09	3.940	4.240
NL# visually informed	4.03	3.880	4.180
NL# sensory-informed	3.95	3.800	4.100

Table 4. Post-Estimation for the purchase intention: predicted margins per combination, honey by treatment

	Margin	95% conf. interval]	
PQ#visual	3.50	3.318	3.672
PQ#sensory	3.54	3.368	3.721
PQ#visual informed	4.17	3.992	4.345
PQ# sensory-informed	3.98	3.804	4.157
ORG#visual	4.26	4.081	4.434
ORG#sensory	4.00	3.823	4.177
ORG# visually informed	4.45	4.269	4.622
ORG# sensory-informed	4.34	4.160	4.513
NL#visual	4.33	4.150	4.503
NL#sensory	4.01	3.833	4.186
NL# visually informed	3.95	3.774	4.127
NL# sensory-informed	3.92	3.744	4.097

**Figure 2.** Predicted margins per combination *honey by treatment* for liking score (a) and purchase intention (b)

DISCUSSION

It is well known that consumer preferences for food depend on both sensory and non-sensory attributes. These include factors such as taste, quality claims, origin, and production method (Kos Skubic et al., 2018a, 2018b; Stolzenbach et al., 2013; Radman et al., 2006). This study examined how these attributes -particularly tasting and labelling - affect preferences for three varieties of acacia honey.

Hedonic ratings between subjects showed statistically significant differences in preference by honey type and treatment. This aligns with earlier findings that appearance and taste strongly influence preferences (Vapa-Tankosić et al., 2020; Oravec et al., 2019). Under blind conditions, ORG honey scored highest, followed by NL and then PQ. However, once label information was revealed, PQ honey improved the most.

The within-subject analysis confirmed that label information did not affect all honeys in the same way. For example, the mean rating for NL honey dropped from 4.27 (uninformed) to 4.04 (visually informed). In contrast, PQ honey increased from 3.50 to 3.90 under the same conditions. ORG honey stayed high overall, though it showed small variations across treatments. These results suggest that labels such as PQ can boost perceptions of lower-rated products, while the lack of a label can reduce the appeal of products that perform well in blind tests.

This finding supports earlier research showing that quality labels act as heuristics, raising the perceived value of products (Cosmina et al., 2016; Sanzo et al., 2001). In

our case, PQ honey, the least liked in blind testing, gained the most from labels and reached ratings similar to NL honey, which had no label but was initially well perceived.

Interestingly, tasting was not always beneficial. In some cases, post-tasting scores were lower than those based on appearance alone, particularly for ORG honey. This supports Varela et al. (2010), who found that expectations set by labels can sometimes exceed the sensory experience, creating a mismatch. For NL honey, tasting did not improve scores, and ratings fell further once label information was revealed. This suggests that consumers devalue unlabelled products when competitors display certifications.

The correlation ($r = 0.7388$) between hedonic ratings and purchase intentions highlights the strong link between taste appeal and consumer behaviour. However, changes in purchase intention were sometimes greater than changes in liking. For PQ and ORG honey, purchase intentions increased more than liking when moving from uninformed to informed conditions. This suggests that labels may influence purchasing decisions even more strongly than taste, perhaps because they provide reassurance about quality and safety.

From a market perspective, these results show that verified quality seals (e.g., PQ) can increase market potential, especially for products that perform poorly in blind tests. In contrast, producers of unlabelled honey may lose out, even if their product is well-liked in sensory evaluations.

This study has some limitations. First, the sample size was relatively small ($N = 100$), which limits the generalizability of the results. Second, the sample was drawn from faculty members and students at the University of Zagreb Faculty of Agriculture. This group may not represent the wider Croatian honey market in terms of age, education, or income.

Third, the use of identical packaging reduced visual bias, but the artificial sensory booths and structured evaluation may not reflect real-life conditions. As a result, preferences in this controlled environment may differ from those in real purchasing or consumption situations.

Participants also knew in advance that they were evaluating honey, which could have created expectation bias. Despite randomisation and blind testing, carryover effects between stages may still have occurred, especially given the short duration of the procedure.

Based on these findings and limitations, several directions for future research are suggested. Future studies should include larger and more diverse consumer samples to strengthen external validity. Replications could test other types of honey (e.g., chestnut, lavender, or mixed honey) or extend the design to other foods with similar sensory and quality traits. This would allow comparisons of label effects across product categories. Additional quality labels (e.g., PDO, PGI, fair-trade, carbon-neutral) should also be tested to see how different certifications influence perception, preference, and willingness to pay. Cross-cultural comparisons could reveal whether label effects are consistent across economic and cultural contexts. Finally, future work should examine consumer knowledge, trust, and attitudes toward labels to better explain differences in responses.

