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CONSUMER BEHAVIOUR OF YOUNG GENERATION IN SLOVAKIA TOWARDS COCOA-ENRICHED HONEY

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ABSTRACT
The new trend of healthy lifestyle increases consumers´ attention towards superfoods or functional food. Due to this fact, honey enriched with various healthy foods such as cocoa, cinnamon, ginger or dried fruits has started to appear on the European market. The aim of this research paper was to investigate consumer´s perception and preferences for cocoa-enriched honey. Consumer research was based on questionnaire survey extended by product testing. This survey was conducted in 2018 (February and March) and in total 257 young Slovak consumers between 18 - 30 years participated. Each respondent tested and evaluated sensory attributes of the product (taste, aroma, colour and texture) using a 5-point scale. Statistical analyses included Friedman test, Mann-Whitney U test, Fisher's Exact Test, Pearson Chi-square test and Cramer'V coefficient. Results showed that the cocoa-enriched honey was evaluated as tasty, aromatic, gently, delicious, special, with ideal sweetness and amount of cocoa. All sensory attributes were evaluated positively (2 - good). Females were more interested in the purchase of this product. Moreover, the product would be purchased mostly by respondents who consider it a healthier alternative to commercial chocolate spreads or by those who consider their eating habits healthy. Laboratory tests revealed that the antioxidant activity of the product was higher in comparison to normal honey. In conclusion, the obtained information could be used in product positioning, promotion and designing appropriate marketing strategy.

Keywords: honey; cocoa; product testing; questionnaire survey; Slovakia

INTRODUCTION
Honey is considered to be a complex food due to its rich nutritional value and biological variability. In general, honey is perceived as a natural sweetener and widely accepted by consumers as a healthy alternative to sugar. Moreover, it contains a wide spectrum of vitamins, minerals, enzymes, amino acids as well as antioxidant compounds such as phenolics acids and flavonoids **(Pyrzynska and Biesaga, 2009; Weston, 2000; Kačániová et al., 2015)**. Besides nutritional value, honey has many antimicrobial and healing properties. In medicine, honey is used for curing various diseases including skin wounds, colds or diseases of gastrointestinal character. Nowadays, honey is frequently used in apitherapy which is an important part of the complementary and alternative medicine. Honey and other bee products are commonly used in pharmacy as diet supplements, prophylactic agents or drug components **(Gašic et al., 2014; Lusby et al., 2005; Al-Mamary et al., 2002)**.

Cocoa powder is a plant-based product, which is obtained by milling roasted cocoa nibs and contains more than 300 constituents including minerals, polyphenol acids and flavonoids. Many studies have proven its antioxidant, anti-inflammatory and cardio-protective properties. Approximately 30% of polyphenol content is made by flavonoids (procyanidin, catechin and epicatechin) therefore this product has a significantly higher antioxidant activity than for example pomegranate, blueberries or cranberries. There is no doubt that cocoa powder has potential health benefits and is perceived by many consumers as a functional food **(Todorovic et al., 2017; Araujo et al., 2013; Lapčík et al., 2017; Godočíková et al., 2016; Kozelová et al., 2014).**

Due to the increasing attention of consumers towards healthy products and functional food, new honey-based products appeared on the European market. Usually, these products are a combination of honey and other healthy foods such as nuts, dried fruits including cherries, prunes, apricots or even various spices (cinnamon, ginger, chilli or cocoa powder). Sometimes, honey is mixed with other bee products such as propolis, pollen, royal jelly or bee bread. The final product (enriched honey) usually has higher antioxidant properties as well as nutritional value **(Kowalski and Makarewicz, 2017; Ćetković et al., 2014; Tumbas et al., 2012; Vulić et al., 2015; Wilczyńska et al., 2017).**

Scientific hypothesis
The aim of this research paper is to study the perception of young Slovak consumers and their preferences towards cocoa-enriched honey.

Several hypothesis were formulated:
Hypothesis 1: - There exist differences in evaluation of sensory attributes (taste, aroma, colour, texture).
Hypothesis 2: - There exist differences in evaluation of semantic differential between genders.
Hypothesis 3: - There exists dependence between purchase intentions and gender.
Hypothesis 4: - There exists dependence between purchase intentions and one´s perception of healthy eating habits.
Hypothesis 5: - There exists dependence between purchase intentions and product perception as a healthier alternative to commercial spreads.
Hypothesis 6: - The antioxidant activity of cocoa-enriched honey will be higher in comparison to normal honey.

