Czech University of Life Sciences in Prague

Faculty of Economics and Management

Department of Trade and Accounting

Diploma Thesis

Honey Consumer´s Purchasing Behaviour

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

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DIPLOMA THESIS ASSIGNMENT

Nový Jindřich

Economics and Management

Thesis title

Consumer Purchasing Behavior of Honey

Objectives of thesis

The aim of the thesis is to identify consumer purchasing behavior of honey and and to formulate recommendations for beekeepers and honey sellers.

Methodology

The methodology of literary research (theoretical background) lies in the analysis, synthesis and compilation of secondary data from expert sources, periodicals, legislation and professional Internet resources. Methodology of own work includes the preparation of evaluation criteria,the performing of quantitative and qualitative questionnaire survey of a random sample of respondents, the evaluation results of the investigation by the appropriate SW and recommendations for beekeepers, respectively sallers.

Schedule for processing

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December 2013	Own work of thesis
February 2013	The thesis completing and handover of work leading to approval
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Honey, consumer, behavior, market, demand, quality, producer.

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BOGDANOV, Stefan. Honey Composition [online]. Book of Honey, Chapter 5. Bee Product Science. Datum vydání: duben/2009, [cit. 25-11-2011]. Pdf. Dostupný z www: <http://fantastic-flavour.com/yahoo_site_admin/assets/docs/CompositionHoney.20105942.pdf>

BROŽEK, Jiří. Včelí produkty. 1.vyd., Praha: vydal Český svaz včelařů ve Státním zemědělském nakladatelství v Praze, 1986. 88 s. 07-104-86.

EPURNOJ, I., P., ZOLOTUCHINA, I., V. Nový způsob určování pravosti medu. In: Odborné včelařské překlady č.2/2008. Český svaz včelařů, Praha, 2008. ISSN 0322-8851. Přeloženo z: Prelovodstvo, 2008, . 4a, str. 52.

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Declaration

I hereby declare that I have worked on my Diploma Thesis titled "Honey Consumer´s Purchasing Behaviour" solely and completely on my own and that I have marked all quotations in the text. The literature and other material I have used are mentioned in the References Section of the Thesis.

Prague, 15 March 2014 …….

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Honey Consumer´s Purchasing Behaviour

Kupní chování konzumentů medu

Summary

The thesis deals with the identification of common consumer purchasing behaviour of honey (and other bee products, especially mead). The theoretical part deals with the definition, composition, division of honeys into kinds, quality parameters, their assessment and values that are accepted under the law. Own processing, based on questionnaire survey, tests which honey is the most preferred by consumers and what can influence in the most significant way the consumer´s choice of honey (package size, price, etc.). In addition to prices, the author investigates other parameters that could affect the purchasing behavior of consumers (age, gender, etc.). Finally, it gives an idea of the level of knowledge of respondents about honey and its properties.

Keywords: Quality, honey, mead, properties of honey, consumer, bee products, questionnaire survey, nectar, honeydew, purchasing behaviour, the Czech Republic.

Souhrn

Předkládaná diplomová práce se zabývá identifikací kupního chování běžného spotřebitele medu (a dalších včelích produktů, především medoviny). Teoretická část pojednává o definici, složení, dělení medů na jednotlivé druhy, kvalitativních parametrech, jejich hodnocení a hodnotách, které jsou podle právních předpisů přípustné. Vlastní zpracování, založené na dotazníkovém šetření, hodnotí, jaký med je spotřebiteli přednostně vyhledáván, podle čeho se výběr orientuje (velikost balení, cena, apod.), jaké vlastnosti medu jsou při jeho volbě pro spotřebitele směrodatné. Kromě cen, autor zkoumá další parametry, které by mohly významně ovlivňovat kupní chování spotřebitele. V neposlední řadě poskytuje představu o úrovni znalostí respondentů o medu a jeho vlastnostech.

Klíčová slova: Kvalita, med, medovina, vlastnosti medu, spotřebitel, včelí produkty, dotazníkové šetření, nektar, medovice, nákupní chování, Česká republika.

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LIST OF ABBREVIATIONS

HMF ..... Hydroxymethylfurfural
IHC ..... International Honey Commission
CUB ..... Czech Union of Beekeepers,Český svaz včelařů, o.s.
CIA ..... Czech Institute for Accreditation
cons. ..... consumer/s
resp. ..... respondent/s
cust. ..... customer/s

LIST OF USED TECHNICAL TERMS

apiculture – včelařství

(bee)hive – úl

beekeeper - včelař

bee wax – včelí vosk

cell – buňka plástu

colony – včelstvo

creamed honey – pastový med

extractor – medomed

flower honey – květový (nektarový) med

from a courtyard - ze dvora

fructose – fruktóza (ovocný cukr)

glucose – glukóza (hroznový cukr)

granulated honey – zkrystalizovaný med

honey extractor - medomed (zařízení na získávání medu pomocí odstředivé síly)

honey flow – snůška

honey for baking – pekařský med

honey granulation / crystallization-krystalizace

honeycomb - plástev

honeydew – medovice, medovicový

honeydew honey – medovicový (lesní) med

mead - medovina

mixed honey – smíšený med

monofloral honey – jednodruhový med

pollen - pyl

royal jelly – mateří kašička

starch - škrob

sucrose – sacharóza (řepný cukr)

yeasts – kvasnice, kvasinky

1 INTRODUCTION

Currently appearing demand for food products is really wide, which varies considerably in their quality. The situation is complicated by the fact that **a lot of poor-quality** or even counterfeit **products enter the market**. Their producers are able to mark them such a way, that without careful examination of the label or even by the physico-chemical analysis, **it is not simply possible to determine if a product is really the product with the appropriate content and quality** that a customer wants to buy and consume. The same problematic situation can be seen in the case of honey. The huge spectrum of different kinds of honeys in markets complicates consumer´s purchases of honey and can cause consumer´s disorientation in the honey demand (Dupal $_1$, 2011; Titěra, 2006).

In view of the fact that author is a beekeeper and thus an ardent defender of high quality natural bee products; he decided to be engaged in perception of the quality of honey by a common consumer and main factors, which could influence it. **The main essence is to determine according to which aspects the quality of honey is evaluated** and how informative value of this product quality these aspects express. In other words, whether the level of information is sufficient to objective perception of a bee product quality.

In addition to studying consumer´s perception of quality of honey, **the obtained data should provide an overview of consumer preferences**, like what is the popularity of some kinds of honeys or popularity of some colors of honeys, how high is honey consumption in households, how the price of bee products and other factors influence their purchase.

Last but not least, **the results** and conclusions **should** identify some weaknesses in bee products´ trade and **give mainly some recommendations for beekeepers** and sellers of bee products **to improve customer service**, increase sales, and thus their profits.

2 AIM AND METHODOLOGY

2.1 The thesis aim

The main aim of the thesis is to identify the honey consumer´s purchasing behaviour and to formulate recommendations for beekeepers and honey sellers. For the purpose of this work it is focused on the main bee product – honey that is the most familiar within the population and is the most important bee product with the most economic significance for beekeepers.

Partial thesis aims are:

- questionnaire survey
- composition of literature review
- research of consumer´s knowledge of properties of honey
- research of consumer´s loopholes of knowledge of honey
- mead consumer´s purchasing behaviour

2.2 Methodology

Methodology has the two main parts: methodology of literature review and methodology of questionnaire´s survey, which are described below.

2.2.1 Methodology of Literature Review

The methodology of literature review is based on analysis, synthesis and compilation of available expert sources relating to honey (see the bibliography at the end of the thesis). It discusses the definition, composition, division of honeys on its kinds, quality parameters, their evaluation and values that are submitted to the legal rules relating to different honeys and have to be strictly met. The literature review deals with issues of labeling, price, selling of honey, general view of beekeeping in the Czech Republic and foreign trade with honey, as well.

2.2.2 Methodology of Questionnaire´s Survey

Methodology of the own work is based on a questionnaire´s survey (questionnaire - see annex 1). The questionnaire was distributed within the Czech Republic from the beginning of August 2013 till the end of September via a web application called "Vyplňto" and by printed questionnaires, which were distributed and subsequently collected by the author. **The results acquired by "Vyplňto" were not processed by this application automatically, but were taken as raw data** and completed with data obtained from printed questionnaires. The own processing was done by the author with using the software SPSS Inc (PASW Statistics 18) and Microsoft Excel. The author was not present during filling the questionnaires in; anyway their return was about 80 - 90 %.

The final number of respondents was 258. **There was no target group**; respondents were not differentiated according to age, gender, level of education or income group. Even people, who do not consume honey, were included.

The questionnaire consists of 31 questions. The type of questions is different. Some of them are filter questions. As written above, the questionnaire was not designed for a target group, so people who do not consume honey filled the questionnaire in, as well. **Some questions are based just on honey consumption, so it was necessary to separate people who consume honey from those who do not use it.** It was done by first filter question, if a respondent answered: "I am not a honey consumer", he/she was redirected to a different kind of questions related to consumption of mead or other bee products.