CONCLUSION

This study confirms that both sensory experiences and informational cues, such as quality and organic labelling, significantly influence consumer preferences and purchase intentions for honey. While taste and appearance are still decisive for preference, labelling exerts an even stronger influence in certain cases - especially for products that were initially rated less positively under blind conditions.

The strong correlation between hedonic ratings and purchase intention underlines the central role of perceived product quality in driving consumer behaviour. The fact that informed treatments had a greater impact on purchase intention than liking also suggests that labels can provide additional psychological reassurance beyond sensory appeal. These findings highlight the importance of strategic labelling and transparency in food marketing and suggest that objective certification schemes can usefully enhance consumer confidence and preference in competitive markets.

For producers, the introduction of certified labelling – such as organic or Proven Quality – can significantly improve consumer perception and compensate for a weaker initial sensory appeal. Investing in quality certification is particularly recommended for small producers competing in crowded markets. For marketers, these findings support strategies that combine visual appeal and clear labelling information to maximise both hedonic response and purchase intent.

For policymakers, the findings underline the importance of supporting transparent, verifiable labelling schemes that convey objective product quality. Such systems promote fair competition and differentiation of added value for domestic producers. Consumer education initiatives aimed at raising awareness of the importance of labels and standards can further enhance the positive impact of labels on purchasing behaviour.

The results of the study are a good starting point for new research with a larger, representative sample of respondents, which would make it possible to quantify the premium that consumers are willing to pay for honey with a certain national or EU quality label. Examples of this are the Croatian Jar, Croatian Quality, protected designation of origin, and protected geographical indication labels.

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REFERENCES

- Apaolaza, V., Hartmann, P., Echebarria, C., Barrutia, J. M. (2017) Organic label's halo effect on sensory and hedonic experience of wine: A pilot study. *Journal of Sensory Studies*, 32 (1), e12243.
- Aprile, M. C., Caputo, V., Nayga Jr, R. M. (2012) Consumers' valuation of food quality labels: the case of the European geographic indication and organic farming labels. *International Journal of Consumer Studies*, 36(2), 158-165.
- Ares, G., Varela, P. (Eds.). (2017) *Methods in consumer research. Volume 1: New approaches to classic methods*. Abingdon, Cambridge: Woodhead Publishing.
- Bissinger, K., Herrmann, R. (2021) Regional origin outperforms all other sustainability characteristics in consumer price premiums for honey. *Journal of Economic Integration*, 36(1), 162-184, DOI: <https://doi.org/10.11130/jei.2021.36.1.162>
- Booth, D. A. (2008) Quantifying sensory preferences: How and when does sensory perception affect consumer choice? *Food Quality and Preference*, 19 (6), 450-465. DOI: <https://doi.org/10.1016/j.foodqual.2008.02.003>
- 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.
- CBS (2024) PC-Axis Databases. Croatian Bureau of Statistics. Available at: https://web.dzs.hr/PX-Web_e.asp?url=%22Eng/Archive/stat_databases.htm%22 [Accessed 5 June 2024].
- Cerjak, M., Karolyi, D., Kovačić, D. (2011) Effect of information about pig breed on consumers' acceptability of dry sausage. *Journal of sensory studies*, 26 (2), 128-134. DOI: <https://doi.org/10.1111/j.1745-459X.2011.00329.x>
- Cerjak, M., Haas, R., Kovačić, D. (2010) Brand familiarity and tasting in conjoint analysis: An experimental study with Croatian beer consumers. *British Food Journal*, 112 (6), 561-579. DOI: <https://doi.org/10.1108/00070701011052660>
- Cosmina, M., Gallenti, G., Marangon, F., Troiano, S. (2016) Attitudes towards honey among Italian consumers: A choice experiment approach. *Appetite*, 106, 110-116. DOI: <https://doi.org/10.1016/j.appet.2016.03.015>
- Croatian Beekeepers Federation (2024) Statistički podaci. Available at: <https://www.pcela.hr/statistika.php> [Accessed 10 October 2024].
- Čuljak, M. (2017) *Izazovi u otkrivanju autentičnosti i patvorina meda*. Master's thesis. Zagreb: University of Applied Health Sciences.
- European Commission (2025) IMSOC - TRACES.NT 6.14.2. European Commission - DG Health & Food Safety. Available at: <https://shorturl.at/iewwL> [Accessed 23 May 2025].
- Gelman, A., Hill, J. (2007) *Data analysis using regression and multilevel/hierarchical models*. Cambridge: Cambridge University Press.
- Jerman, D. (2021) Muke po medu. *Gospodarski list*, 3. Available at: <https://gospodarski.hr/rubrike/pcelarstvo-rubrike/muke-po-medu/> [Accessed 28 April 2024].
- Kallas, Z., Alba, M. F., Casellas, K. S., Berges, M., De Greef, G. D., Gil, J. M. (2017) Impact of the sensory experience on consumers' preference toward the origin of honey: a case study in Mar del Plata, Argentina. Available at: <https://nulan.mdp.edu.ar/id/eprint/2849/1/kallas-et-al-2017.pdf> [Accessed 19 September 2024].
- Kardas, M., Staškiewicz-Bartecka, W., Sołtys, K., Dul, L., Sapała, A.-M., Kiciak, A., Bielaszka, A. and Kardas, J. (2024) The quality of selected raw and pasteurized honeys based on their sensory profiles and consumer preferences. *Frontiers in Nutrition*, 10, 1330307.