MATERIAL AND METHODOLOGY

Consumer research

The primary data were based on questionnaire survey and product testing both conducted in the spring 2018 (February - March). The tested product was rapeseed honey in creamed consistency enriched with cocoa powder (see Table 1). Respondents evaluated both sensory and abstract attributes using a 5-point scale. Afterwards each respondent answered the questions regarding consumer and purchasing behaviour. Target group were 257 young consumers between 18 – 30 years. According to socio-demographic characteristics, the research sample comprises women (56.03%) with secondary education (73.15%) and living in the city (52.53%). The majority of respondents were students (54.09%) or employed (45.91%) with a monthly income up to 600 € (67.32%).

Figure 1 Cocoa-enriched honey.

Statisic analysis

Statistical analyses were conducted in SPSS version 25 (IBM) and following non-parametric tests were applied:

- Friedman test
- Mann-Whitney U test
- Fisher's Exact Test,
- Pearson Chi-square test
- Cramer'V coefficient

Laboratory testing

Sample preparation

An amount of 0.25 g of sample was extracted with 20 mL of 80% ethanol for 2 hours. After centrifugation at 4000 g (Rotofix 32 A, Hettich, Germany) for 10 min, the supernatant was used for measurement (antioxidant activity, polyphenols, flavonoids, phenolic acids). Extraction was carried out in triplicate and the results reported are the results of those replicate determinations with standard deviations

Determination of antioxidant activity

The radical scavenging activity of extracts was measured using 2,2-diphenyl-1-picrylhydrazyl (DPPH) **(Sánchéz-Moreno et al., 1998)**. The sample (0.4 mL) was mixed with 3.6 mL of DPPH solution (0.025 g DPPH in 100 mL methanol). The absorbance of the reaction mixture was determined using the spectrophotometer Jenway (6405 UV/Vis, England) at 515 nm. Trolox (6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid) (10 - 100 $mg.L^{-1}$; $R^2 = 0.989$) was used as the standard and the results were expressed in $mg.g^{-1}$ Trolox equivalents. All chemicals were analytical grade and were purchased from Reachem (Slovakia) and Sigma Aldrich (USA).

Determination of polyphenol content

Total polyphenol content extracts was measured by the method of **Singleton and Rossi (1965)**, using Folin-Ciocalteu reagent. 0.1 mL of each sample was mixed with 0.1 mL of the Folin-Ciocalteu reagent, 1 mL of 20% (w/v) sodium carbonate, and 8.8 mL of distilled water. After 30 min in darkness the absorbance at 700 nm was measured using the spectrophotometer Jenway (6405 UV/Vis, England). Gallic acid (25 – 300 $mg.L^{-1}$; $R^2 = 0.998$) was used as the standard and the results were expressed in $mg.g^{-1}$ gallic acid equivalents.

Determination of flavonoid content

Total flavonoids were determined using the modified method of **Willett (2002)**. 0.5 mL of sample was mixed with 0.1 mL of 10% (w/v) ethanolic solution of aluminium chloride, 0.1 mL of 1 M potassium acetate and 4.3 mL of distilled water. After 30 min in darkness the absorbance at 415 nm was measured using the spectrophotometer Jenway (6405 UV/Vis, England). Quercetin (0.5 – 20 $mg.L^{-1}$; $R^2 = 0.989$) was used as the standard and the results were expressed in $mg.g^{-1}$ quercetin equivalents.

Determination of phenolic acid content

Total phenolic acid content was determined using method of **Farmakopea Polska (1999)**. A 0.5 mL of sample extract was mixed with 0.5 mL of 0.5 M hydrochloric acid, 0.5 mL Arnova reagent (10% $NaNO_2$ + 10% Na_2MoO_4), 0.5 mL of 1 M sodium hydroxide (w/v) and 0.5 mL of water. The absorbance at 490 nm was measured using the spectrophotometer Jenway (6405 UV/Vis, England). Caffeic acid (1 – 200 $mg.L^{-1}$, $R^2 = 0.999$) was used as a standard and the results were expressed in $mg.g^{-1}$ caffeic acid equivalents.

