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MONITORING OF HONEY CONSUMPTION IN THE AREA OF THE CITY NAŠICE WITH REFERENCE TO THE HEALTH EFFECTS OF HONEY CONSUMPTION

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Summary

There is a wide range of bee products on the market. The most famous and most accepted by consumers is honey. In Western European countries, the average consumption of honey per capita ranges from three to eight kilograms, while the average consumption of honey in Croatia is very low, 400 grams per capita. The European Union produces only 52% of honey for its own needs. The aim of the research was to study the availability of honey to potential consumers, honey consumption habits, ways of consuming honey, and knowledge of the properties of honey. A survey was conducted online. Respondents were of different genders and different age groups. The survey consisted of 20 questions, and 130 individuals (46% mean and 54% women) from the city of Našice were interviewed. The obtained data were analysed. After conducting research and processing the results, it can be concluded that honey is a product that is accepted by consumers of different age groups. Respondents believe that propolis has better healing properties than honey, but they rarely consume it. Honey is available and affordable to consumers.

Keywords: honey, honey consumption, types of honey

Introduction

The basic raw material for honey production is nectar produced by various plants using nectar glands in their flowers or outside them. Nectar is a sweet and fragrant liquid with a water content of 50 – 75 %, simple sugars content 20 – 25 %, and abundance of minerals, provitamins, essential oils and proteins (Bauer et al., 1999). Honey contains over 180 different compounds and elements that have been identified and it is believed that further studies will find new, yet unknown compounds. A teaspoon of honey contains more than a hundred important ingredients for the body. These are primarily sugars, up to 75%: on average fructose 38%, glucose 30%and the rest are maltose and other disaccharides, water 18%, organic acids 0.3% (mainly gluconic, malic, tartaric, citric), enzymes, minerals 0.2% (iron, copper, manganese, silicon, chlorine, calcium, potassium, sodium, magnesium, etc.), vitamins C and B complex and phytochemicals (flavonoids and phenols) that have oxidizing properties (Laktić and Šekulja, 2008). It has been known for centuries that honey is food and medicine. The nutritional properties of honey have been intensively researched lately. Most research is based on the qualitative and quantitative content of flavanoids in honey. Indirectly, through nectar, pollen and honeydew, honey bees bring polyphenols into their hives. The amount of polyphenols that will be in the honey depends on the quality of bee pasture, honey collection season, geographical area, etc. (Kurtagić, 2017). Lachman et al. (2010) state that the main groups of flavanoids found in honey are flavones, flavonols, and flavones. In addition to flavonoids, other phenols have been found in honey, such as phenolic acids, coumaric, ellagic and ferulic acids, and their esters (Pasupuleti et al., 2016). Their presence in honey depends on the botanical origin, and some flavonoids can be used as markers of the botanical origin of honey (Kaškonienė and Venskutonis, 2010). Andrade et al. (1997) found that ellagic acid identified in honey may be a marker for heather honey (*Erica* sp.). Tomás-Barberán et al. (2001) state that abscisic acid is a possible marker of acacia honey, and that a possible connection with the botanical origin of honey is also shown by folic acid derivatives present in honey. Studies have shown that honeydew honey has a higher phenol content than flower honeys (Meda et al., 2005). The proteins in honey origin from pollen grains (Kochan, 2013). Honey also contains vitamins that have a high pharmacological activity that is stimulated by biogenic substances (enzymes, phytohormones, microelements) present in honey (da Silva et al., 2016). Use of honey in medications for diabetes is mentioned in Ayurveda since ancient times. Honey is normally added to the prepared decoctions. Bee's honey is beneficial for diabetic patients in two ways. One is that honey being sweeter than sugar, one may need a much smaller quantity of honey as a sweetener and honey contain lesser calories than sugar. Further, by providing vitamins B2, B4, B5, B6, B11 and vitamin C, and minerals such as calcium, iron, zinc, potassium, phosphorous, magnesium, selenium, chromium, and manganese. The nutritional values of honey could be altered by feeding the bees with selective food (Arawwawala and Hewageegana, 2017). In the human body, honey is very well digested and is almost completely utilized; its sweetness is approximately the same as

