

## HONEY MARKET CHALLENGES: FLAVORED HONEY AS HEALTHY FOOD CHOICE FOR CONSUMERS

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### ABSTRACT

The honey market has adapted to changing consumer preferences for healthy, sustainable produced, local, and high-quality food, which also leads to the development of new flavored honeys. The aim of the paper is to explore honey consumption trends and examine consumer acceptance of new flavored honeys. Consumer study is based on questionnaire survey combined with the evaluation of sensory attributes (color, taste, aroma, consistency, overall acceptance) of selected samples of flavored honeys (cinnamon, raspberry, cocoa and hazelnuts, grape powder, and ginger). The research was conducted in 2023 in Slovakia with a sample of 86 young consumers. Various statistical methods (the Chi-square test of independence, the Friedman test, Nemenyi procedure, extraction method principal component analysis and principal component analysis) were used to identify consumer acceptance and attitudes toward new flavored honeys. Results indicate that the younger generation tends towards occasional honey consumption, averaging up to 3 kg per year. Furthermore, the results showed that nearly 70% of consumers consume flavored honey and prefer honeys with propolis, pollen, royal jelly, ginger, and cinnamon. The motives for consumption are primarily taste and health benefits and key factors influencing the purchase and consumption of flavored honeys include quality and composition. Sensory evaluation highlights positive evaluations for color of honey with raspberry; aroma, taste, and overall acceptance of honey with cinnamon; and taste of honey with cocoa and hazelnuts. The findings underscore a shifting preference among younger consumers towards flavored honeys, indicating a growing market demand driven by both taste preferences and perceived health benefits, potentially reshaping the honey consumption patterns towards new and value-added products. Consumer study offers new insights for scientific research and provide valuable information for honey producers in developing and marketing of new flavored honey. Additionally, it contributes to public health awareness, emphasizing the significance of flavored honey consumption.

**Keywords:** honey, flavored honey, consumer, trends, health, sensory evaluation, Slovakia

### INTRODUCTION

Nowadays, the honey market is undergoing dynamic changes driven by shifting consumer preferences and emerging trends, reshaping perceptions of honey consumption. The first trend, with potential implications for the honey market, is characterized by consumer preferences for purely natural and raw food choices (Román *et al.*, 2017). One of these products is honey, regarded as a natural food made by bees from plant nectar, and it is consumable without the need for processing (Damto, 2019). Batt and Liu (2012) state that honey is clean and pure product without chemical contamination. Cortés *et al.* (2011) add that the mentioned natural substance contains carbohydrates, water, proteins, vitamins, minerals and phenolic compounds and therefore it can be used for various purposes (Gündoğdu *et al.*, 2019). So, honey is perceived as one of the most highly valued and appreciated natural products (Samarghandian *et al.*, 2017).

Following the above, honey is also connected with another consumer trend related to lifestyle, healthy diet and the prevention of disease (Sgroi & Modica, 2023). In the context of this, honey is the product with medicinal and nutritional values as well as healthy and therapeutic properties (Sgroi & Modica, 2023; Alnafissa & Alderiny, 2020; Kleisiari *et al.*, 2022). González-Montemayor *et al.* (2019) further point out biological properties of honey with emphasis on antioxidant, antibacterial, and anticancer ones. Moreover, honey was used as the first sweetener in the world (González-Montemayor *et al.*, 2019) and has higher nutritional properties in comparison with sugar and other sweeteners, so honey is perceived as healthier replacement (Palma-Morales *et al.*, 2023). Honey is often used as the sweetener to the tea, coffee, or juices (Mateescu *et al.*, 2020), but Dias *et al.* (2023) also focus on the using honey in food producing. Honey can be used in different types of food products, such as bakery products (biscuits, muffins, bread, and other bakery products), beverages (sport beverages, fruit beverages, vegetable beverages, ice tea, yoghurt drinks, and chocolate milk beverages), confectionary, candy, marmalades, jams, spreads, yogurts and others (Hirpara *et al.*, 2023; Bogdanov, 2017; Praneeth, 2012; Sharma *et al.*, 2016; Asminaya *et al.*, 2022; Maria Rosiana & Khoiriyah, 2018). Sharma *et al.* (2016) emphasize that using honey in food products is also very safe.