The questionnaire contains 16 questions about honey, 8 questions about mead, 1 question about other bee products and 6 questions are identifying questions, which breakdown respondents into some categories according to gender, age, number of children, place of living, level of achieved education and income of household (they are called demographic questions). These questions were put at the end of the questionnaire according to general recommendations for questionnaire designing (Demčák, 2014).

Question order:

1. **Filter questions**

2. **Questions pointing at the objectives of the survey** (It is started with simple questions which attract interest of respondents and continued with more complex questions)

3. **Sensitive and personal questions (socio-demographic) questions**

After finishing the questionnaire, a small group of respondents were used as a pilot study to check if the structure of the questionnaire is appropriate, the questions are clearly formulated etc.

For simplier evaluation, just one answer could be chosen generally, but some questions could be answered by more than one answer (close-ended questions) and some of them could be added by respondent´s own answer (semi-close-ended). It allows for much longer responses and therefore potentially provide more creativity and more interesting information.

Some respondent´s own answers were really interesting or funny and were mentioned in the text commenting the results of the questionnaire. On the other hand, in some cases the respondent´s own answer was nonsense, thus these answers were excluded from the evaluation. All data obtained from the survey are categorical (qualitative), specifically nominal data.

2.2.3 Methodology of Data Evaluation

For a data evaluation two main statistical methods were chosen:

1. **Simple frequencies –** individual answers to appropriate question were counted and written in an absolute form or in relative values by using percentages.

2. **Chart builder –** for a better interpretation of results, chart builder as a visual tool was used.

3. **Contingency tables (cross tabulations or cross tabs)** - in contrast to simple frequencies, where only one question was examined, this method allows to find association between two questions. It means to find out if there is dependence between the mentioned two questions (variables). The most used test of independence for contingency tables is **Pearson chi-square** statistic. The test is based on comparison of empirical (observed) frequencies and expected frequencies in cells of contingency table (Taylor, 2007).

Note: In some cases, question could be answered by an "undefined" answer; e.g. "How high is the income of your household?" could be answered by: "I do not want to specify". These respondents were excluded from the corresponding contingency table testing.

Assumptions of Pearson chi-square statistic

For using Pearson chi-square statistic there should be taken into account following conditions:

1. **Asymptotic test** → required the sample sufficiently large – the number of honey consuming respondens is 241 and the number of all respondens is 258, which is enough (Nešetřilová, 2014).

2. **All expected frequencies > 1** → these values are calculated by SPSS. If an expected frequency is less than 1, some categories (answers) should be joined together or excluded (if it is possible) to meet this condition.

3. **Max 20% of expected frequencies < 5** → if it is not satisfied, the solution is the same as in the above article – to join some categories together or exclude them (if it is possible) (Taylor, 2007).

Null hypothesis H_0 assumes independence of examined categorical variables and the alternative hypothesis H_A indicates dependence between these variables.

The decision whether the questions are dependent or not is tested by a comparison between **p-value** and the significative level **α**. The p-value is calculated by software SPSS and means the probability of the test statistics, providing H_0 is true.

- **$p < \alpha$ → reject the null hypothesis at the α level of significance**

- **$p > \alpha$ → do not reject (accept) the null hypothesis at the α level of significance**

Usual values of **α** are $\alpha = 0.01$, $\alpha = 0.05$ or $\alpha = 0.10$.

Measure of Association

Having been proved dependence between two questions, it is suitable to find out how it is strong by using measures (coefficients) of association. **The most appropriate coefficient for purposes of this thesis is the Cramer´s coefficient V**, because the value does not depend on dimensions of the contingency table (it means on numbers of categories of each variable).

Some other coefficients depend on numbers of categories and it would not be so simple to compare obtained results with others, because each variable (question) includes different number of categories (answers). **For nominal variables the value of Cramer´s coefficient V ranges between < 0; 1 >**, where the value 0 means no association between variables and the value 1 means perfect association between variables (Hurťák, 2008). Values close to 0 are called weak association and if values lie close to 1, they are perceived as strong association (Nešetřilová, 2013).

It can be used another coefficient of association called Goodman and Kruskal's lambda. The coefficient represents an asymmetric measure – where it has to be taken into account, which variable is dependent and which independent; moreover the symetric value can also be calculated for variables that cannot be defined simply as dependent or independent (for example, color and kind of honey). Goodman and Kruskal's lambda ranges between < 0; 1 >, where the value 0 means no association between variables and the value 1 means a perfect association between variables. Values close to 0 are called weak associations and if values lie close to 1, they are perceived as strong associations (Nešetřilová, 2013).

2.2.4 Methodology of calculation of additional values

Average values

An average value (e.g. honey consumption) was calculated as a sum of middle values of each category multiplied by the frequency of the category and divided by a number of all respondents (or consumers).

$$A = \frac{1}{n}\sum_{i=1}^{i=k} m_i n_i$$

$$m_i = \frac{b_U - b_L}{2}$$

A ..... average value
n ..... number of all respondents (consumers)
n_i ..... number of respondents included in i-category
m_i ..... average value of i-category
b_U ..... upper bound of i-category
b_L ..... lower bound of i-category
k ..... number of categories

Note: In the cases of questions dealing with consumer prices there were the categories (answers) written in the questionnaire as following:

- 101 – 110 CZK
- 111 – 120 CZK

As lower bounds are taken real border values (e.g. 110 instead of 111), because the real (mathematical) border value is **110 CZK, not 111 CZK**. The values " +1" (e.g. 111) were used for simplier decision of consumer. According to the rules of designing questionnaires, the categories have to be exactly specified (Demčák, 2014). So, if there are written categories as following:

- 101 – 110 CZK
- 110 – 120 CZK

and a consumer would like to answer "110 CZK", he/she would not know whether choose the category 101 – 110 CZK or 110 – 120 CZK.

Calculation of percentages if more than one answer was allowed

The same weight of importance was assigned to all answers. Then groups of the same answers were counted and expressed as a share of all answers in percentages. In other words, the amount of repetitions of one answer was divided by the amount of all answers.

3 LITERATURE REVIEW

3.1 Honey as the Main Bee Product

As introduced, honey is the most important bee product; therefore in this theoretical part it will be given the utmost attention just to honey.

3.1.1 Definition of Honey

Honey is a valuable substance produced by bees. Bees produce it by changing of picking sweet syrups and place it into a honeycomb like their winter food supplies. A microbiologically steady and so non-perishable substance arises from unstable sweet syrups by a complex changing process. **Honey is considered a foodstuff of a saccharide character produced by a bee society**. Bees change and transform collected sweet syrups or different secretions from flowers, enrich them by own specific beneficial matters, concentrate them and place them into the honeycomb for maturing (Brožek, 1986; Čermáková, 2010; Dupal, 2004; Dupal $_1$, 2011; Hrobařová, 2010; Píchová, 2010).

Another simple definition of honey can be that honey is a product, which originates by a transformation of nectar or honeydew in the bee´s food (Dobrovoda, 1986).

Nowadays honey is defined by The Public Notice No.76/2003 Collection of Laws, which defines requests of natural sweeteners , honey, confections, cocoa powder and mixture of cocoa and sugar, chocolate and chocolate candies, as subsequently amended (hereinafter referred to as "The Public Notice No. 76/2003 Coll."), like a natural foodstuff of a saccharide character predominantly consisted of glucose and fructose, organic acids and enzyms, gathered during collecting sweet syrups from flowers (nectar), insect secretions on flower surfaces (honeydew) or on living flower parts by bees (Apis mellifera), which collect it, transform, combine it with their own specific substances, store it and let it dehydrate and ripen in honeycombs.

3.1.2 Composition of Honey

Honey is a natural product, mainly composed of a complex mixture of carbohydrates and other minor substances, such as organic acids, amino acids, proteins, minerals, vitamins, and lipids (Finola et al., 2007). In addition to several major components it contains substances that are present in very small quantities. The significance of some of them still has not been fully understood (Titěra, 2006).

Due to the various spectra of honey, their composition is closely linked to the floral source and time of honey flow, height above sea level, level of ripeness, but also to the breed of bees or processing method, etc. (Arráez-Román et al., 2006; Komlackij, Plotnikov, 2006). It is clear that the contained substances and their concentrations are significantly different. However, **there can be found lower and upper bounds, within them the concentrations of substances normally occur**, or even they are comparable to flowers and honeydew honeys (Čermáková, 2010; Píchová, 2010). The table 1 shows the chemical composition of flower honey and honeydew honey. For both honeys there are average values (1st and 3rd table column) and maximum and minimum values (2nd and 4th table column).