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sucrose. Due to the sugar content, honey is classified as a high-energy food. The energy value of honey ranges from 12 500 to 13 600 kJ/kg, which is less than white sugar (16 000 to 16 500 kJ/kg) (Laktić et al., 2005). Studies have shown that honey has an antibacterial effect based on the absence of resistance, which is also an advantage over antibiotic therapy (Levy and Marshall, 2004). Different degrees of antibacterial action of honey arise from the different characteristics of individual types of honey (Mulu et al., 2004). In general, honey stops the growth of bacteria at the cellular level (Cernak et al., 2012). Today on the market there is a large number of different types of honey with different geographical origin. By morphology of pollen grains, it is possible to determine the pollen composition of honey, and thus determine its botanical origin and classify it into monofloral or polyfloral honeys (Sabo et al., 2011). Mandić et al. (2006) state that people with good sensory abilities who are in frequent contact with different types of honey can well identify botanical origin of honey. Scientific findings, in recent years, have shown that daily consumption of honey in small amounts of at least one teaspoon a day provides a number of beneficial effects on human health (Bauer et al., 1999). Consumption of honey in EU countries is three to eight kilograms per capita per year and in the Republic of Croatia many times less, regardless of all the values contained in this healthy food. The European Union produces only 52% of honey for its own needs, which is a large, but so far untapped export opportunity for Croatian beekeepers (Špoljarić, 2010).

The aim of this paper was to study the consumption of honey in the town of Našice, and the habits of consumers with regard to honey consumption.

Materials and methods

The survey was conducted through Microsoft forms on 130 respondents and was completely anonymous. The survey was posted on a personal Facebook page, and the visitors were asked to access the survey. The survey consisted of 20 questions; the first part of the survey refers to the gender and age of the respondents and whether they consume honey, while the second part refers to specific habits of consuming and knowing the properties of honey. The obtained data were analysed using Microsoft Excell software.

Results and discussion

130 respondents participated in the survey, of which 46% were male and 54% female (Fig. 1). The majority of respondents were at younger age, 38.24% of respondents were aged 18-29. Second largest group were respondents aged between 30-45 (24.32%), followed by age up to 20 years (11.7%). Slightly fewer respondents were present in the population aged 30-35 years (8.6%) and 35-40 years and older (7.8%). This can be explained by the fact that people at a slightly older age are not very eager to participate in online surveys. Honey is available in the diet of a large number of respondents (82.4%) (Fig. 1).