Due to growing concerns about production safety, consumers are increasingly inclined towards the trend of consuming local food, and honey is no exception (Wu *et al.*, 2015). Local partnerships provide valuable insights into consumer preferences for locally produced honey. Kassai and Farkas (2012) emphasize the role of such partnerships in engaging local actors, offering a framework to understand consumer behavior. Consumption of local honey can therefore be a way to avoid food safety risks (Popp *et al.*, 2018). However, the preference for consuming local honey can also be perceived from different points of view. The first aspect is the origin (Kehagia *et al.*, 2007), as Wu *et al.* (2015) emphasize a higher interest in locally produced honey if information about the negative aspects of the production of imported honey is available. Sunarić *et al.* (2020) further emphasize the different nutrient content between domestic honey and highly processed commercial honey. In the context of the above, it is necessary to focus on the honey adulteration (Damto, 2019). Lunyova *et al.* (2021) emphasize that the production process of natural honey is expensive and therefore concerns about the widespread adulteration of honey are justified. Consumption of this honey can be harmful to health and the quality of the honey is at a lower level. Following the points mentioned above, quality is considered one of the key aspects when choosing honey (Oravec *et al.*, 2020). The country of origin associated with the locality of the product represents a trust in the high quality of domestic honey (Pocol *et al.*, 2022). Jones Ritten *et al.* (2019) connected the quality with honey labeling. Pocol *et al.* (2022) point to honey certifications as an important parameter for assessing the quality of honey and the trustworthiness of the product by consumers. Oravec *et al.* (2020) focus on honey certification marks that include information on region of origin, brand, and producer. Šedík *et al.* (2023b) emphasize the existence of trademarks, which are a guarantee of buying high-quality local honey. Locality of honey can also be associated with another consumer trend, which is sustainability. When buying local honey, a lower ecological footprint is noted, so it significantly positively affects and supports a healthy and sustainable lifestyle (Blanc *et al.*, 2021). In connection with the sustainability and production of honey, it is also pointed out that the activity of bees contributes positively to the ecosystem balance of the territory and the whole environment (Sgroi & Modica, 2023; Pilati & Prestamburgo, 2016).

Despite the mentioned information regarding the health effects of honey, as well as the availability of high-quality and safe local honey, the level of honey consumption is relatively low (Kowalczyk *et al.*, 2023). Palmieri *et al.* (2022) highlight low annual honey consumption in European countries, reaching an average of approximately 0.60 kg per person in 2020. Among the European countries with the highest average honey consumption per capita, we can include Slovenia (1.60 kg), Greece (1.55 kg), Switzerland (1.41 kg), Austria (1.32 kg), Ukraine (1.15 kg), and Slovakia (1.10 kg) (FAO, 2019).

One option to increase and enhance honey consumption among consumers is to focus on creamed honey, which is formed through controlled crystallization and exhibits improved sensory and physical properties (Karahan *et al.*, 2023). Creamed honey is more popular among consumers in many countries because of its more homogeneous consistency, easier spreadability, and its suitability as a bread spread (Zak & Wilczyńska, 2017; Chen *et al.*, 2009). The use of honey becomes easier, and it does not drip (Krell, 1996).

It is also important to highlight that the existence of creamed honey can support the consumption of other bee products (royal jelly, propolis, perga, pollen, and bee bread), which can be mixed into this type of honey (Karahan *et al.*, 2023; Krell, 1996; Habryka *et al.*, 2020b; Čelan *et al.*, 2022). Furthermore, creamed honey can be enriched with additives, such as medicinal plants (garlic, mint, and mushrooms), extracts, fresh buds of pine and walnut, dried fruit and vegetable products, chokeberry fruits, mulberry fruits and leaves, cocoa, fruit or vegetable juices, herbs, marshmallow root, seaberry, elderberry, cranberry, hops, cloves, ginger, vanilla, black cumin, blackberry, strawberry, orange, raspberry, european blueberry, lemon grass, lemon, peppermint, strawberries, raspberries, grain cereal flour extrudates (Đorđević *et al.*, 2022; Džugan *et al.*, 2017; Šedík *et al.*, 2019; Pohorecka, 2004; Socha *et al.*, 2009; Guldás *et al.*, 2022; Milek *et al.*, 2021; Tomczyk *et al.*, 2019; Shahbazi & Bahrami, 2019; Žebracká *et al.*, 2022; Bobade & Sharma, 2017).

The key advantages of these honeys are their consumer acceptance and the fact that flavored honey is becoming increasingly popular among consumers (Šedík *et al.*, 2020). The reason is not only the new original taste and easy spreadability of the product but also the possibility of using it as a spread, thereby replacing other foods (Mateescu *et al.*, 2020). Honey with additional ingredients, such as chocolate or fruit, can be an interesting alternative for consumers as a suitable substitute for sweet spreads or jams (Šedík *et al.*, 2023a; Šedík *et al.*, 2020; Milek *et al.*, 2021; Habryka *et al.*, 2020b; Sowa *et al.*, 2019; Guldás *et al.*, 2022). In addition to consumer acceptability, an important attribute of these honeys is the fact that enrichments incorporated into honey significantly enhance its health-promoting properties (Žebracká *et al.*, 2022; Sowa *et al.*, 2019; Džugan *et al.*, 2017).

In the context of the mentioned trends in the honey market and potential future directions, it is essential to understand consumer acceptance of new types of honey, flavored honey, and honey with enrichments. Thus, the need to comprehensively understand consumer behavior and preferences regarding the consumption of flavored honey products can be considered a key research problem. Despite existing studies examining general consumer preferences for honey products, there remains a significant gap in the literature regarding the specific dynamics of flavored honey consumption. Given these considerations, the aim of the paper is to identify consumer consumption patterns of honey and flavored honey, with a focus on motives for consuming flavored honey, factors influencing the purchase and consumption of flavored honey, as well as price acceptability. Additionally, the paper aims to examine consumer preferences in evaluating sensory attributes of selected samples of flavored honeys. The mentioned was achieved by questionnaire survey combined with sensory evaluation of flavored honeys, which are not explored in-depth in current scientific literature, and a comprehensive study is absent. Consumer study may be a significant contribution not only to the scientific community but also to research on new flavors that can enrich the honey. It is also relevant for business entities focusing on the development of new innovative honey products and policymakers aiming to enhance public health by incorporating health-beneficial additions into honey and increasing consumer awareness of their consumption. The study reflects current trends in consumer interest in healthy foods, sustainability aspects, development of new innovative products with a focus on maintaining high quality, origin guarantees, and food safety.