RESULTS AND DISCUSSION

Respondents firstly evaluated product´s taste, aroma, colour and texture using a 5-point scale (1 – very good and 5 – very bad). By applying the Friedman test, the differences between these sensory attributes were tested. Based on the results, the first hypothesis was confirmed (*p*-value = 0.014). In average, all attributtes were evalueted as good. The best evaluation obtained texture (2.29) followedby taste (2.32), colour (2.33) and aroma (2.46). Moreover, Figure 2 illustrates sensory evaluations according to gender. Based on the Mann-Whitney U test, there do not exist significant differences in evaluations between males and females. However, it could be stated that females evaluated slightly better. Similar sensory evaluation was conducted by **Šedík et al. (2018a)**.

Next, respondents evaluated selected characteristics of the product displayed by a 5-point scale using modified semantic differential. In general, results showed that respondents perceived product positively. On average, product was evaluated as tasty (2.3), with ideal sweetness (1.6), aromatic (2.3), gentle (2.6) delicious (2.3) special (2.4) with adequate amount of cocoa (2.4). The product was perceived neither irresistible nor average (3.2), and as for the question whether it has more honey or cocoa taste, respondents felt slightly more the taste of honey (2.7). Furthermore, Figure 2 illustrates evaluations of semantic differential by gender. It could be observed that females evaluated all selected characteristics more positively. Nevertheless, the only statistically significant differences were proven and hypothesis 2 was confirmed (see Table 1) in terms of tasty/disgusting (*p*-value = 0.044), delicious/tasteless (*p*-value = 0.039), special/ordinary (*p*-value = 0.037) adequate/too much amount of cocoa (*p*-value = 0.030) and honey taste/cocoa taste (*p*-value = 0.003). Females felt the taste of honey more intensively than males. The third hypothesis assumed differences between males and females in purchase intention of the product. Application of Fisher's Exact Test proved that there exist statistically significant differences. Females are more interested in product purchase than males (Figure 4). The main motives of purchase were taste, followed by health aspect while the frequent reasons of not purchasing the product were too intensive sweet and honey taste, or simply preference of normal honey. Besides purchase motives and barriers, the study investigated the impact of healthy eating habits on purchase intentions. By applying Pearson Chi-square test, hypothesis 4 was confirmed and there exists statistically significant dependency (*p*-value = 0.000). Based on the results, it could be concluded that the majority of respondents who do not consider their eating habits healthy at all, would not purchase cocoa-enriched honey (Figure 5).

Hypothesis 5 assumed dependency between product perception as a healthier alternative to commercial spreads and purchase intention. Based on the result of Pearson Chi-square test, this hypothesis was confirmed. The majority of respondents who perceive this product as a healthier alternative would purchase it (Figure 6).

In addition, respondents representing the young generation consume honey mostly occasionally. This situation could be improved by health promotion campaigns even in the framework of school catering programs **(Bittsánszky et al., 2015)**. According to **Guziy et al. (2017)**, honey consumers in Slovakia mostly consider the country of origin, type and price before purchasing a product. The size and design of packaging play the least important role, which was proven by applying an eye-tracking experiment as well **(Hazuchová et al., 2018).**

Table 1 Gender differences in product evaluation.

Product characteristic	Sig.
taste	.246
aroma	.059
colour	.341
texture	.302
tasty/disgusting	.044**
ideal/insufficient sweetness	.309
aromatic/without aroma	.051
gentle/strong	.115
delicious/tasteless	.039**
special/ordinary	.037**
irresistible/average	.201
adequate/too much amount of cocoa	.030**
honey taste/cocoa taste	.003**

Note: **Statistically significant for p <0.05 Mann-Whitney U test.

In order to study if enrichment of honey by cocoa powder would increase antioxidant activity and prove the hypothesis, the product was analysed in laboratory conditions.

Antioxidant activity

The antioxidant activity of rapeseed honey enriched with cocoa powder determined with the DPPH method was 6.73 mg TEAC.g^{-1} (Table 3). Pure rapeseed honey is rich in compounds with antioxidant activity, especially flavonoids and phenolic acids. Honey enriched with herbs, spices, bee products, fruits as well as coffee and cocoa beans is very popular nowadays. Some studies reported that phenolic compounds found in cocoa beans may present different properties such as antioxidant, anticarcinogenic, and antiradical activities. Polyphenols are the main antioxidant-active constituents of cocoa. Flavanols and procyanidins have previously been identified as the active antioxidant agents of cocoa **(Bauer et al., 2016)**. Cocoa beans as well as cocoa powder are very attractive for consumer also for organoleptic properties. Bitter and chocolate taste of cocoa powder is very good with the combination of sweet honey taste. Adding cocoa powder to honey can also increase antioxidant activity. **Jaafar et al. (2017)** tested the antioxidant activity of monofloral honey (regarding rapeseed honey) and determined values from 0.08 to 0.51 AEAC.g^{-1} (ascorbic acid equivalent antioxidant capacity). In our study the activity was several times higher probably due to the cocoa powder addition.