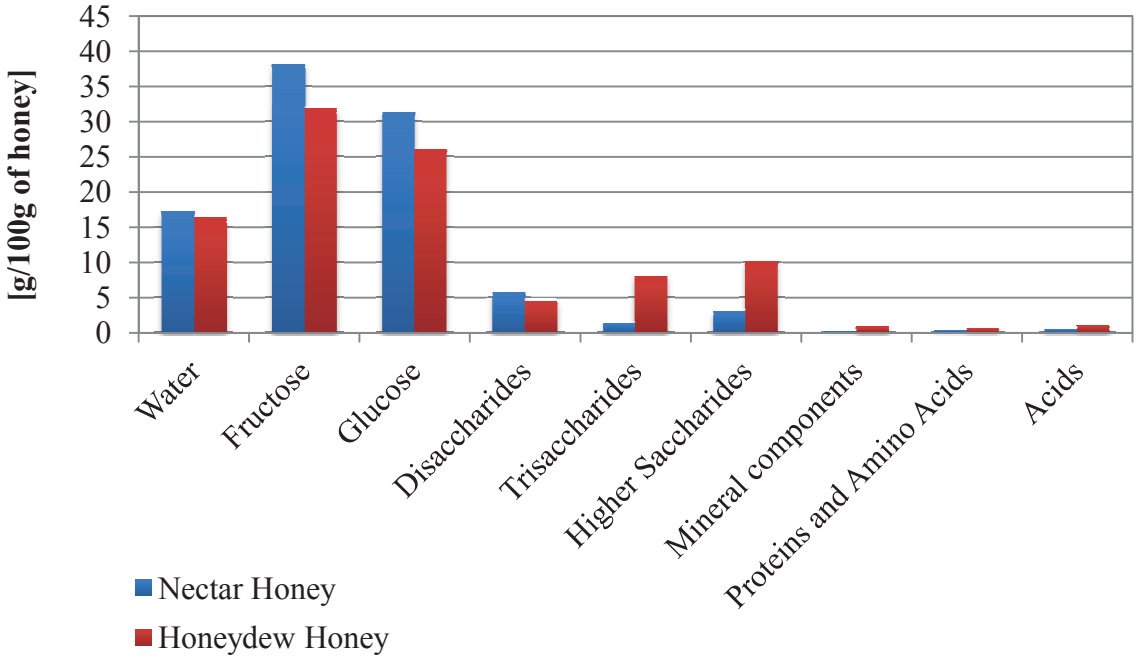
table 1: **Chemical Composition of Flower and Honeydew Honey** (Bogdanov, 2009).

Component *	Flower Honey		Honeydew Honey	
	Average	Range	Average	Range
Water	17.2	15-20	16.3	15-20
Monosaccharides				
Fructose	38.2	30-45	31.8	28-40
Glucose	31.3	24-40	26.1	19-32
Disaccharides				
Sucrose	0.7	0.1-4.7	0.5	0.1-4.7
Others	5.0	2.0-8.0	4.0	1.0-6.0
Trisaccharides				
Melezitose	< 0.1		4.0	0.3-22.0
Erlose	0.8	0.6-6.0	1.0	0.1-6.0
Others	0.5	0.5-1.0	3.0	0.1-6.0
Higher Saccharides	3.1		10.1	
Saccharides in total	79.7		80.5	
Mineral components	0.2	0.2-0.5	0.9	0.6-2.0
Proteins and Amino Acids	0.3	0.2-0.4	0.6	0.4-0.7
Acids	0.5	0.2-0.8	1.1	0.8-1.5
pH	3.9	3.5-4.5	5.2	4.5-6.5

* values (except pH) are quoted in g/100 g of honey

For a better illustration of an average chemical composition of flower and honeydew the values from the table 1 are converted into a bar graph - chart 1.

chart 1: **Average chemical composition of flower and honeydew honey** (own processing).



Obviously, in table 1 and chart 1 **the intervals of component contents for flower and honeydew honey are close**, even they overlap for most substances, which agrees with the statement about the comparability of flower and honeydew honeys above (Čermáková, 2010; Píchová, 2010). An interesting example is the **total content of sugars, when both honeys are almost the same but they differ from the contents of individual saccharides**; for example honeydew honeys contain less monosaccharides (glucose and fructose), but the content of trisaccharides (mainly melezitose) and higher sugars is higher than in the case of flower honeys. The honeydew honeys are also richer in the content of minerals, amino acids, proteins, acids and have a higher pH.

Sugars

The main constituent of honey are **sugars** that **take 95 – 99 %** (85 – 95 % (Finola et al., 2007)) **of dry matter**. The main components consist of simple sugars, also known as

monosaccharides, especially glucose (or dextrose) and fructose (or laevulose) (White, 1967). Further represented sugars are disaccharides - sucrose, maltose and then higher sugars or oligosaccharides - dextrins. Some honeydew honeys contain sometimes trisaccharide melezitose[1] (Čermáková, 2010). The relatively small amounts of other sugars such as turanose, isomaltose, trehalose, erlose, etc. can also be found in honey (Werner von der Ohe, 2005).

Honey can also be defined as a supersaturated solution of carbohydrates containing 70 - 80 %, or about 90 % of dry matter (Dupal, 2004). **Most of honeys contain more fructose than glucose**. Their ratio has the main impact on the own process of the honey granulation (Dupal $_1$, 2010).

Water

Water is the next essential component of honey and takes about 14 – 19 % (Titěra, 2006). Čermáková (2010) mentions a wider range of 13 – 20 %. Other literature describes the water content of 14 – 23 %, while The Public Notice No.76/2003 Coll. allows to 20 %[2] of water. Honey, which has over 25 % of water, is already threatened with the danger of fermentation (Hajdušková, 2000).

Minerals

Typical chemical elements possible to find in honey include: potassium, phosphorus, magnesium, chlorine, iodine, copper, sodium, calcium, zinc, iron (Titěra, 2006), aluminum, boron, vanadium, gold, lithium, manganese, molybdenum, nickel, silver, strontium, titanium, sulfur (Čerevenko, 2006). The following sources treat more deeply of individual minerals in honeys (a deeper study is not the aim of this thesis), for example Brožek (1986), Čerevenko (2006),

[1] Melezitose can get beekeepers into trouble because it crystallizes more quickly in cells of a honeycomb and a problem arises how to get the honey out from these melezitose honeycombs. This kind of saccharide represents a danger for bees if let leave in a beehive as stocks during winter, because it overtaxes digestive tracts of bees.

[2] The Public Notice No.76/2003 allows to 23% of water in the case of honey for baking.

Dobrovoda (1986), Doner (1980), Hajdušková (2000), Křenková (2009), Titěra (2006), White (1967, 1975, 1980).

The practical importance of minerals serves to find out what **kind of honey** (if flower or honeydew honey) is present. Honeydew honeys usually exhibit higher contains of mineral, so their conductivity is higher. More about conductivity and classifications of honeys can be found in the chap. 3.5.1.

Amino Acids, Proteins

According to White (1967) honey contains usually 11 - 21 various free amino acids. **The most important enzyme in honey is the enzyme invertase** which splits the disaccharides into monosaccharides glucose and fructose and has the basic influence on the quality of honey. It has to be mentioned another important enzyme - diastasis whose activity is one of the qualitative indicators of honey (see chapter 3.5.1) (Dobrovoda, 1986; Titěra, 2006).

Acids

Acids that influence flavour, stability and many other highly-valuated features, are organic and inorganic (Dobrovoda, 1986) and they can inactivate free radicals because of their antioxidating ability. It can be mentioned e.g. gluconic acid, malic, succinic, citric, acetic, formic acid and others. (Dobrovoda, 1986; Titěra, 2006).

Other substances

The honey also contains pigments that affect the color of the product. Color created by different pigments, mainly of plant origin, belong to the group of flavonoids, carotenoids, chlorophylls and anthocyanins (Dobrovoda, 1986; Křenková, 2009). All types of honey possesses an extremely small particles, colloidal particles, forming sediment in honey, but there are always scattered. Particles of bee wax that have passed through sieves during honey extracting are always present. In addition to them, honey contains pollen particles, oils and other foreign substances (Dobrovoda, 1986).

3.2 Kinds of Honey According to its Source

As well as other foods and foodstuffs, honey according to several aspects can be broken down into different categories. **The basic breakdown** is watching two main viewpoints – **according** to **source** of honey and according to **technology of extracting and processing** honey (The Public Notice No.76/2003 Coll.).

The first basic breakdown of honeys according to its source is based on a detection of what the main **source of sweet syrups** (saccharides) has been. In principle, for the climatic conditions of the Czech Republic two elementary sources could be taken into account: nectar and honeydew. Therefore, **honeys are divided into flower** honeys **and honeydew honeys** primarily (Brožek, 1986; Čermáková, 2010; Dobrovoda, 1986; Doner, 1980; Dupal, 2004; Dupal $_1$, 2011; Hajdušková, 2000; Hrobařová, 2010; Loutocká, 2010; Píchová, 2010; Titěra, 2006; The Public Notice No.76/2003; White, 1980).