Based on the aforementioned, following research questions were formulated:

RQ1: What are the consumer preferences for flavored honey consumption?

RQ2: How do consumers evaluate the sensory attributes of selected samples of flavored honeys?

## MATERIAL AND METHODS

### Data collection

The consumer study was conducted by a questionnaire survey supplemented with sensory evaluation of attributes of flavored honeys. The research was carried out on a sample of 86 young respondents aged up to 35 years in April 2023 in Slovakia. The younger generation of consumers was selected due to declining honey consumption, as well as their higher openness to new experimental foods and taste profiles. The research was carried out using the convenience sampling technique

and only respondents aged 18 to 35, honey consumers, consumers without food allergies and intolerance to the ingredients in the tested honeys participated in it. The aim of the research was to identify consumption patterns of honey and flavored honey, with a focus on the consumption of flavored honey. The mentioned includes key motives for consuming flavored honey, preferences for way of consumption, factors influencing purchase and consumption, price acceptance, and packaging size. The aim of the sensory evaluation was to assess the attributes of five selected flavored honeys (Sample A = honey enriched with cinnamon; Sample B = honey enriched with raspberry; Sample C = honey enriched with cocoa and hazelnut; Sample D = honey enriched with grape powder; Sample E = honey enriched with ginger), with consumers unaware of the type of the enriched honey. Samples of flavored honey were purchased on Slovak market and all samples involve rapeseed honey of creamed consistency. The research was divided into two parts. The first part of survey required participants to respond to a series of questions related to consumer behavior on the honey market and the consumer acceptability of new flavored honey. The duration of this section was approximately 20 minutes. During the second part of survey, sensory evaluation sessions, respondents evaluated various sample of flavored honey based on predetermined criteria. This part of research lasted approximately 30 minutes per participant. The informed consent was obtained from participants and respondents agreed to data processing for scientific purposes, while anonymity and confidentiality of answers were ensured. Respondents were categorized based on demographic characteristics as follows: gender (males, 23.26%; females, 76.74%), residence (rural, 53.49%; urban, 46.51%), number of household members (1-2 members, 16.28%; 3 members, 37.21%; 4 members, 36.047%; 5 members and more, 10.465%), income (up to 199 Euros, 22.09%; 200 – 499 Euros, 40.70%; 500 – 1,000 Euros, 29.07%; more than 1,000 Euros, 8.14%), and economic activity (students, 63.95%; employed, 36.05%).

### Measures and analysis

The questionnaire survey was divided into two parts and included closed-ended questions, scaling questions with a 7-point scale, and ordinal questions. The first part of the survey focused on honey consumption, as well as the consumption of flavored honey and consumer preferences in the purchase and consumption of this type of honey. Firstly, respondents determined the frequency of honey consumption by selecting one of the following options: more than 3 times a week, 1-2 times a week, 1-2 times a month, and occasionally (e.g., during the winter season, illness). Furthermore, consumers identified the amount of honey consumed per year, choosing one of the following options: less than 1 kg, 1.01-2.99 kg, 3.00-4.99 kg, or 5.00 kg and above. In the context of the aforementioned, we investigated whether there is a dependence between the frequency and quantity of honey consumption using the Chi-square test of independence.

Furthermore, survey includes questions related to consumption of flavored honey. Respondents who consume flavored honey chose the supplements and flavors they consume from the the following options: peanuts, chokeberries, cranberries, lemon, chocolate, blueberries, bilberries, chestnuts, pomegranate, chia seeds, chili, strawberries, cocoa, cardamom, hemp, turmeric, wild berries, lavender, hazelnuts, poppy seeds, raspberries, apricots, royal jelly, moringa, nuts, pollen, gingerbread, pistachios, buckwheat, orange, propolis, sea buckthorn, currants, rosemary, spirulina, rose hips, cinnamon, thyme, vanilla, cherry, ginger, or any other flavor they could specify.

Respondents also identified motives for consuming flavored honey, including taste, habit of honey consumption since childhood, health benefits, recommendations from nutritionist, alternative to other foods, lifestyle, nutritional values, strengthening immunity, supporting good sleep, source of energy, source of vitamins, source of minerals, source of sugars, antioxidant effects, and the desire to try something new. Motives were rated on a scale from 1 to 7, with 1 representing insignificant motivation and 7 representing significant motivation. Differences in the evaluation of motives for consuming flavored honey were identified using the Friedman test, Nemenyi procedure, and graphical representation illustrated by Demsar plot.

Another question related to the preference for consuming flavored honey where consumers choose one of the following methods or options to incorporate flavored honey into their meals: using flavored honey as a spread, incorporating flavored honey into oat/cereal porridge, using flavored honey as a marinade/sauce, using flavored honey in cakes/cookies, or using flavored honey in beverages.