Total polyphenol, flavonoid and phenol acid content

The results of total polyphenol, flavonoid and phenolic acid content are summarized in Table 3. Pure rapeseed honey is rich in phenolic substances. **Wen et al. (2017)** determined in this honey presence of gallic, protocatechuic, p-hydroxybenzoic, caffeic, ferulic, p-coumaric and benzoic acid.

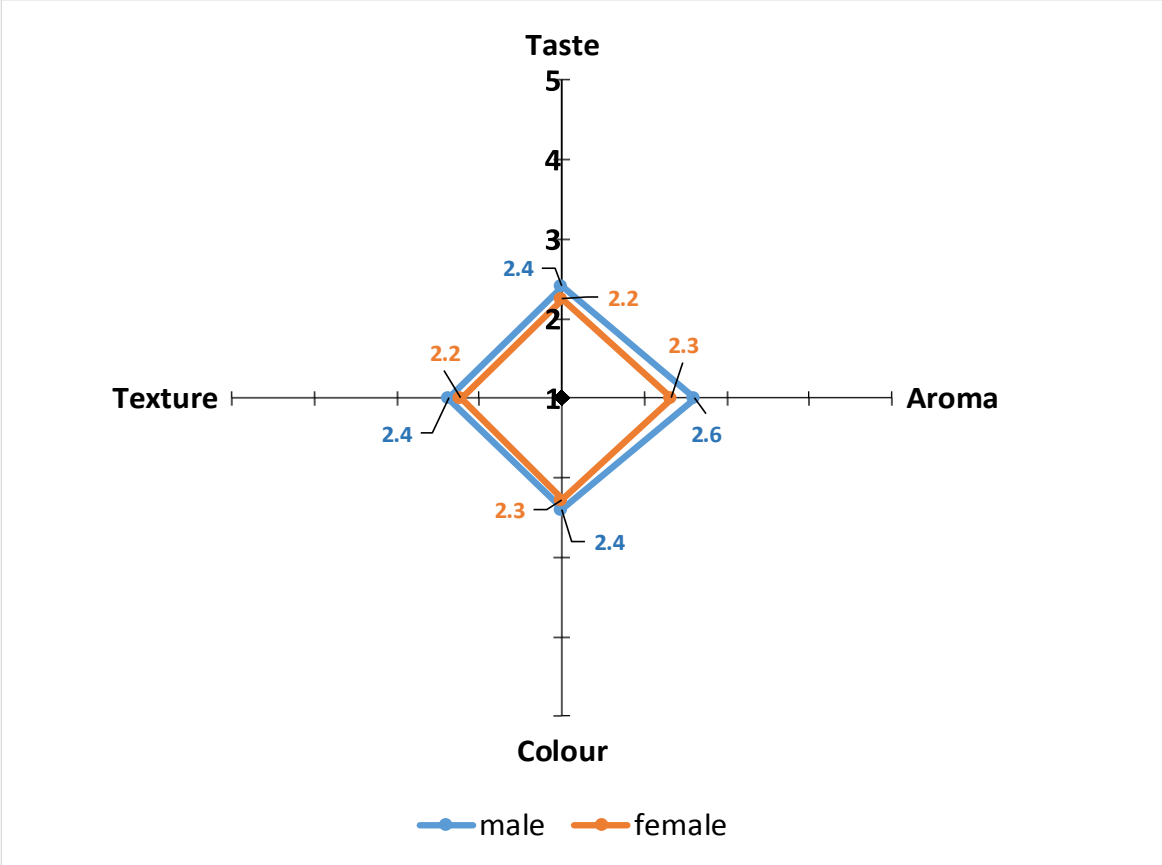

Figure 2 Sensory evaluation of cocoa-enriched honey by gender.