3.2.1 Flower Honeys

The flower honey is a honey **mainly made from the nectar** of flower´s blooms (The Public Notice No.76/2003).

Nectar – is located in blooms of blooming plants that need for their successful pollination to transfer the pollen from one flower to another. It is provided mainly by bees next to other pollinators in nature (Titěra, 2006).

Nectar is a sweet secretion given by plant glands, which are located mostly in blooms. The concentration (range 3 – 80 %) of this water solution of sugars, depends not only on the type of plants, but also on climate, hour of honey flow, weather, humidity, air temperature, etc. (Dobrovoda, 1986; Pichová, 2010) . Another literature quotes the water content of 98 % and more (Dupal, 2004).

3.2.2 Honeydew Honeys

The honeydew honey is **mainly made from secretions of insects** (Hemiptera) sucking living parts of plants or from secretions of living parts of plants. (The Public Notice No.76/2003 Coll.).

Honeydew – as well as nectar, honeydew is primarily a solution of sugars. The **honeydew is produced** and carried on the surface of plants **through some insect species** (aphids) – they are so-called honeydew producers belonging to the order Homoptera (Čermáková, 2010; Dobrovoda, 1986; Hajdušková, 2000; Titěra, 2006). Some authors consider honeydew as excretion stuff of some species of insects and other producers of honeydew (Dupal, 2004; Píchová, 2010).

3.3 Kinds of Honey According to Technology of Extracting and Processing

The second basic breakdown of honeys deals with the way of extracting honey from the honeycombs and following processing (The Public Notice No.76/2003 Coll.). For purposes of this thesis there will be introduced only two most important ways of extracting and processing honey.

Extracted honey - honey is obtained by the classical and most usually used **method using centrifugal force**. Full honeycombs are placed into a rotating basket, where honey flies out from cells to the outer cover of honey extractor and flows down to the bottom where it is taken for further processing.

Creamed honey – honey that was after extracting **additionally processed into a cream consistency** composed of a mixture of small crystals (The Public Notice No.76/2003 Coll.). Creaming is implemented by so-called "controlled granulation" by mechanical mixing until the honey has a required density. Such honey does not crystallize anymore to a solid consistency; therefore it is easy to spread on a bread loaf. On the other hand it does not flow, so it can be suitably used for consumption for children and elderly people (Čermáková, 2010;

Hrobařová, 2010). Further Czech slang expressions of creamed honey can be seen in the author´s bachelor thesis (Nový, 2012).

3.4 Issues of Labeling Honeys

Honey, as well as most of common foodstuffs, has to be labeled for consumer´s easier orientation in supplies of honeys. Except the case of honey sale **"from a courtyard"** (see the chap. 3.4.1) the supplier is obliged to label a honey with a label, where compulsory information, set by a statutory mechanism, is written.

3.4.1 Labels for Honey from Beekeepers

Labels for honey from beekeepers are required when the product is distributed to the markets and shops that sell honey to the final consumer and are located in the same region as beehives. Honey produced by a beekeeper who does not have production authorization should be labeled in line with the requirements of Act No.166/1999 Collection of Laws (on veterinary care and amending and supplementing certain related acts - Veterinary Act), as subsequently amended and with the requirements of The Public Notice No.76/2003 Coll. A label has to state (according to § 8 of Public Notice No. 76/2003 Coll.) a full name and home address of beekeeper (a natural person), quantity and expiration (just month and year)[1]. If it is sold directly from the beekeeper´s house (the sale of honey **"from a courtyard"**), a label is not necessary (Titěra, Vořechovská, 2009; Vořechovská, Titěra, 2011).

3.4.2 Labels for Honey from a Production

Labels for honey from a production unit are mandatory if a beekeeper distributes his/her products to the market network, which is understood like placing products (foodstuffs) on the market. Foodstuffs are labeled in the Czech Republic according to these basic laws: The Act No.110/1997 Collection of Laws, about foodstuffs and tobacco products, label-

[1] The expiration of honey is most usually set up for two years.

ing, amending and supplementing certain related acts, as subsequently amended and The Public Notice No.113/2005 Collection of Laws, about labeling foodstuffs and tobacco products, as subsequently amended. For labeling honey there are also valid requirements of The Public Notice No.76/2003 Coll. and the label has to contain following information: business name of the manufacturer, the manufacturer´s seat, quantity, expiration (just month and year) and country of origin. In the case of distribution outside the region it is also necessary to indicate the honey in line with the beekeeper´s registration number assigned by the veterinary administration (Titěra, Vořechovská, 2009; Vořechovská, Titěra, 2011). **The main motivation for beekeepers to let their beekeeping authorize is to have more possibilites to sell their honey**, e.g. to sell it to markets that are located out off their region, to supply selling chains, etc.

As mentioned, the geographical origin of honey (country of origin) is mandatory, but there can be written only states that honey comes from, whether from EU countries or from countries outside the EU, alternatively a mixture of honeys from EU and non-EU countries. There is no obligation to indicate, how the ratio of these honeys is high. Even it is not unlawful a marking of honey as a "Czech product," although by careful reading it can be found on the label information that honey comes from European and non-European countries. The author perceives this praxis like a cheating of consumers. It is also one of the reasons why **Federal standard of quality** called "Czech honey" was established (see chap. 3.4.2) (Dupal$_1$, 2010; The Public Notice No.76/2003 Coll.).

In addition to the mandatory labeling the kind of honey according to its source (either flower or honeydew honey), it is allowed to supplement more additional information:

- regional, territorial or another specification of location (e.g. flower honey - Podkrkonošský),
- information in relation to the origin of honey - it can be called "monofloral" or "mixed" honey (§ 8 letter a) of The Public Notice No.76/2003 Coll.),

- specification of plant species, which have been the main source of the appropriate honey (Titěra, Vořechovská, 2009; Vořechovská, Titěra, 2011; The Public Notice No.76/2003 Coll.).

3.4.3 Czech Honey Quality Standard

Because **honey produced in the Czech Republic achieves significantly higher quality** than that given by § 10 of The Public Notice No.76/2003 Coll. or by other legislation, such as the European Code quality for honey, the Czech Union of Beekeepers (CUB, Český svaz včelařů: ČSV) **have established** for its members **Federal standard quality** CUB No.1/1999 - Czech Honey Federal Standard (**Český med**), as subsequently amended (hereinafter referred to as "The Standard CUB No.1/1999"), **which should distinguish high-quality domestic honey** from the others (Píchová, 2010). Filtered and baking (industrial) honeys can not be labeled by this standard (The Standard CUB No.1/1999) in any case.

This standard provides guidelines for collecting and processing honey obtained exclusively from the production of bee colonies in the Czech Republic. Contrary to generally given values of honey by The Public Notice No.76/2003 Coll., some values of honey such as water content, hydroxymethylfurfural and sucrose content in all kinds of honey are tighten (see table 2). **A beekeeper who fulfils the requirements given by The Standard CUB No.1/1999 is allowed to mark his/her honey by the certificate "Czech honey", which for a consumer means guaranteed high quality of honey** (The Standard CUB No.1/1999). This certificate presents a good opportunity of advertising and new selling possibilities for beekeepers.

3.5 Qualitative Requirements of Honey

Although honey is a very complex and variable element matter, by analyses of thousands of samples it was set up that the various characteristics can be found between certain levels. For quality identification and control a set of several **laboratory parameters of chemical composition of honey and its physical properties have been established**. Their **extreme values were taken as quality standards**. Based on the laboratory results there may be exposed a laboratory protocol or certificate of quality. This is highly recognized by beekeepers to have

a certificate of quality of their honey, especially if it has been made out by an accredited laboratories, because these are regularly and rigorously inspected by accreditation authorities (e.g. in the Czech Republic it is CIA - Czech Institute for Accreditation) (Titěra, 2006).

3.5.1 The quality of honey in terms of legislation - the physical and physico-chemical parameters of honey and its changes

The following table 2 shows contents of the components and the values of quantities, which are preferably monitored in honey for compliance with the requirements of The Public Notice No.76/2003 Coll.

table 2: **Contents of individual components and values of variables observed in honeys** (The Standard CUB No.1/1999, The Public Notice No.76/2003 Coll.).

Requirement	FLOWER HONEY	HONEYDEW HONEY	BAKING HONEY	CZECH HONEY
water Content [% of weight max.]	20	20	23	18
Sucrose Content [% of weight max.]	5*	5	–	5
Sum of Fructose and Glucose Content [% of weight min.]	60	45	–	–
HMF [mg/kg max.]	40	40	–	20
Electric conductivity [mS/m]	≤ 80	≥ 80	–	–
Acidity [mekv/kg max.]	50	50	80	–
Activity of Diastase [° of Schade min.]	8	8	–	–
The content of water-insoluble substances [% of weight max.]**	0.1	0.1	–	–

* A monofloral honey of Black Locust (Robinia pseudoacacia - Trnovník akátu) and of Lucerne (Medicago sativa - Tolice vojtěška) can contain sucrose up to 10%.