- Kos Skubic, M., Erjavec, K., Klopčič, M. (2018a) Consumers' preferences regarding national and EU quality labels for cheese, ham and honey: The case of Slovenia. *British Food Journal*, 120 (5), 1015–1031. DOI: <https://doi.org/10.1108/BFJ-11-2017-0622>
- Kos Skubic, M., Erjavec, K., Ule, A., Klopčič, M. (2018b) Consumers' hedonic liking of different labelled and conventional food products in Slovenia. *Journal of Sensory Studies*, 33 (5), e12444.
- Larmond, E. (1977) *Laboratory methods for sensory evaluation of food*. Ottawa: Canada Department of Agriculture.
- Mascarello, G., Pinto, A., Crovato, S., Tiozzo Pezzoli, B., Pietropaoli, M., Bertola, M., Mutinelli, F., Formato, G. (2024) Consumers' Perceptions and Behaviors Regarding Honey Purchases and Expectations on Traceability and Sustainability in Italy. *Sustainability*, 16 (20), 8846. DOI: <https://doi.org/10.3390/su16208846>
- Meilgaard, M., Civille, G. V., Carr, B. T. (2015) *Sensory evaluation techniques (5th ed.)*. Boca Raton: CRC Press.
- Mesić, Ž., Juračak, J. (2022) Frauds in Food Supply Chains: The Case of Croatian Market. In: Soucie, S., Peštek, A. *Counterfeiting and Fraud in Supply Chains*. Bingley: Emerald Group Publishing, 49-72.
- Ministry of Agriculture (2025) Evidencija izdanih Potvrda o sukladnosti proizvoda sa Specifikacijom proizvoda Dokazana kvaliteta – med. Zagreb: Ministry of Agriculture Available at: <https://shorturl.bz/p2O> [Accessed 23 May 2025].
- Ministry of Agriculture, Forestry and Fisheries (2019) Nacionalni pčelarski program za razdoblje od 2020. do 2022. godine. Zagreb: Ministry of Agriculture, Forestry and Fisheries. Available at: <https://shorturl.at/K29Py> [Accessed 23 May 2025].
- Ministry of Agriculture, Forestry and Fisheries (2024) Godišnje izvješće o stanju poljoprivrede u 2023. godini. Zagreb: Ministry of Agriculture, Forestry and Fisheries. Available at: <https://shorturl.at/uUZbc> [Accessed 23 May 2025].
- Nascimento, A. G., Toledo, B. S., Guimarães, J. T., Ramos, G. L., da Cunha, D. T., Pimentel, T. C., Cruz, A. G., Freitas, M. Q., Esmerino, E. A., Mársico, E. T. (2022) The impact of packaging design on the perceived quality of honey by Brazilian consumers. *Food Research International*, 151, 110887.
- Official Gazette (2020) Pravilnik o nacionalnom sustavu kvalitete poljoprivrednih i prehrambenih proizvoda "Dokazana kvaliteta". Zagreb, Official Gazette (NN 18/2020). Available at: https://narodne-novine.nn.hr/clanci/sluzbeni/2020_02_18_465.html [Accessed 21 April 2024].
- Oravec, R., Juhász, A., Nábrádi, A., Neszmélyi, G. (2019) Role of sensory analysis and consumer test in the evaluation of acacia honey. *Annals of the Polish Association of Agricultural and Agribusiness Economists*, 21 (1), 124–130. DOI: <https://doi.org/10.5604/01.3001.0013.0787>
- Oravec, T., Kovács, I. (2019) Sensory examination of honey and the effect of sensory characteristics on purchase decisions. *Analecta Technica Szegedinensia*, 13 (1), 64-71. DOI: <https://doi.org/10.14232/analecta.2019.1.64-71>
- Pavliček, D., Furgel, S., Jaki Tkalec, V., Denžić Lugomer, M., Novosel, T. (2022) Ispitivanje kakvoće meda na hrvatskom tržištu u razdoblju 2019.-2021. godine, *Veterinarska stanica*, 53 (5), 513-523. DOI: <https://doi.org/10.46419/vs.53.5.15>