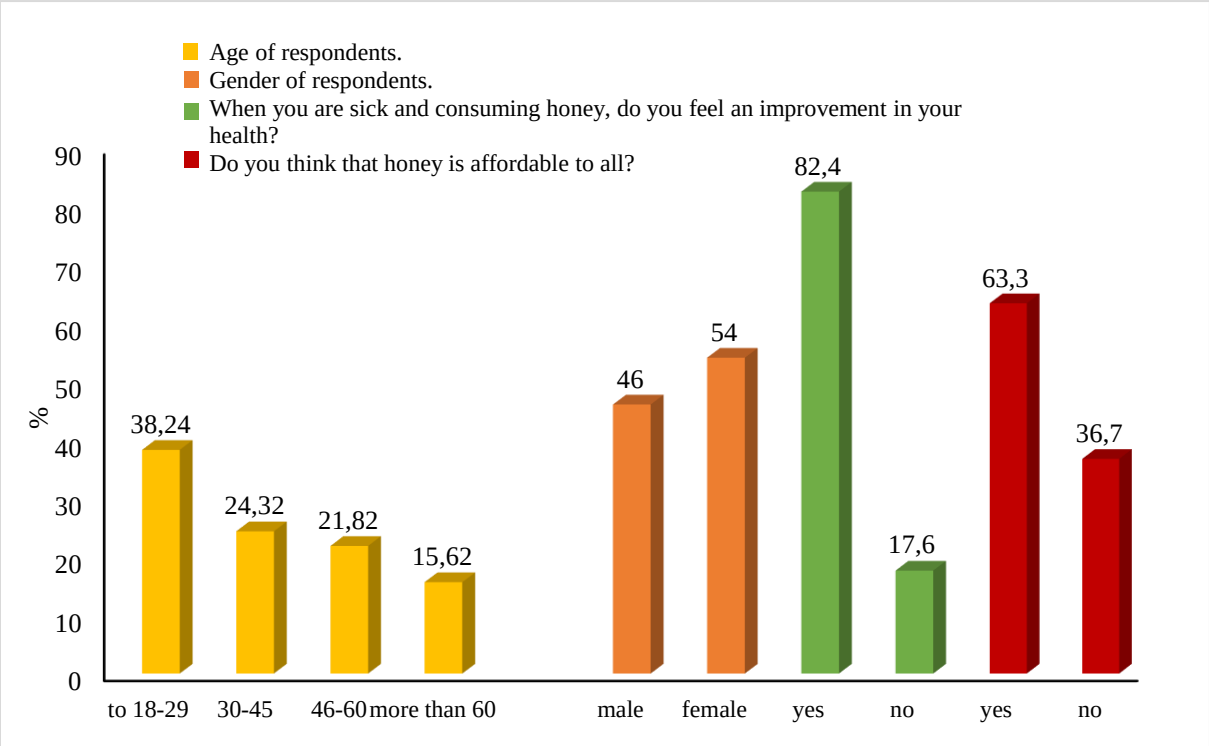

Fig. 1. Answers to questions about age, gender, existence of medicinal properties and availability

Respondents believe that honey contains medicinal properties (99.2%), while only a few of them have the opposite opinion (0.8%) (Fig. 2). Kurtagić (2017) states that the share of polyphenols in honey is relatively small, but they are responsible for the healing properties of honey. By regular consumption of honey, biogenic substances (enzymes, photohormones, mickroelements) from honey will enhance the action of vitamins as well as the healing effect of honey through enzymes, phytohormones and trace elements (Nikolić-Pavljašević and Redžepagić-Dervišević, 2016). Despite the fact that the subjects are aware of the healing properties of honey, they do not consume honey often enough. Only 6.3% of respondents consume honey on daily basis (Fig. 3). Honey is mostly consumed several times a year (41.4%), once a week (25%), and once a month (18%). When buying, the choice of honey is influenced by quality (45.7%), followed by taste (15%), producer (13.4%) and price (11.8%).

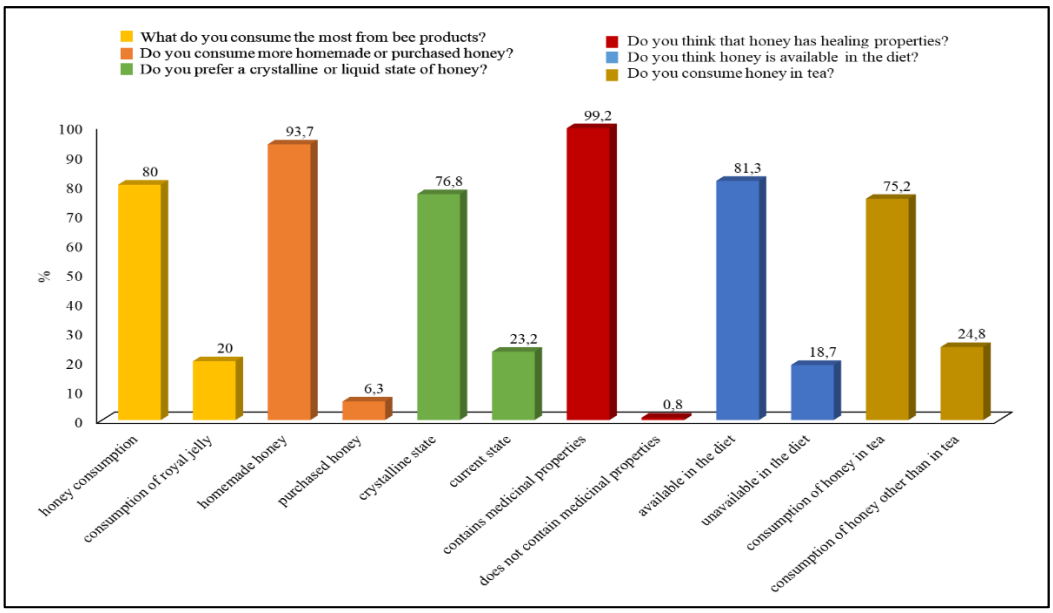

Fig. 2. Answers to questions about the type of bee products consumed, preferences, medicinal properties, availability, method of consumption