** Honey which was extracted by pressing may contain up to 0.5% of water-insoluble substances.

Water Content

Water is an indicator of the quality and maturity of honey. **The lower water content the honey has, the more qualitative, stabler and denser the honey is**. The water content of honey can be determined by a laboratory refractometer or roughly by accurate weighing a known volume of honey (the density determination) (Titěra, 2006). Honey over 25 % of water is already threatened by the danger of fermentation (Hajdušková, 2000). According to other authors, a mature honey should contain not more than 19 % of water, usually only 15 – 18 %. The water content around 20 % and more shows the honey that was removed from a beehive and extracted prematurely, so it was not ripe enough. Honey containing over 19 % of water tends already to spontaneous fermentation. Higher water content can even be caused by adding water to honey by cheating sellers (Dupal$_1$, 2010). The Standard CUB No.1/1999 is stricter allowing maximum water content for the Czech honey only to 18 % (see table 2).

Sucrose Content

The **sucrose content** according to The Standard CUB No.1/1999 and The Public Notice No.76/2003 Coll. **can be up to 5 % of weight**. This requierement does not apply to some monofloral honeys, which can have the sucrose content higher (Dupal, 2004).

HMF (hydroxymethylfurfural)

It is a substance produced by heating simple sugars in an acidic environment (Dupal $_1$, 2010). **Thanks to the level of HMF it can be detected if honey was not stored for a very long time or incautiously heated**. For unheated honeys the HMF content is below 10 mg/kg. Honey that has been liquefied sparingly, mostly still complies with the values given in table 2. The high content of HMF indicates heat damage of honey. Such honey does not mean a danger of one´s health, but it deprives the honey of many valuable substances (Dupal, 2004; Titěra, 2006). Such devasted honey then becomes a "plain" sweetener such a way. HMF presence leads to further reactions, which can change honey´s color (caramelization). Such honey becomes darker (Loutocká, 2010).

Sum of Glucose a Fructose

The minimum sum of the glucose and fructose are shown in the table 2. It is not important for the honey to achieve just the sum of these monosaccharides but rather their **ratio**, which **has a decisive influence on the properties of the honey, especially at the beginning and during the development of granulation**. It holds up well and the more fructose honey contains, the longer time remains liquid and does not crystallize so rapidly (Brožek, 1986; Čermáková, 2010; Dobrovoda, 1986; Dupal, 2004; Hajdušková, 2000; Píchová, 2010; Titěra, 2006).

Granulation of honey - is a **natural** and **inseparable phenomenon** of honey´s growing old. **Every honey stands sooner or later a granulation** (Baker, 2007). **Flower honeys** with high glucose content **solidify very quickly**[1], usually in just a few weeks after extracting. Honeydew honeys mostly crystallize after a few months due to a higher fructose content (Hajdušková, 2000). Firstly it becomes cloudy and then solidifies into a mushy, creamy or completely rigid consistency. Granulation occurs for the following reasons: high solids´ content and low water content (supersaturated solution (Čermáková, 2010; Dupal, 2004)). The result is a gradual elimination of crystals from the solution. Some time later, honey transforms into a solid mass. This process is called saccharification ("zcukernatění") because the crystals of honey resemble crystals of sucrose. Consumers not knowing this phenomenon may use this term incorrectly and feel that honey converts into sugar (sucrose) by this process or that sugar was added into honey by a beekeeper (Bienen aktuell, 2007). The term saccharification is incorrect (Brožek, 1986; Dobrovoda, 1986), although it is still used by some authors (Píchová, 2010). **Crystallization does not change the composition or quality of the product** (Titěra, 2006). If the honey has not solidified during two years, there stands a serious suspicion that it was damaged somehow, usually by heat (Hajdušková, 2000).

Liquefying of honey – a granulated honey can be changed back into its liquid form by heating again; anyway there should be taken into account following principles to avoid the devaluation of honey´s biologically valuable and active substances. In particular, the **honey must not be heated at a high temperature for too long time**. Consumers liquefy honey usually by heating it in a water bath. Dobrovoda (1986) and Brožek (1986) warn consumers against heating honey in a water bath over 40° C. Titěra (2006) recommends, that it is better to expose

[1] Author has experience with flower honeys that start to crystallize only some days after extracting.

honey to temperature around 50° C for a short time than to expose it to a lower temperature of 40° C for a long time - it would be more damaging for the honey. Some sources warn against giving honey to a hot tea because of destroying its biologically valuable substances. This refuses Titěra (2006) and declares that a classically prepared cup of tea after pouring the boiling water into it has the temperature of 80 - 90° C. Immersed teaspoon of honey cools the temperature immediately by a few degrees down and when the tea can be drunk, which means the temperature does not exceed 65° C, heat stress that honey was exposed to, decreases the biological activity only by 6 – 10 %. So if the consumer gives into the hot tea by 10 % greater dose, the amount of active substances in honey is maintained. The same experience acknowledged Dupal$_2$ (2011). Honey crystallization proves a right and high quality of honey (Dobrovoda, 1986).

Electrical conductivity - measurement of electrical conductivity **is used as a method to distinguish the kind of honey according to its source** (whether nectar or honeydew). The flower honey´s conductivity comes up to $55.0\,mS \cdot m^{-1}$ (milli-Siemens, related to the unit of length - one metre) and honeydew honey´s conductivity is achieved higher due to higher content of minerals: $90 - 130\,mS \cdot m^{-1}$. Conductivity of mixed honeys lies in the range $50 - 105\,mS \cdot m^{-1}$ (Dupal, 2004; Dupal $_1$, 2010). $80\,mS \cdot m^{-1}$ was determined as a border value of differentiation between flower and honeydew honeys (Decree No. 76/2003 Coll.).

Acidity - an additional criterion, affected by the presence of acids. **Honey contains a wide range of organic and inorganic acids** and their contents can be therefore used for the assessment of the quality or authenticity of honey (Dupal $_1$, 2010). The organic acids are responsible for the acidity of honey and contribute largely to its characteristic taste (Olaitan, 2007). By fermentation (proces that can be initiated by a high water content – a fault of honey, as discussed above) the acid content increases, but generally does not exceed $30 mekv / kg$ (milliequivalents per 1 kg). Contemporary Czech and European law permits a maximum value $50 mekv / kg$ (Titěra, 2006, Decree No. 76/2003 Coll.).

Diastase activity - diastase is an enzyme splitting higher saccharides (starch) into simple sugars. Enzymes represent the most complex protein structures. Enzymes are very sensitive to heat and inappropriate storage of honey. **Fresh and properly stored or manipulated honeys have high enzyme activities**. Therefore the main importance of the enzyme diastase is the

evaluation of the quality of honey by the diastase activity. The minimum value was determined to 8 degrees of Schade (see table 2) (Dupal, 2004; Titěra, 2006).

The content of water-insoluble substances – must not exceed 0.1 % of weight (The Public Notice No. 76/2003 Coll.).

3.5.2 The Sensory Properties of Honey

The sensory analysis as a control process of quality and food safety has already been used for many years. Its importance lies especially in the speed of acquiring relevant information in general, particularly in a relatively low cost of acquisition. Sensory analysis is the evaluation of food directly by human senses, including the processing of the results by the human central nervous system. **Analysis is carried out under conditions which ensure the objective, accurate and reproducible measurement** (Loutocká, 2010).

Sensory properties are often assessed during trading honey according to the requirements and customer´s habits. **Consumers** have an option to analyze a glass of honey by their senses, **mostly analyze the overall appearance** (closely related to the shape and type of the glass / the packaging and attractive label), color and consistency of honey.

Color

The color palette of honey is very diverse and depends on the botanical origin (Čermáková , 2010). The color of honey can be almost transparent, with various shades of yellow, green, amber, golden brown, from light to dark brown or almost black. **Common color for flower honeys is light and for honeydew honeys dark color**. However, some monoflower honeys (honeys whose source comes from only one kind of flower) can break this rule (Dupal, 2004). The color of honey depends on many other factors, such as age of the combs (Dobrovoda, 1986) or the way and duration of heating of the honey. Creamed honeys have white or yellowish color (Hrobařová, 2010).

Appearance

Appearance of honey is pure liquid (clear), but mostly mild up to strong form. **Depending on** the level or **development of crystallization** it may contain honey crystals or can be mostly or completely granulated. Crystals can form a soft, pasty, creamy or up to a solid substance (Dupal, 2004).

Consistency

As already mentioned, every quality (genuine, unmodified) honey crystallizes after some time. Its consistency is therefore between complete liquidity and entire solidity. **The viscosity of honey depends mainly on the water content** (Brožek, 1986) and the temperature (Čermáková, 2010). The higher the water content and the higher the temperature of a honey, the less viscous honey is (Dobrovoda, 1986).