Furthermore, factors related to the purchase and consumption of flavored honeys were also assessed, considering aspects such as price, price discounts, alternative product prices, quality, composition, type of honey used in flavored honey production, nutritional values, health benefits, country of origin, producer, locality, processing technology, packaging appearance, information on the package, label design, packaging size, packaging material (eco-friendliness), color of flavored honey, aroma of flavored honey, consistency of flavored honey, recommendations, online promotion, offline promotion, place of purchase, innovativeness, and flavor. Factors were rated on a scale from 1 to 7, with 1 indicating no importance and 7 indicating high importance. Moreover, we examined the interrelationships among 21 factors using extraction method principal component analysis and rotation method Varimax with Kaiser Normalization.

In the context of consumer preferences in the flavored honey market, consumers specified the price they are willing to pay for 250 g of flavored honey and they choose from options such as 3.00-3.99 Euros, 4.00-4.99 Euros, 5.00-5.99 Euros, 6.00-6.99 Euros, or more than 7.00 Euros. Additionally, consumers determined their preferred packaging size for flavored honey, choosing from the options of 15 g, 200 g, 250 g, 350 g, 400 g, 600 g, and 700 g.

The final part of the research involved the sensory evaluation of attributes of 5 samples of flavored honeys. Sensory evaluation included attributes such as taste, color, aroma, consistency, and overall acceptance of the flavored honey samples. Based on these attributes, consumers ranked the tested samples, with 1 representing the lowest preference and 5 the highest preference. Preferences for flavored honey samples and perceived differences among them were examined using the Friedman test and Multiple pairwise comparisons using Nemenyi procedure. After the application of sensory evaluation, consumers ranked the samples in terms of their preferences and potential purchase and consumption, where 1 indicated not consumption/not purchase, and 5 indicated consumption/purchase. In the context of the overall evaluation of the samples by sensory evaluation, consumers answered an additional question aimed at assessing the importance of the criteria affecting their decision. They evaluated attributes such as taste, color, consistency, and aroma on a scale from 1 to 7, where 1 represented an unimportant criterion and 7 represented an important criterion.

For statistical data analysis, a significance level of 0.05 was set, and statistical methods were performed using the XLSTAT 2022.4.1 and IBM SPSS 28 software.

**RESULTS**

**Consumer preferences for consumption of honey and flavored honey**

The results of the consumer study indicate that young consumers predominantly consume honey only occasionally during the winter season or illness (37.21%), 1-2 times per week (27.91%), or 1-2 times per month (20.93%). On the other hand, it is necessary to point out that regular consumption, exceeding 3 times per week, was identified in 13.95% of the respondents included in the consumer study. Regarding the annual quantity of honey consumed, the results indicated consumption at very low levels, less than 1 kg (40.70%), or 1.01-2.99 kg (41.86%). Higher honey consumption in the range of 3.00 to 4.99 kg was identified in 11.62% of respondents, and only 5.82% of consumers annually consume honey at levels exceeding 5.00 kg. Furthermore, using the Chi-square test of independence, a statistically significant dependence between the examined variables was revealed ( $p < 0.001$ ). The results indicate that consumers who consume honey more frequently have higher annual honey consumption quantities (Table 1).

**Table 1** Honey consumption

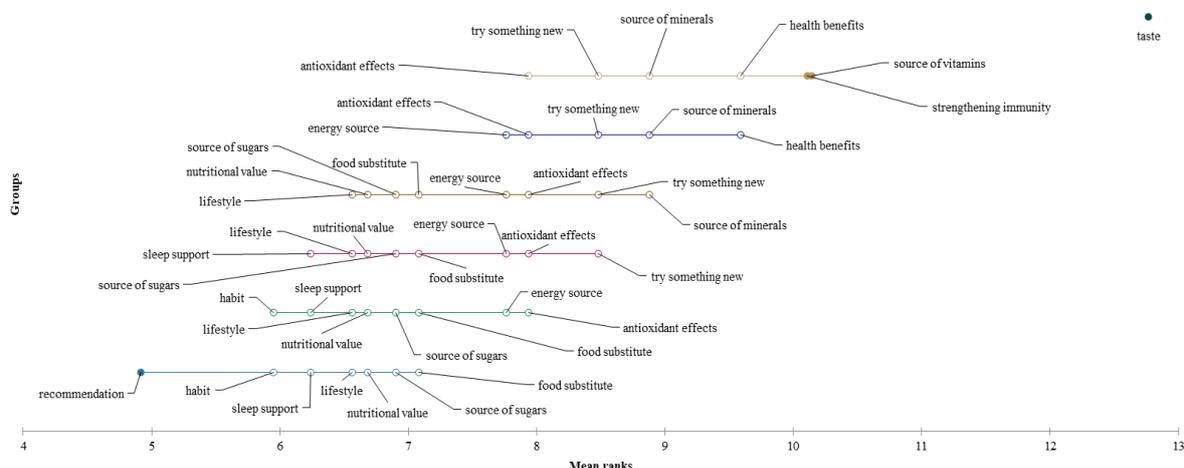
Frequency of consumption	Amount of consumption			
	<1 kg	1.01-2.99 kg	3.00-4.99 kg	>5.00 kg
more than 3 times a week	1.16%	4.65%	5.81%	2.33%
1-2 times a week	3.49%	16.28%	4.65%	3.49%
1-2 times a month	10.465%	10.465%	0.00%	0.00%
occasionally	25.58%	10.465%	1.16%	0.00%

The consumer study further revealed that 30.23% of the respondents participating in the survey have not consumed flavored honey or honey with enrichments. On the other hand, a positive finding is that 69.77% of consumers have experienced the consumption of new varieties of honey. The most popular enriched honeys among young Slovak consumers are honey with propolis (27.91%), honey with pollen (26.74%), honey with royal jelly (19.77%), honey with ginger (18.60%), and honey with cinnamon (12.879%).