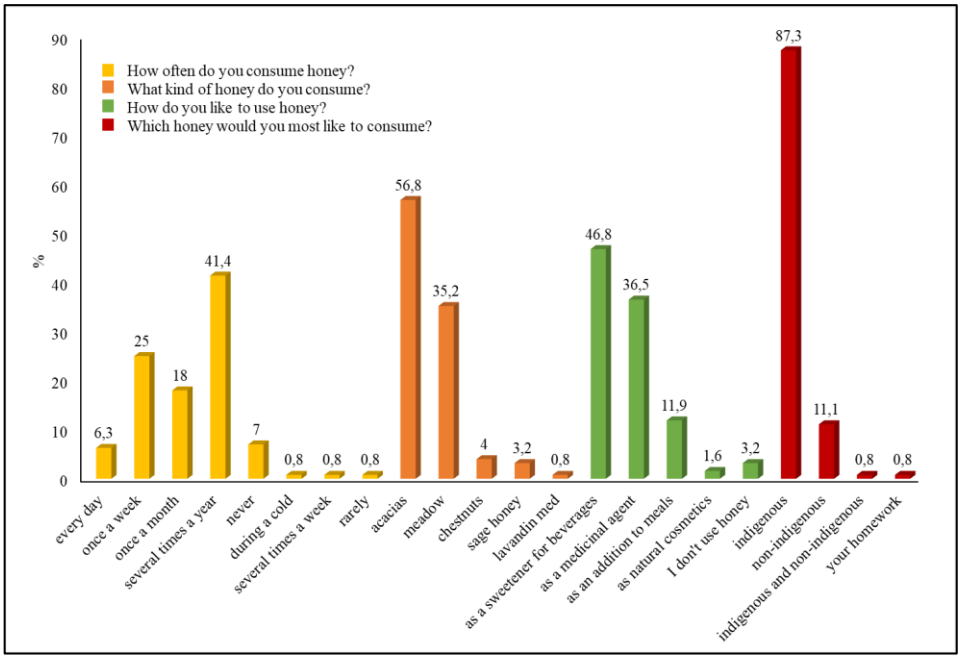

Fig. 3. Answers to questions about the frequency, type, manner and preference of honey consumption

Legislation (Ministry of Agriculture, 2005) sets quite strict quality parameters for honey. However, the question of the credibility of certain types of honey remains. In their research, Kenjerić et al. (2007 and 2008) analysed the characteristic flavonoids in *Robinia* and sage honey, which are evidence of the monofloral origin of honey. In general, the folic acid derivatives present in honey can be linked to the botanical origin of honey. The flavonoids pinocembrin, apigenin, campherol, quercetin, galangin, chrysin, pinobaksin, luteolin, and hesperitin are most commonly present in honey. The presence of these flavanoids in honey depends primarily on the botanical origin of honey. Therefore, individual flavanoids are markers of the botanic origin of honey (Lachman et al., 2010). According to research by Bertoncelj (2008) and Pasupuleti et al. (2016) the proportion of phenolic compounds and flavanoids in honey is correlated with floral and geographical origin on the one hand and antimicrobial activity on the other.

When choosing honey, the country of origin (7.1%), colour (6.3%), and brand (0.8%) have a slightly smaller influence (Fig. 4).