Fragrance

Honey fragrance is caused by aromatic substances, whose content depends on the botanical origin of honey. Aroma of some honeys is very specific and strong, flower honeys has naturally a characteristic flower aroma, while honeydew honeys should be short of flower aroma having rather spicy or resinous smell (Dupal, 2004).

Flavour

Flavour as well as fragrance is **typically honeyed** and according to botanical origin lightly scented. Flavour depends on the processing of honey. According to its origin, the flavour can differ considerably from intensively sweet to a savoury or pungent smell (Dupal, 2004).

3.5.3 Decay of Honey and its Counterfeiting

Beekeeper (primary producer), processor, packer, distributor/dealer are links in the chain that can interact the quality of honey and also its decay (Dupal $_1$, 2011). Gentle handling of honey

preserves its natural properties**. It should be observed the rules of cleanliness of the whole chain, to avoid secondary contamination of the product** (Brožek, 1986).

A common beekeeper´s practice is to create artificial sugar stocks in the overwintering bee colonies. The solution used for feeding bees consists of water and sugar - sucrose. **If** these **sugar stocks are mixed with natural monosaccharide sugars, then such extracted honey shows high sucrose content** (Bienen aktuell, 2007). However, there are cases when "bee-keepers" fed their bees by sucrose during honey flow intentionally to get more "honey". Such "honey " lacks valuable honey substances, which can be detected by sensory or physico - chemical analyses and the product cannot be considered honey in any case. This is a counter-feiting of honey and consumer´s deception (Dupal $_1$, 2011).

Some counterfeiters have developed a specialized technology to manufacture products sold as "honey" which have never been in a contact with bees. It is a mix of juices and syrups, which does not endanger consume´s health, but it is only a factory product based on sucrose or starch. **Sometimes honey** having e.g. 15 % of water **is additionally mixed with water to increase the weight**. Due to the popularity of dark honey, colourings are added into honey in some cases, too (Titěra, 2006).

Every honey coming from all regions of the Czech Republic is totally without any problems. The inspection of the quality of food is carried out in the State Veterinary Administration (Státní veterinární správa - SVS) - the production and import, and also in Czech Agriculture and Food Inspection Authority (Státní zemědělská a potravinářská inspekce - SZPI) - market, business network, among others. The supervision organization of research in this field is IHC (International Honey Commission) (Dupal $_2$, 2011; Titěra, 2006).

3.6 Price of Honey

Some authors recommend a minimum price limit of quality honey at 100 CZK / kg, but also mention that the movement of the price level also varies depending on traditions of the region. **Price for flower honey usually ranges between 100 - 120 CZK / kg and for honeydew honeys between 120 - 160 CZK / kg**. Furthermore, there is a warning against putting obtrusive low prices, being given an impression of poor quality product by the customer, which can

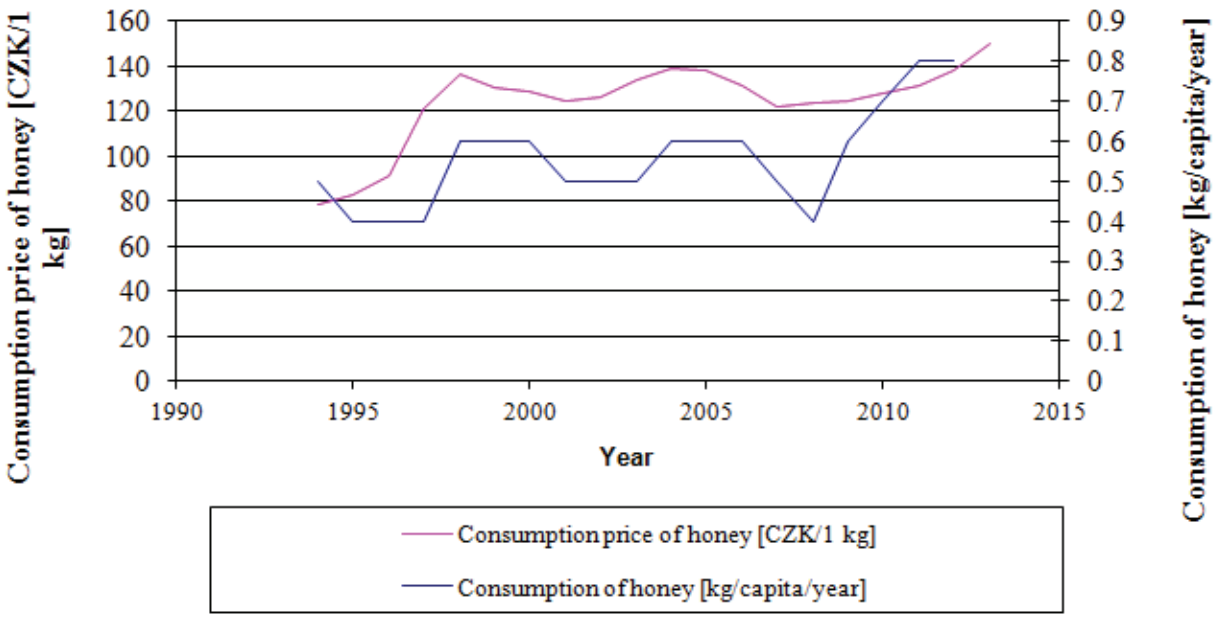
discourage him from buying the product (Kurtin, 2010). The past and current development of prices of honey and annual consumption of honey can be seen in table 3 and in chart 2.

table 3: **Consumption of honey and its price** (CZSO, 2013; CUB $_1$, 2014; MA, 2013).

	Consumption of honey [kg/capita/year]	**Consumption price of honey [CZK/1 kg]**
1994	0.5	78.7
1995	0.4	82.7
1996	0.4	91.4
1997	0.4	121.2
1998	0.6	136.2
1999	0.6	130.0
2000	0.6	128.5
2001	0.5	124.8
2002	0.5	125.7
2003	0.5	133.5
2004	0.6	138.5
2005	0.6	137.6
2006	0.6	131.0
2007	0.5	121.9
2008	0.4	123.3
2009	0.6	124.2
2010	0.7	127.7
2011	0.8	131.5
2012	0.8	137.6
2013	-	150.0

For a better illustration the data from the table 3 are converted into chart 2.

chart 2: **Consumption of honey and its price** (own processing).



The bees´ health has the greatest influence on constantly rising prices. It is thought that diseases resulting in colony´s weakening or deaths lead to a reduction of production, lack of honey on the market, which inevitably causes a rise in its price. **Lack of honey on the market can introduce various substitutes on the market and, paradoxically, it may result in a decline of honey prices.** On the other hand, the rapid rise of price may be reflected in declining demand, since many customers will be looking for cheaper substitutes (Táborský, 2010). The average market price is slightly increasing in time, e.g. in 2010 it was at 127.70 CZK / kg of honey, in 2013 the price was at 150.00 CZK / kg (CUB $_1$, 2014).

3.7 Mead

Mead is an alcoholic beverage made of honey, water (or fruit juice) and cultures of wine yeasts. Mead is one of the oldest alcoholic beverages in human history and has had an important cultural role, particularly in Europe and Africa (Teramoto, 2000). Probably, it was discovered in Africa, when honey mixed with rain water fermented in tree hollows. Thanks to its pleasant taste and medicinal effect it is a popular dainty. In many cultures symbolized wisdom, courage and strength. People passed on recipes for mead from generation to generation; mead was expanded worldwide this way and has gained a high popularity.

3.7.1 Production of Mead

Production of mead is very similar to making wine. The production technology has not been changed for many centuries, however the equipment used in the production process of mead, has gone through enormous development, of course.

The base of production of mead is the same for all meads generally: **A solution of honey and water is allowed to ferment** in fermentation tanks, where noble wine yeast cultures should be used for better beginning and development of fermentation. Typically, this is done at a temperature higher than 20 ° C that must be consistent. Fermentation time is different for each of mead, ranging from one to four weeks. Then it has to mature in barrels for a long time. The most quality meads may mature for several years. Mead during the fermentation gets a maximum of 14 % of alcohol. Other authors mention 10 – 12 % (Dupal, 2004) or 8 – 18 % (Mendes-Ferreira at al., 2010). Every mead is a complete original. Some additional steps can be included during this production technology, e.g. mead filtration to get rid of dead yeast that causes turbidity of mead (especially in a commercial production, in hobby production not so often) (IMedovina, 2013).

All steps in the production of mead may differ in some details, but the principle remains the same. However, there are **two variants** of production of mead – **meads produced by boiling or by cold process**. Boiled meads are specific for boiling the solution of honey and water. Titěra (2006) recommendes boiling at 100 °C for one hour at least, other authors mention that mead should be pasteurized at 65 °C for 10 min (Mendes-Ferreira at al., 2010). A disadvantage of this process could be seen in the disappearance of the favorable substances coming from honey, which do not survive the high temperature. Therefore, meads produced by cold method, as well as wine, are usually of higher quality (IMedovina, 2013).