Consumers further evaluated the influence of selected motives for the consumption of flavored honeys. Based on the survey results and the means, it can be concluded that the key motives for consumption are the taste of new honeys (mean = 6.77), the potential for strengthening immunity (mean = 5.83), the perception that this type of honey is a source of vitamins (mean = 5.78), the perceived importance of consumption for overall health (mean = 5.63), the belief that flavored honeys are a source of minerals (mean = 5.36), an opportunity to try/consume something new (mean = 5.23), and the antioxidant effects (mean = 5.14). On the other hand, the least significant motives for consumption among young Slovak consumers are the recommendation of nutritionists (mean = 3.84), support for good sleep (mean = 4.65), consumption habit (mean = 4.50), lifestyle (mean = 4.57), and using them as food substitutes/alternatives (mean = 4.73). Using the Friedman test ( $p < 0.0001$ ) and post-hoc Nemenyi procedure, statistically significant differences were revealed in the evaluation of motives for the consumption of flavored honey. The perceived differences are graphically illustrated by a Demсар plot (Figure 1). Flavored honey as an ingredient in various dishes was the subject of further investigation. The results revealed that 33.72% of consumers prefer incorporating enriched honey into oat or cereal porridge, another 22.09% would use it as a spread, 19.77% of consumers would use in cakes/desserts/cookies, and 17.44% would

consume it in beverages. The least attractive use of flavored honey would be in sauces or marinades, because only 6.98% of young consumers would use it.

The factors influencing the purchase and consumption of flavored honey were also examined in a consumer study. Based on the research results and means, it can be stated that the key factors for the purchase and consumption of these new types of honey include quality (mean = 6.49), flavor (mean = 6.21), composition (mean = 5.93), health benefits (mean = 5.74), local product (mean = 5.5), producer (mean = 5.48), country of origin (mean = 5.35), nutritional values (mean = 5.20), and recommendation (mean = 5.05). In the context of the examined factors, we also identified mutual relationships among the factors using exploratory factor analysis with Kaiser-Meyer-Olkin test and Bartlett's test. The results of Kaiser-Meyer-Olkin Measure of Sampling Adequacy is at a level 0.720, which indicate the presence of a strong partial correlation. Moreover, the results of Bartlett's test of Sphericity showed the significance of factor analysis ( $p < 0.001$ ). Principal component analysis revealed three groups of factors. The first of them is "price" factor, which highlights the role of pricing considerations, encompassing the product's price, discounts, and the price of alternative food options, in shaping consumer decision-making. The second factor is "product attributes related to quality" consisting of composition, country of origin, type of honey, quality, processing technology, nutritional values, information on the label, local product, package size and health benefits which contribute to consumers' perceptions of flavored honey from the view of quality, safety and healthiness. The last factor is "other marketing aspects" which includes online promotion, offline promotion, label design, innovations, packaging appearance, consistency, recommendations, and place of purchase. This factor is aimed at the significance of marketing tactics, product presentation, and external influences, that shape consumer choices (Table 2).



**Figure 1** Differences in evaluation of key motives for consumption of flavored honey

**Table 2** Factors affecting purchase and consumption of flavored honey (Rotated Component Matrix)

Factors	Component		
	1	2	3
online promotion	0.829		
offline promotion	0.811		
label design	0.763		
innovativeness	0.739		
packaging appearance	0.645		
consistency	0.537		
recommendations	0.501		
place of purchase	0.428	0.412	
composition		0.730	
country of origin		0.692	
type of honey		0.672	
quality		0.655	
processing technology		0.605	
nutritional values		0.583	
information on the label		0.580	
local product		0.542	
package size		0.519	
health benefits		0.489	
price			0.920
price discount			0.891
price of the alternative product			0.843

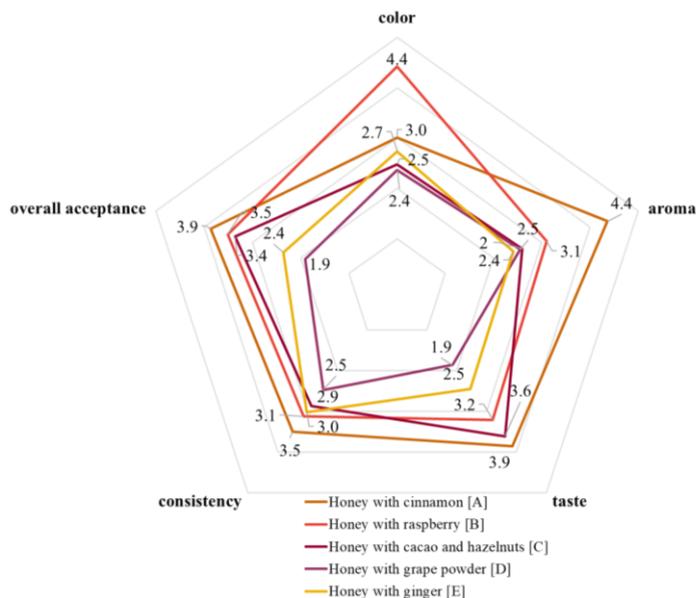
Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