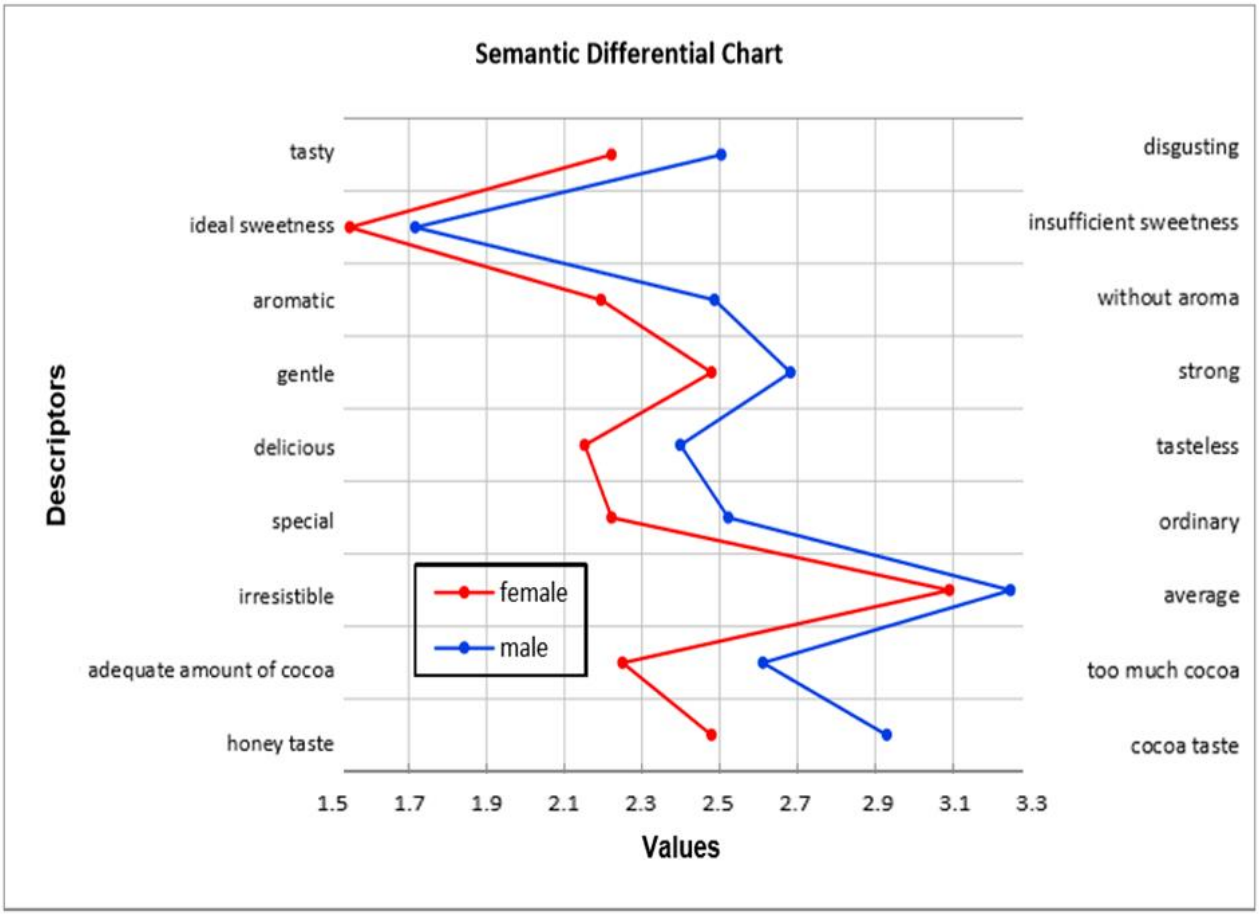

Figure 3 Semantic differential: product evaluation of selected characteristics.