3.7.2 Prices of Mead

Mead can be counted as a favourite beverage in the Czech Republic, which goes hand in hand with the traditional beekeeping in the Czech Republic. **This bee product can be seen as an alternative way to increase the consumption of honey** indirectly and to improve beekeep-

er´s profit. As written by Sroka and Tuszynski (2007), this beverage has progressively gained economic importance, due to the therapeutic/nutriceutical properties attributed to honey and by an increasing demand for gourmet products. For a basic overview, the table 4 brings consumption prices of some meads made by Czech producers.

table 4**: Consumption price of mead** (medoviny.cz, 2014).

Mead	Price [CZK / 0.5 l]
Dolská	116
Halada	106
Z podhradí	104
Krkonošská	126
Valašská	126
Královská	128
Hřebečská	116
Elisa	100
Benátecká	98
Z Polštejna	132

3.8 Beekeeping in the Czech Republic

The Czech beekeeping is one of the most organized apicultures all over the world. **The dominant majority of beekeepers in the Czech Republic is consolidated by the Czech Union of Beekeepers (CUB) which registers more than 46,000 members**. This amount represents 98 % of all beekeepers in the country. The Czech beekeepers keep about half a million bee colonies. This is 97 % of the total number of colonies registered in the Czech Republic.

Thanks to a perfect organization the Czech beekeeping reaches significant achievements. Especially in the field of bee health, social and professional growth of its members**, increase of production and quality of honey and its sales**, support of beekeeping industry, research, etc. An important task of the CUB is also cooperation with legislative and executive state authorities, government institutions and non-governmental organizations for the purpose of securing legislative steps and other activities leading to the implementation of activities written above (CUB $_{1}$. 2012).

3.8.1 Subsidies of the Czech Beekeeping

In the 1990s there was a sharp decline in the number of bee colonies and beekeepers. The reason was purely economic, having nothing to do with health of bee colonies as in neighboring countries. Beekeeping has become unprofitable because of the large reduction in buying up prices, the gradual increase in prices of sugar and all beekeeping equipment. Over time, **with a help of the state and the EU, it was achieved stabilization of numer of bee colonies and beekeepers.** Currently, there are subsidy programs that support the beekeepers.

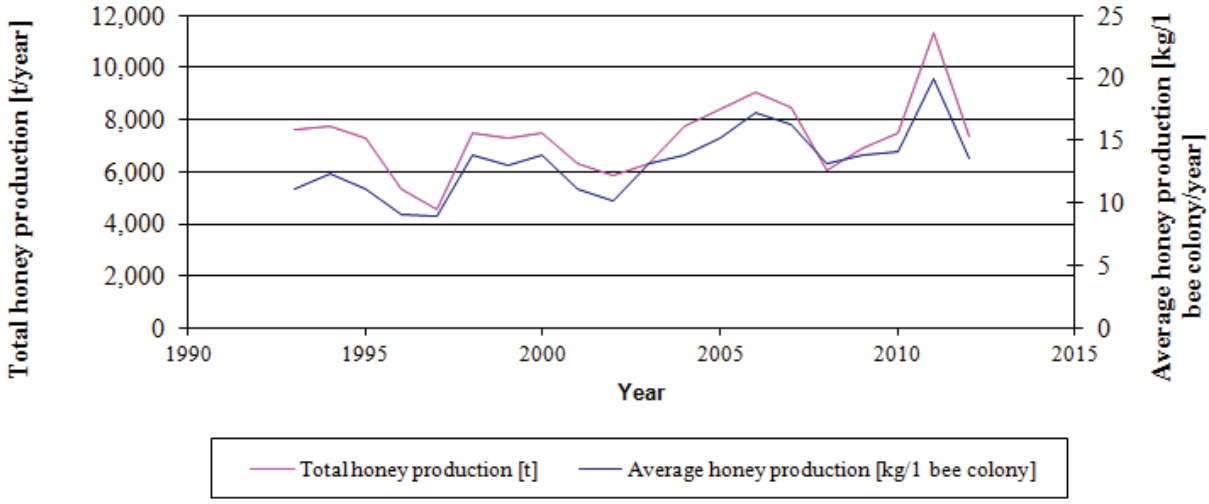
The following programs rank among subsidised by the state: A **subsidy** for each wintering bee colony, **funds for activities with young people**, support for maintenance of bee genetic resources, etc. Subsidies provided by EU and the Czech Republic: technical assistance, rationalization of migration of beehives, financing analyses of honey, bee colonies restoration, applied research (CUB $_1$, 2013; Roub, 2010).

Due to the above introduced grant programs it can be successfully prevented a further sharp decline in the number of bee colonies. Fluctuations in the number of bee colonies are caused mainly by higher than average colonies´ deaths caused by bee diseases and by reducing the market price of honey. **In 2012, there were 540,705 registered bee colonies** (CUB $_1$, 2013).

3.8.2 Production and Consumption of Honey in the Czech Republic

Chart 3 represents the total and **average production of honey in the Czech Republic** per year. Although number of bee colonies fluctuates, the total production is still moving around a value of 7,000 tons per year. The second curve in the Chart 3 is the average production of honey of one colony per year. It **has a growing trend**, in 1993 the average was 11.11 kg / colony, in 2011 already 19.99kg / colony but the next year the average production decreased to 13.56 (CUB $_1$, 2014).

Chart 3: **Total and average honey production per year** (own processing).



One of the factors that adversely affects Czech beekeeping is relatively **low consumption of bee products**, especially of honey. **In the Czech Republic, the consumption of honey is between 0.5 - 0.9 kg per capita per year** (a growing trend). In developed European countries the consumption of honey is three times higher (Hajdušková, 2000). Efforts to increase honey consumption is realized by growing number of products containing honey (mead, honey pastries, etc.), as well as various support programs aimed at promoting awareness of honey.

3.8.3 Foreign Trade in Honey

The still declining balance of trade (see table 5) can be understood negatively because it **increases the import of very cheap and low quality honeys**, which have been becoming the equivalent of the domestic high-quality honeys. There is also a risk of introducing diseases dangerous to bees. The most important customers of honey in 2013 were Slovakia, Romania and Germany and the biggest volume of honey was imported from Ukraine, China, Germany in the same year (CUB $_1$, 2013). The author does not understand why it is necessary to export the Czech honey to Germany and to import the German honey to the Czech Republic.

table 5: **Balance of foreign trade in honey in tons** (CUB $_{1}$, 2014).

	1997	1998	1999	2000	2001	2002	2003	2004
Export	277	989	1169	2271	1793	1867	2024	2975
Import	750	614	686	660	1073	1144	1757	1134
Balance	-473	375	483	1611	720	723	267	1841

	2005	2006	2007	2008	2009	2010	2011	2012
Export	2826	2995	4357	2595	2051	1188	2 270	1 583
Import	1580	2392	1723	2050	1825	2172	1 777	1 946
Balance	1246	603	2634	545	226	-984	493	-363

4 RESULTS AND DISCUSSION

This chapter presents the results of the author's own survey, which are processed according to described methodology in the chapter 2.2.2. The whole questionnaire can be found in annex 1.

4.1 Evaluation of the survey

The basis of own processing is the evaluation of returned questionnaires, which is broken down into more parts. Each part focuses on a different area of behaviour of bee product consumers.

4.1.1 Identification of all respondents

As written in the methodology (2.2.2), the questionnaire was made up of 31 questions relating to bee products. The questionnaire was answered by 258 respondents, 195 women and 63 men, whose age and gender are summarized in chart 4. The dominant majority are women between 21 - 30 years of age (127 resp.), then men between 21 - 30 years of age (41 resp.). 178 respondents (69 % of resp.) stated their permanent residence in cities, remaining 80 respondents (31 % of resp.) live permanently in the country (question No. 29 – see annex 1).

chart 4: question No. 26 and 27: **Age and gender of respondents** (own processing).