The results further indicate the price acceptance of young consumers for a 250 g package of flavored honey. In general, it can be stated that for young consumers, an acceptable price is at the level of 5.00 - 5.99 Euros (31.39%), or 4.00 - 4.99 Euros (27.91%). On the other hand, 20.93% of consumers would pay a maximum of 3.99 Euros for the given product, and 19.77% of consumers are willing to pay more than 6.00 Euros for the product. In the context of preferred package size, the consumer survey revealed that the most preferred size among young consumers is 250 g (34.88%), 400 g (20.93%), or 350 g (17.44%). An interesting finding was that 15.12% would prefer a larger package with a weight of 600 and 700 g. On the contrary, only 4.65% of young Slovak consumers would prefer single-use packaging (15 g).

**Evaluation of sensory attributes of flavored honeys**

Sensory evaluation of flavored honeys were the subject of the second part of the research. The first evaluated attribute was the color of flavored honeys. The results of the research, based on the average ranking, showed that young consumers preferred the following samples: honey enriched with raspberry [B] (mean = 4.42), honey enriched with cinnamon [A] (mean = 3.01), honey enriched with ginger [E] (mean = 2.73), honey enriched with cocoa and hazelnuts [C] (mean = 2.48), and honey enriched with grape powder [D] (mean = 2.36). The second parameter was the aroma of flavored honey. The results of the average ranking showed that consumers prefer honey enriched with cinnamon [A] (mean = 4.36), followed by honey enriched with raspberry [B] (mean = 3.09), honey enriched with cocoa and hazelnuts [C] (mean = 2.59), honey enriched with grape powder [D] (mean = 2.54), and honey enriched with ginger [E] (mean = 2.41). Another investigated sensory attribute was the taste of flavored honeys. The results of the research, based on the average ranking, showed that the most flavor-preferred enriched honey is honey enriched with cinnamon [A] (mean = 3.86) and honey enriched with cocoa and

hazelnuts [C] (mean = 3.61). Less tasty honeys from the point of view of young consumers are honey enriched with raspberry [B] (mean = 3.21), honey enriched with ginger [E] (mean = 2.45), and honey enriched with grape powder [D] (mean = 1.86). Consistency is another aspect considered in the context of sensory evaluation. The results of the average ranking showed that honey enriched with cinnamon [A] (mean = 3.50) is consistently the best rated, followed by honey enriched with raspberry [B] (mean = 3.12), honey enriched with ginger [E] (mean = 3.02), honey enriched with cocoa and hazelnuts [C] (mean = 2.87), and honey enriched with grape powder [D] (mean = 2.48). Finally, consumers evaluated the overall acceptance of honey samples from the sensory evaluation of the flavored honeys, and based on the results of the average ranking, we can conclude that the greatest overall acceptability is for honey enriched with cinnamon [A] (mean = 3.86), honey enriched with raspberry [B] (mean = 3.51), honey enriched with cocoa and hazelnuts [C] (mean = 3.36), and lower acceptability is identified in honey enriched with ginger [E] (mean = 2.36) and honey enriched with grape powder [D] (mean = 1.91). Indicated preferences of flavored honeys in terms of individual sensory attributes are shown graphically in Figure 2.



**Figure 2** Sensory evaluation of product attributes of different samples of flavored honey

Furthermore, statistically significant differences in the evaluation of sensory attributes of the examined samples were identified using the Friedman test ( $p < 0.0001$ ). The implemented Nemenyi method demonstrated the existence of differences (Table 3). Based on the results, it can be highlighted that the most positively evaluated attributes were the color of honey enriched with raspberry [B], the aroma of honey enriched with cinnamon [A], the taste of honey enriched with cinnamon [A], overall acceptance of honey enriched with cinnamon [A], and the taste of honey enriched with cocoa and hazelnuts [C]. Conversely, the least favorably evaluated among all sensory attributes and samples was the taste of honey with the enrichment of grape powder [D].

**Table 3** Evaluation of sensory attributes of flavored honey samples

Sample	Frequency	Sum of ranks	Mean of ranks	Groups
taste [D]	86	628,000	7,302	A
overall acceptance [D]	86	648,000	7,535	A B
overall acceptance [E]	86	843,000	9,802	A B C
color [D]	86	843,000	9,802	A B C
aroma [E]	86	863,000	10,035	A B C D
taste [E]	86	883,000	10,267	A B C D
consistency [D]	86	893,000	10,384	A B C D
color [C]	86	893,000	10,384	A B C D
aroma [D]	86	923,000	10,733	A B C D E
aroma [C]	86	943,000	10,965	A B C D E
color [E]	86	1003,000	11,663	B C D E F
consistency [C]	86	1063,000	12,360	C D E F G
color [A]	86	1123,000	13,058	C D E F G
consistency [E]	86	1128,000	13,116	C D E F G
aroma [B]	86	1158,000	13,465	C D E F G H
consistency [B]	86	1173,000	13,640	C D E F G H