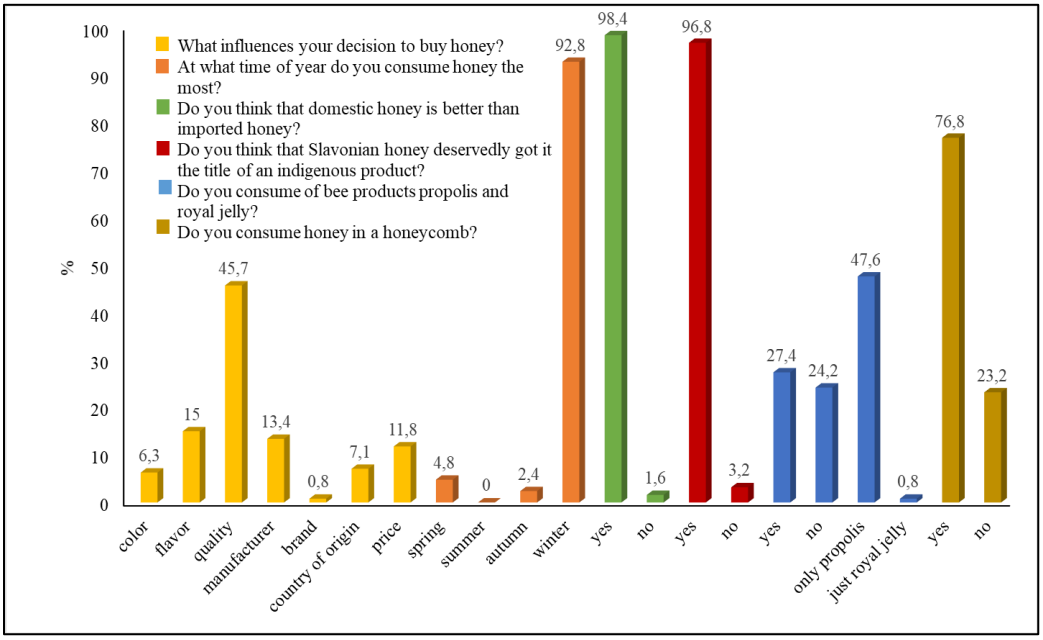

Fig. 4. Answers to questions about buying honey, the season of consumption, the origin of honey, consumption of propolis, royal jelly and honey in the honeycomb

Domestic honey (93.7%) is used more often than purchased (6.3%). In the wider area of the town of Našice, there is large number beekeepers, and consumers have the opportunity to buy honey directly from producers. Respondents prefer honey in the crystallized state (76.8%) to the liquid state (23.2%). Crystallization of honey is a normal property of honey and it is not considered as loss of quality. Many consumers believe that crystallized honey is of poor quality or that it is forged honey (Laktić and Šekulja, 2008), which has not been confirmed in this case. It can be assumed that most of the respondents are familiar with the reasons for the crystallization of honey and that they may associate crystallization with non-adulteration of honey, which would be interesting to further investigate. Fig. 4. shows the consumption of honey according to the seasons. Consumption is most common in winter (92.8%), followed by spring (4.8%), slightly less in autumn (2.4%), and least in summer (0%).

The most consumed is acacia honey (56.8%), followed by meadow (35.2%), chestnut (4%), sage honey (3.2%) and lavander (0.8%). Bauer et al. (1999) recommend the use of acacia honey in insomnia to calm the irritated nervous system. However, perhaps the reason for acacia honey higher consumption is in availability and in organoleptic properties. Namely, acacia honey is extremely bright, yellowish in colour, mild in aroma and taste. Sage honey is an autochthonous type of honey, and in Europe it is produced only in parts of the Croatian coast and islands, and is less known and available on the continent (Kenjerić et al., 2008). So, the consumption of 3.2% is quite satisfactory. Meda et al. (2005) state that the content of phenol in the examined 27 samples of honey ranged from 32.59 to 114.75 mg/100g, and that honeydew honey has a higher content of phenol than flower honey. The value of honey on the market varies based on floral origin. In some northern European countries, honeydew is a favourite type