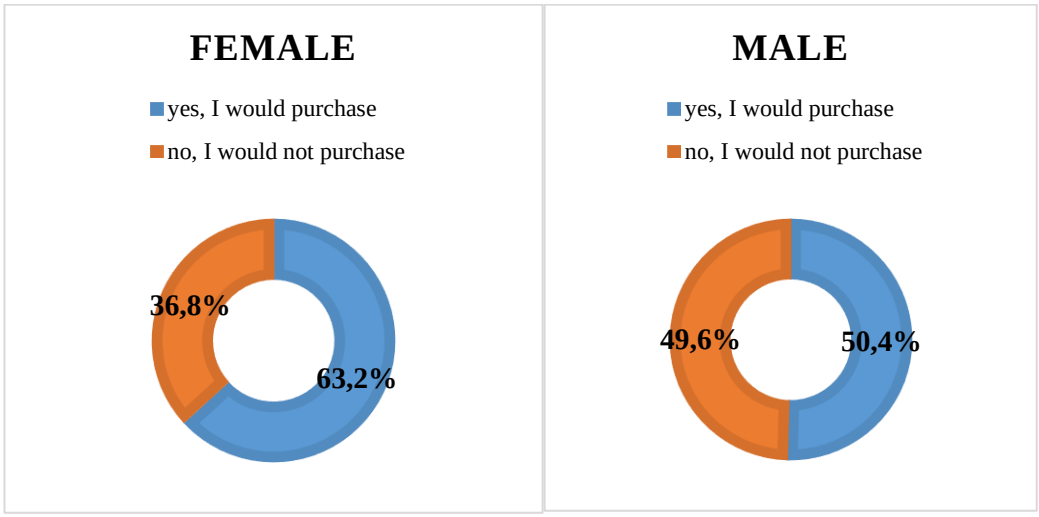

Figure 4 Purchase intentions of cocoa-enriched honey by gender.

Table 2 Impact of selected factors on purchase intentions.

	Sig.	Cramer´s V coefficient
Purchase intentions and gender	.043**	.128
Purchase intentions and healthy eating habits	.000**	.313
Purchase intentions and product perception	.000**	.526

Note: **Statistically significant for p <0.05 Pearson Chi-square test and Fisher´s Exact Test.

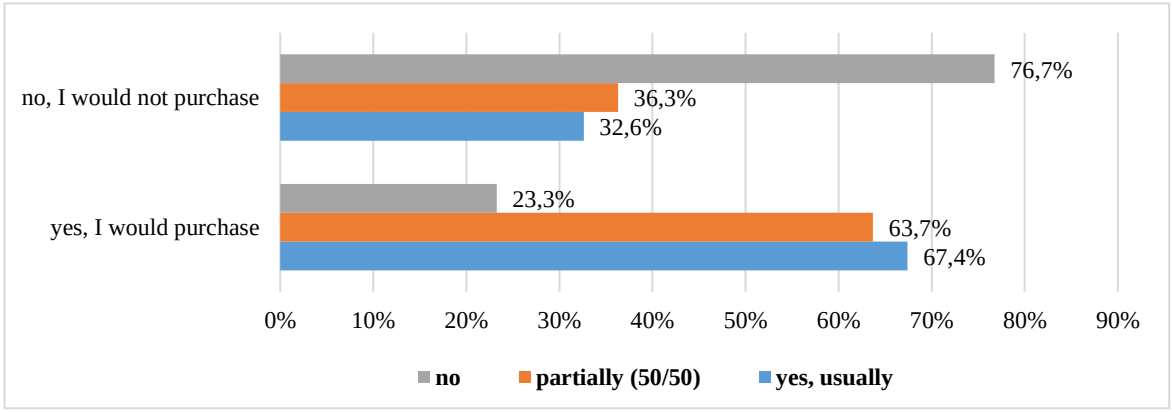

Figure 5 Respondents' purchase intentions and perception of their healthy eating habits.

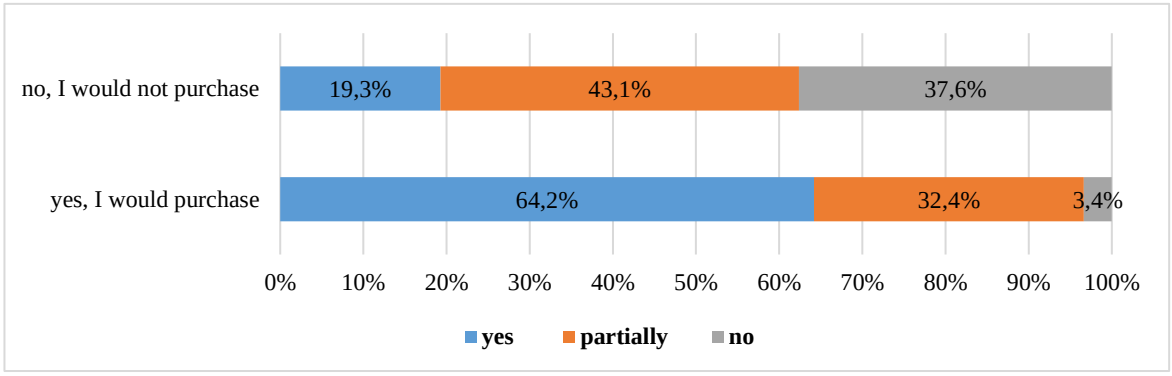

Figure 6 Respondents' purchase intentions and product perception as healthier alternative to commercial chocolate spreads.