- Rabe-Hesketh, S., Skrondal, A. (2022) *Multilevel and longitudinal modeling using Stata (4th ed.)*. College Station, TX: Stata Press.
- Reeve, J. R., Hoagland, L. A., Villalba, J. J., Carr, P. M., Atucha, A., Cambardella, C., Delate, K. (2016) Organic farming, soil health, and food quality: Considering possible links. *Advances in Agronomy*, 137, 319–367. DOI: <https://doi.org/10.1016/bs.agron.2015.12.003>
- Reganold, J. P., Wachter, J. M. (2016) Organic agriculture in the twenty-first century. *Nature Plants*, 2, 15221. DOI: <https://doi.org/10.1038/nplants.2015.221>
- Sanzo, M. J., Del Río, A. B., Iglesias, V., Vázquez, R. (2001) El efecto de la actitud y de la calidad percibida sobre la intención de compra de un producto agroalimentario tradicional. In: XI Congreso Nacional de ACEDE. Zaragoza, Spain, 16-18 September 2001, Nacional de la Asociación Científica de Economía y Dirección de la Empresa.
- Starowicz M., Lamparski G., Ostaszuk A., Szmatołowicz B. (2021) Quality evaluation of polish honey: On-line survey, sensory study, and consumer acceptance. *Journal of Sensory Studies*, 36, e12661. DOI: <https://doi.org/10.1111/joss.12661>
- StataCorp (2023) *Stata Statistical Software: Release 18*. College Station, TX: StataCorp LLC.
- Stolzenbach, S., Bredie, W. L., Christensen, R. H., Byrne, D. V. (2013) Impact of product information and repeated exposure on consumer liking, sensory perception and concept associations of local apple juice. *Food Research International*, 52 (1), 91-98.
- Svečnjak, L., Hegić, G., Kezić, J., Turšić, M., Dražić, M. M., Bubalo, D., Kezić, N. (2008) The state of beekeeping in Croatia. *Journal of Central European Agriculture*, 9 (3), 475-482.
- Tuomisto, H. L., Hodge, I. D., Riordan, P., Macdonald, D. W. (2012) Does organic farming reduce environmental impacts? – A meta-analysis of European research. *Journal of Environmental Management*, 112, 309–320. DOI: <https://doi.org/10.1016/j.jenvman.2012.08.018>
- Vapa-Tankosić, J., Ignjatijević, S., Kiurski, J., Milenković, J., Milojević, I. (2020) Analysis of consumers' willingness to pay for organic and local honey in Serbia. *Sustainability*, 12 (11), 4686.
- Van den Bergh, B., Schmitt, B. H., Warlop, L. (2011) Embodied myopia. *Journal of Marketing Research*, 48 (6), 1033–1044. DOI: <https://doi.org/10.1509/jmr.10.0424>
- Varela, P. Ares, G., Giménez, A., Gámbaro, A. (2010) Influence of brand information on consumers' expectations and liking of powdered drinks in central location tests, *Food Quality and Preference*, 21 (7), 873-880. DOI: <https://doi.org/10.1016/j.foodqual.2010.05.012>
- Verbeke, W., Scholderer, J., Lähteenmäki, L. (2009) Consumer appeal of nutrition and health claims in three European countries. *Food Quality and Preference*, 20 (8), 703–716. DOI: <https://doi.org/10.1016/j.foodqual.2009.06.003>
- Yeow, S. H. C., Chin, S. T. S., Yeow, J. A., Tan, K. S. (2013) Consumer purchase intentions and honey related products. *Journal of Marketing Research & Case Studies*, 2013, 197440. DOI: <https://doi.org/10.5171/2013.197440>