of honey and more prized than flower honeys (Prodolliet and Hischenhuber, 1998). Consumers in Croatia prefer unifloral honeys. Respondents mostly consume honey in tea (75.2%), but also in some other ways (24.8%). Consumption of honey with chamomile, lemon balm or St. John's wort tea enhances the action of the active substances from tea, as well as those contained in honey itself (Bauer et al., 1999). Honey can be used as a cosmetic preparation and treatment aid. Traditionally, honey is used in the treatment of burns, open wounds, cuts, and skin infections (Kochan, 2013). Recent studies of the therapeutic effect of honey have been associated with the treatment of conjunctivitis, corneal inflammation (Albietz and Lentin, 2006). Honey can be used and diluted with distilled water in a ratio of 1: 1 in the treatment of various infections (Al-Waili, 2004). Respondents believe that domestic honey (98.4%) is much better than imported honey (1.6%), and that Slavonian honey deservedly received the title of indigenous product (87.3%) (Fig. 3), so it is to be assumed that consumers have created certain habits in honey consumption. Geographical and botanical properties are important for the quality of honey, and the taste, smell and colour of honey change according to the nectar from the flower (Kaya et al., 2005). Because of this, respondents would rather consume indigenous honey (87.3%) than others (11.1%), and only a few of them would consume both (0.8%) or their own domestic (0.8%). Sabo et al. (2013) in their research conducted pollen analysis of chestnut, acacia and goldfinch honey in the Našice area, and found that taxonomic variability is greatest in rare groups, followed by a group with a small amount of pollen, a secondary and dominant group. Considering the above, chestnut honey and acacia honey are classified as unifloral honeys, and goldfish honey is polyfloral honey. Identifying the source of honey is a difficult task, still there is no appropriate analytical method for unambiguously determining the botanical origin of honey (Anklam, 1998). Of the other bee products, the respondents consume propolis (47.6%) the most, and a very small number of respondents consume royal jelly (0.8%). The properties of propolis are very well known among the people, but little is known about royal jelly. Beekeepers and nutritionists try to promote royal jelly on their websites, stating that royal jelly has antibacterial and antiviral properties, and that it acts on the human body as a biostimulator, regenerator and development factor, because it contains all important substances necessary for the development and survival of living organisms. New discoveries regarding the active components of royal jelly, their internal mechanisms of action and the possibility of isolation and purification of pure substances represent a starting point for the formulation of new products for therapeutic and pharmacological use as an alternative to conventional antibiotics. From the available literature, royal jelly and its derivative components, such as royalisin, jelleines and 10-hydroxy-2-decenoic acid (10-HDA), have shown high activity against Gram-positive bacteria, while their effectiveness decreases against Gram-negative bacteria (Fratini et al., 2016). Several studies conducted on royal jelly have shown that this product is also effective against many multidrug-resistant bacteria, such as MRSA (methicillin-resistant *Staphylococcus aureus*) (Fratini et al., 2016). Honey is the most common in consumption of all bee products (80%), and many people consume it in honeycomb (76.8%) (Fig. 4). During the manipulation of honey, a large part of vitamin C is lost, while it is preserved in the original honey or honeycomb (Laktić et al., 2005). The data on the high percentage of honey consumption in the honeycomb also speaks of the knowledge of the properties of honey in the honeycomb. Fig. 4. shows that respondents mostly use honey as a sweetener for beverages (46.8%), followed by a medicinal product (35.6%), a food supplement (11.9%) and the least as a natural cosmetic (1.6%). If honey is used as a medicinal agent in combination with antibiotics, honey does not alter the action of antibiotics and no adverse interactions occur (Boateng and Nso Diunase, 2015). It is important to emphasize that the respondents believe that honey is affordable for everyone (63.3%) and that it contains medicinal properties (82.4%).

Conclusions

Based on this research, it can be said that honey is recognized as a product that contributes to health improvement. Consumption is most common in the winter months as a tea sweetener. Considering the answers of the respondents, it can be concluded that honey consumption is related to traditional knowledge about honey. Very few respondents use honey for any purpose other than as a tea sweetener. Many other beneficial effects of honey have been scientifically proven: as a prophylaxis and aid in the treatment of various diseases. So, scientists together with beekeepers, should work intensively and introduce consumers to new knowledge, and contribute to the increase of consumption of honey, especially domestically produced.

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