While gallic, ferulic and protocatechuic acids were determined only in small amount, benzoic acid (18.11 mg.kg^{-1}) and p-hydroxybenzoic (1.22 mg.kg^{-1}) were dominant, detected in higher amount. **Özkök et al. (2010)** determined total phenolic acid content in Turkish monofloral honey and their results ranged from 0.035 to 0.36 mg GAE.g^{-1} (gallic acid equivalent). Total phenolic acid content in our sample of monofloral honey is higher due to the cocoa powder addition. **Ali et al. (2015)** determined in cocoa powder gallic acid, protocatechuic and chlorogenic. Protocatechuic acid was dominant with amount 18.8 mg.g^{-1}. **Wen et al. (2017)** also determined the flavonoid composition in rapeseed honey and found the presence of rutin, myricetin, morin, quercetin, kaempferol,

galangin, apigenin and chrysin. Morin (11.12 mg.kg^{-1}) and quercetin (5.18 mg.kg^{-1}) were dominant in this type of honey. According to **Ayoub et al. (2009)** the flavonoid concentration in honey is approximately 0.02 mg.g^{-1}. In our sample enriched with cocoa powder the amount of flavonoids was higher. Cocoa powder is a very good source of phenolic compounds especially flavonoids. Flavonoids present in cocoa include flavanols, anthocyanins, flavonols, and flavones. Flavanols, the most abundant flavonoids in cocoa, comprise the monomeric flavanols (+)-catechin and (-)-epicatechin, and their oligomeric and polymeric forms (procyanidins). (-)-Epicatechin has been reported as the major monomeric flavanol in cocoa, representing ca. 35% of the total phenolic content **(Andres-Lacueva et al., 2008)**. Apart from polyphenol content, cocoa is also rich in methylxanthine, namely caffeine and theobromine. These substances have stimulating effect on the human body, so we can recognize that consumption of honey enriched with cocoa powder can have not only antioxidant but also stimulating effect on the organism.

For testing the last hypothesis, the results of antioxidant activity, total polyphenol, flavonoid and phenolic acid content (Table 3) were comapred with similar laboratory tests of normal honey, where resutls were as follows: DPPH [mg TEAC.g^{-1}] 0.313 ±0.018, TPC [mg GAE.g^{-1}] 1.212 ±0.011, TFC [mg QE.g^{-1}] 0.033 ±0.013 and TPAC [mg CAE.g^{-1}] 0.084 ±0.022 **(Šedík et al., 2018b)**. It could be concluded that the antioxidant activity of cocoa-enriched honey was few times higher.

Table 3 Antioxidant activity, total polyphenol, flavonoid and phenolic acid content in analyzed sample.

Parameter	Cocoa-enriched honey
DPPH [mg TEAC.g^{-1}]	6.73±0.98
TPC [mg GAE.g^{-1}]	4.84±0.67
TFC [mg QE.g^{-1}]	0.25±0.03
TPAC[mg CAE.g^{-1}]	2.71±0.16

Note: DPPH - radical scavenging activity; TEAC - trolox equivalent antioxidant capacity; GAE - gallic acid equivalent; QE - quercetin equivalent; CAE - caffeic acid equivalent; mean (n = 3) ± standard deviation.

CONCLUSION

Consumer research showed that cocoa-enriched honey obtained positive evaluations among young consumers in Slovakia. Taste, aroma, colour and texture was evaluated as good. Furthermore, the product was described as tasty, aromatic, gentle, delicious, special, with ideal sweetness and adequate amount of cocoa. The product scored as neither irresistible nor average and the dominant taste of the product was neither honey nor cocoa. However, females felt the honey taste more than males. In some characteristics, females evaluated this product more positively.

In general, the majority of respondents would purchase the product. However, female consumers were more interested in product purchase than male consumers. Moreover, respondents who considered their eating habits healthy and those who perceived this product as a healthier alternative to commercial chocolate spreads had higher willingness to purchase it.

Regarding the antioxidant activity, the tested products obtained a few times higher results than normal honey, therefore, it is assumed that this combination of two ingredients increases the overall benefits for health of final products. In fact, this observation could be used in tailoring a suitable marketing strategy and product positioning as a functional food. The target group should be female consumers who are interested in healthy lifestyle.

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