Continue Table 3						
taste [B]	86	1208,000	14,047	D	E	F G H
overall acceptance [C]	86	1273,000	14,802		E	F G H
consistency [A]	86	1333,000	15,500			F G H
overall acceptance [B]	86	1338,000	15,558			F G H
taste [C]	86	1383,000	16,081			G H I
overall acceptance [A]	86	1488,000	17,302			H I
taste [A]	86	1488,000	17,302			H I
aroma [A]	86	1703,000	19,802			I
color [B]	86	1728,000	20,093			I

Based on the results of the Friedman test and Nemennyi method, statistically significant differences were identified among the samples in all sensory attributes. Regarding color, sample B was the most positively evaluated, and statistically significant differences in ratings were demonstrated between sample B and the other samples. The second sensory attribute was aroma, and the results indicated that sample A was rated the highest. Statistically significant differences in ratings were identified between sample A and the other samples, as well as between sample B and sample F. In terms of taste, sample B was rated the highest, with statistically significant differences identified among the group of samples B, D, A, and the group of samples E, F. Consistency represented another sensory attribute evaluated by consumers, and it can be stated that sample A was the most positively evaluated, with differences in ratings identified between samples A and E. Regarding overall acceptance, sample A was rated the highest, and the results revealed statistically significant differences among the group of samples A, B, C, and the group of samples E, D.

In the context of sensory evaluation of attributes of individual samples of flavored honeys, the research results, based on average rankings, indicated that consumers would prefer honey enriched with cinnamon [A] (mean = 4.11), honey enriched with raspberry [B] (mean = 3.36), honey enriched with cocoa and hazelnuts [C] (mean = 3.30), honey enriched with ginger [E] (mean = 2.29), and honey enriched with grape powder [D] (mean = 1.93) for purchase and consumption. The average ranking of individual samples is consistent with the sensory evaluation of the overall acceptance of flavored honey samples. Furthermore, we identified that the taste of honey has the most significant impact on the overall acceptance of flavored honey samples and their future purchase and consumption.

## DISCUSSION

The results of a consumer study conducted in Slovakia indicate that young consumers under the age of 35 consume honey only a few times a week and occasionally, with corresponding annual honey consumption at the level of up to 1 kg or 1.01 kg to 2.99 kg. These findings are consistent with other studies. **Žak (2017)** found that only 11% of young consumers consume honey daily, while 55% consume it only occasionally. Similarly, **Majewska et al. (2012)** revealed that only 12.5% of students consume honey several times a week. **Grontkowska (2019)** noted that 75% of consumers consume honey several times a week or occasionally, with only 1.7% of consumers up to 30 years consuming honey daily. Additionally, **Pocol et al. (2018)** found that young consumers consume honey only a few times a week or occasionally. In terms of consumption quantity, **Pocol et al. (2018)** observed annual honey consumption among young consumers below 1 kg. **Žak (2017)** also identified low monthly honey consumption, with less than 250 g per month. **Khaoula et al. (2019)** revealed that the majority of young consumers under 25 years consume less than 4 kg of honey per year. Honey consumption can be influenced by perceived consumer trends related to healthy lifestyle and interest in functional foods for the future perspectives (**Šedík et al., 2019**). However, **Grontkowska (2019)** found that the primary reason for low consumption is insufficient taste of honey. Therefore, flavored honey has become attractive for consumption, as flavor is a significant factor influencing honey consumption (**Sparacino et al., 2022**).

The study in Slovakia showed that up to 70% of young consumers preferred flavored honeys, specifically those with propolis, royal jelly, pollen, and cinnamon. Study conducted by **Elsadibah et al. (2023)** revealed that only 9.96% of consumers consumed flavored honey. The divergent behavior can be explained by the fact that our study focused only on the young generation, while study of **Elsadibah et al. (2023)** examined the behavior of all age generations. **Leaka et al. (2020)** and **Šedík et al. (2023a)** identified that preferred types of flavored honey are honeys with dried fruit, lemon, cinnamon, propolis, bee pollen, and royal jelly. **Leaka et al. (2020)** found that consumers generally prefer flavored honey and honey value-added products, providing extra value compared to traditional honey. Many studies indicated positive health benefits resulting from the consumption of flavored honey (**Šedík et al., 2020; Wilczyńska et al., 2017; Mateescu et al., 2020**). Following the above, it can be stated that taste and health aspects can be the key reasons for acceptance and consumption of flavored honey. The results of our study also showed that taste and health benefits can be motivating factors for consumption. Furthermore, our study revealed that consumers prefer to use flavored honey as a spread. **Ganie et al. (2022)** also found that consumers accept honey-based apple spreads and marmalade products. Moreover, **Šedík et al. (2019)** suggests that honey with cocoa can be used as an alternative to chocolate spreads.

As part of the consumer study, sensory evaluation was conducted, and the results showed that honey with cinnamon is the most acceptable to consumers in terms of color, aroma, and consistency. **Wilczyńska et al. (2017)** also conducted sensory analysis of flavored honeys, revealing that the addition of spices, specifically ginger, cardamom, and cinnamon, influenced the spicy taste assessment. However, for consumers, honey with cinnamon is the most accepted. **Šedík et al. (2020)** conducted sensory evaluation of flavored honeys and found that honey with cocoa and cinnamon were evaluated the most positive, mainly in terms of aroma, color, and taste. Additionally, **Wilczyńska et al. (2017)** pointed out that the quantity of additives significantly affects the acceptance of honey's texture and color. **Habryka et al. (2020a)** supports this finding, emphasizing that the use of enrichments is influenced by changes in sensory characteristics as well as overall consumer acceptance of new innovative flavored honey with health benefits.

Based on the above, honey, especially among the young generation, is not an attractive food for consumption in Slovakia. In relation to the increase in honey consumption in the European Union, **Vida and Feketéne Ferenczi (2023)** propose to develop a global "honey strategy", focusing on the beneficial physiological effects and promoting honey consumption through programs to promote honey consumption in various forums, raising awareness of the ecological importance of bees, limiting adulteration honey, and direct purchase of quality honey from producers. However, it is important that the honey market also adapts to the changing demands of consumers and reflects evolving consumer tendencies. Trends in honey consumption are mainly determined by new honey flavors incorporated into traditional honey. The mentioned presents an opportunity for honey producers to diversify their product offering and use this growing trend to their advantage. By promptly responding to new consumer demands, they can differentiate themselves from other producers and increase their competitiveness on the market by developing and producing new flavored honeys using innovative flavors.

Retailers can also be affected by the aforementioned trends. It is essential to wide honey offer with flavored honeys that are innovative and bring added value to consumers. If retailers constantly monitor changes in customer preferences and flexibly adapt to market conditions, they can effectively increase sales and profits. However, it is important that these retailers can provide the necessary information about the benefits and variety of flavored honeys, look for suppliers who offer products that meet the preferences of customers, cooperate with local beekeepers in order to provide customers with honey with an emphasis on high quality and sustainability.

New trends in the honey market and the offer of flavored honeys can significantly influence state policy. It is desirable that regulations and standards governing flavored honey be adopted to ensure consumer protection. Furthermore, the state can help support honey producers who have decided to develop new flavored honeys, either in the form of financial incentives or educational programs. State policy can significantly support research and innovation in honey production, processing, and flavoring technologies to improve the quality and competitiveness of products on the market.

## CONCLUSION

The paper focused on emerging trends in the honey market towards the choice of natural, healthy, local, sustainable food products with high quality. Honey is a food that meets current consumer requirements, but it is crucial to choose honey based on its origin, which is the guarantee of quality, safety, and healthiness. The paper also pointed out a new trend of enhancing honey consumption through new flavored honeys with various enrichments. A conducted consumer study revealed that young Slovak consumers are not frequent honey consumers and the majority of them consume less than 3 kg of honey annually. However, the study also revealed that almost 70% of respondents consumed flavored honey, with a preference for honey with propolis, pollen, royal jelly, ginger, and cinnamon. Key motives for consuming these new types of honey include taste, followed by health benefits, immunity enhancement, and awareness that flavored honey is a source of energy, vitamins, and minerals. An interesting finding was that many young consumers try new flavored honeys due to desire to experience something new. Quality, composition, health aspects, locality, manufacturer, and origin were identified as significant factors influencing consumers' purchasing and consumption decisions. To position new flavored honeys in the market, it was found that young consumers would be willing to pay 4 to 6 euros for a 250 g package, with a preference for flavored honey in weights of 250 g, 350 g, or 400 g.

Furthermore, results of sensory evaluation of taste, aroma, consistency, and overall acceptance showed that honey with cinnamon was the most attractive to consumers. Regarding color evaluation, honey with raspberries was visually the most appealing to consumers. However, when evaluating all attributes and samples, honey with cocoa and honey with cinnamon have positive ratings for taste and overall acceptance, as well as consistency, flavor, aroma, and overall acceptance of honey with raspberries. In contrast, honey with grape powder have negative ratings for taste and overall acceptance.

The results of the study, focusing on consumer preferences and sensory evaluation of flavored honeys, contribute to the scientific field, as there is currently a lack of studies based on the combination of consumer surveys and sensory evaluation. The findings enrich the understanding of changes in consumer preferences for honey consumption, the importance of honey origin, the growing interest in new flavored honeys, and the support of honey consumption, especially among young consumers. The results can be a basis for further research and the experimental development of new flavored honeys. Additionally, the study can be beneficial for honey producers who can utilize these findings in developing and producing new flavored honeys with health-beneficial enrichments, as well as in creating and implementing marketing strategies for introducing new products to the market. The study's results are also applicable to policy makers aiming to promote public health through the consumption of new honey flavors and in informing consumer about the consumption of flavored honeys with an emphasis on enrichments.

Despite the numerous contributions of the study to both scientific knowledge and practical applications, the study has its limitations. The key limitation is the reliance on self-reported measures, the restriction to the young generation, and the territorial focus on Slovakia. Therefore, future research could expand to all age groups of consumers and explore the acceptance of flavored honey among consumers in different countries to specify differences.

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