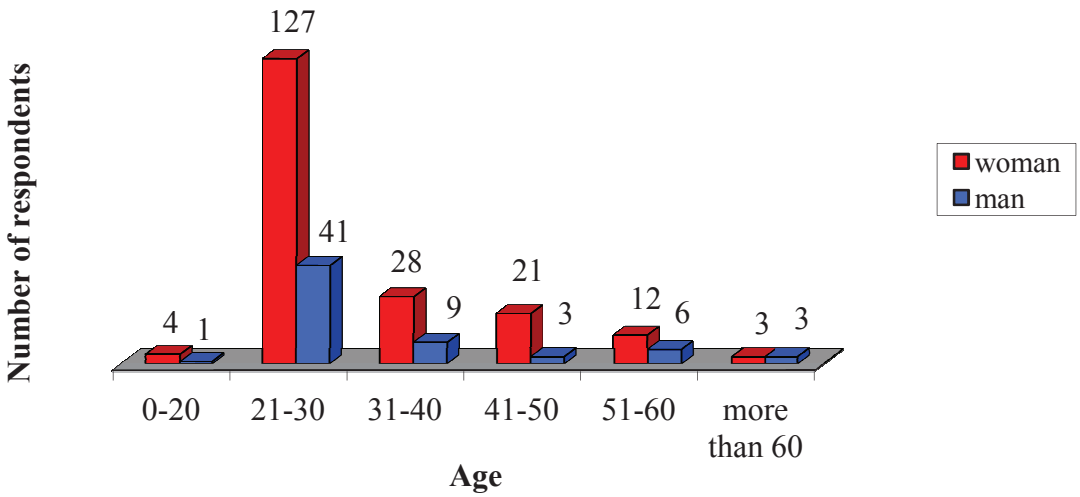
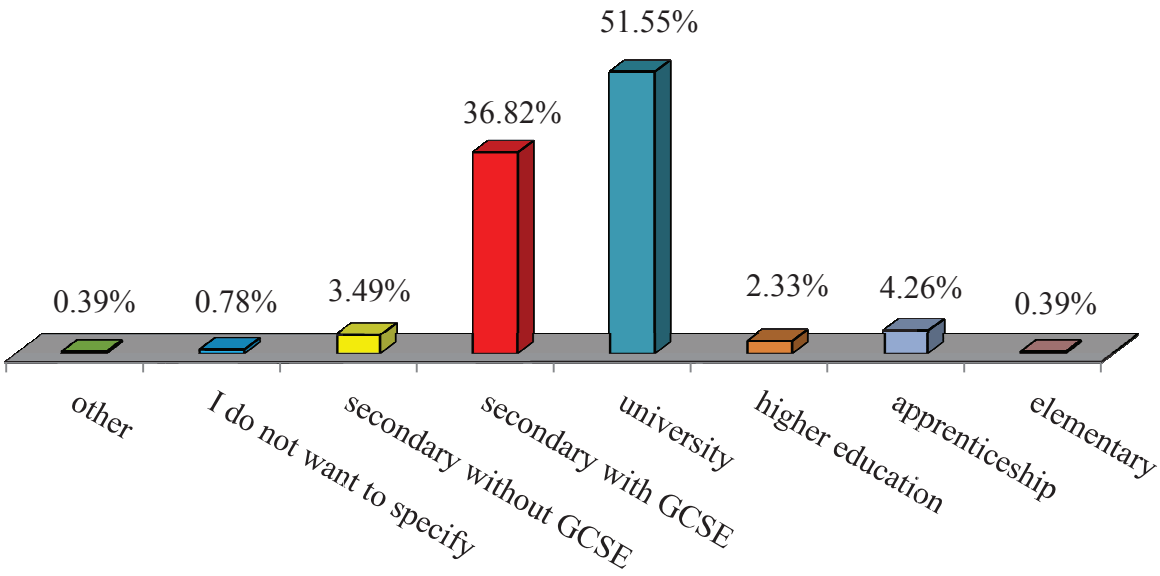


chart 5: question No. 30: **Education of respondents** (own processing).

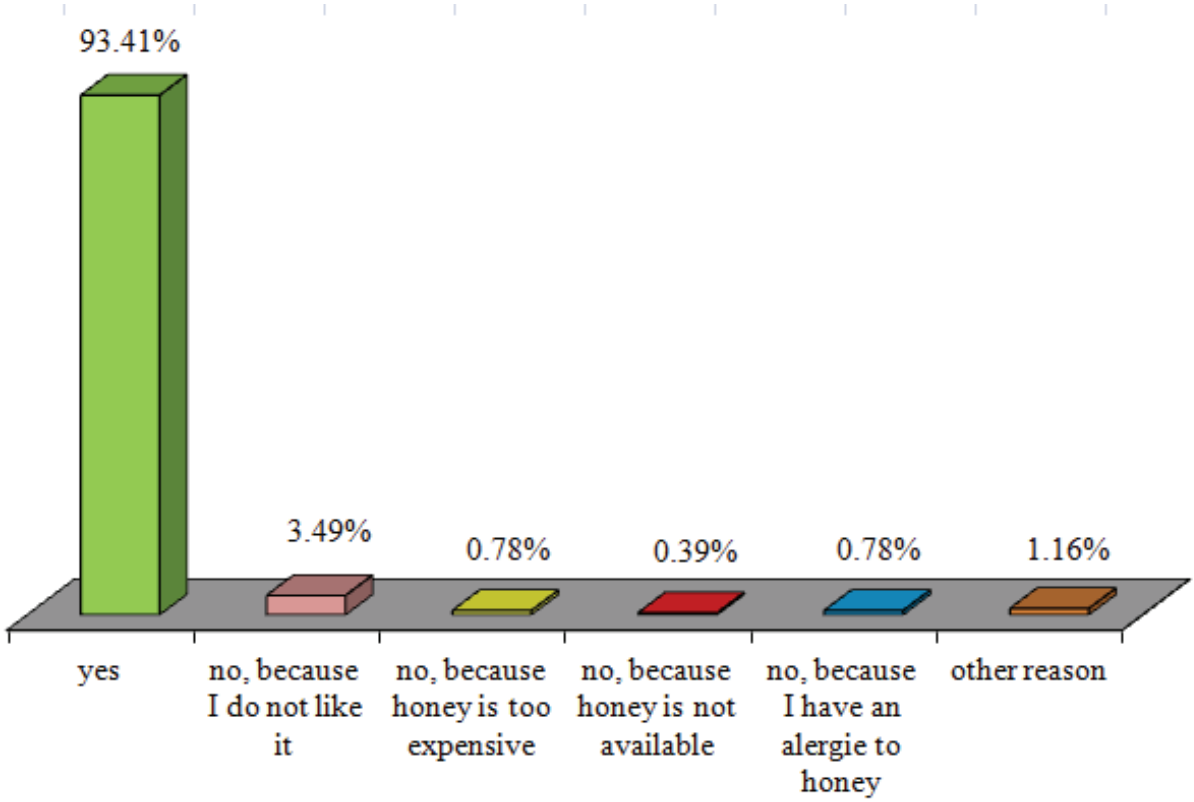


In the chart 5 the level of education of respondents is shown. **The majority of respondents** (51.55 % of resp.) **have university education** and then the most frequent level of education is secondary education with GCSE (36.82 % of resp.). The structure of education of the reminder of resp. is diverse and the frequences of individual educational groups are relatively low.

4.1.2 The first filter question – separation of honey consumers from the remainder of respondents

Since the survey was not aimed at a specified target group, consumers and people who do not consume honey were included, as well. **The following group of questions deals only with honey consumption**, thus honey consumers had to be separated from the others. The chart 6 represents the number of honey consumers and some reasons why the other respondents do not consume honey.

chart 6: question No. 1: **I am a honey consumer:** (own processing).

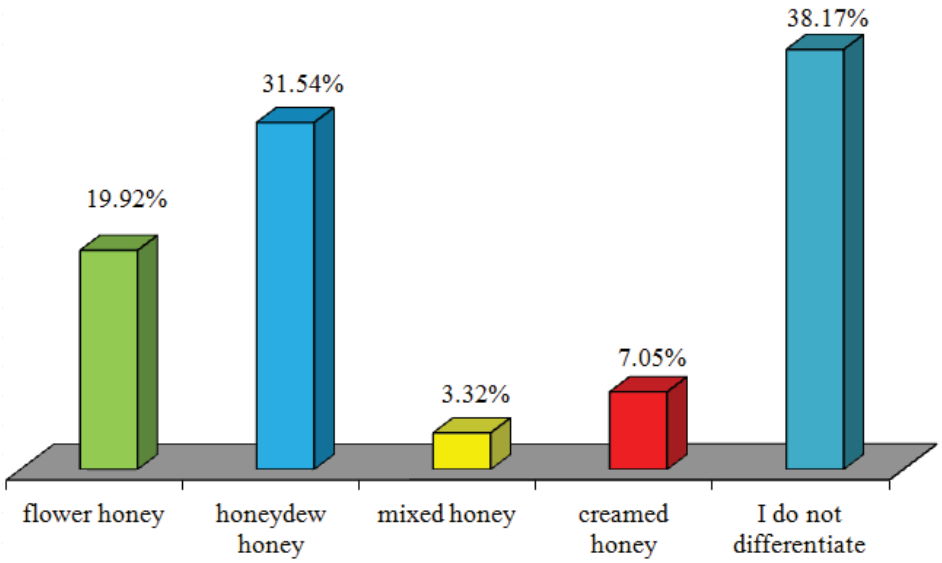


Share of honey consumers in all respondents is 93.41 % (241 cons.), 3.49 % of resp. do not like honey, for 0.78 % of resp. honey is too expensive, one answer (0.39 % of resp.) was, that honey is not available and 2 resp. (0.78 % of resp.) have an allergy to honey. 1.16 % of resp. ticked another reason.

Note: For purposes of following questions related only to honey, 17 resp., who do not consume honey were not included.

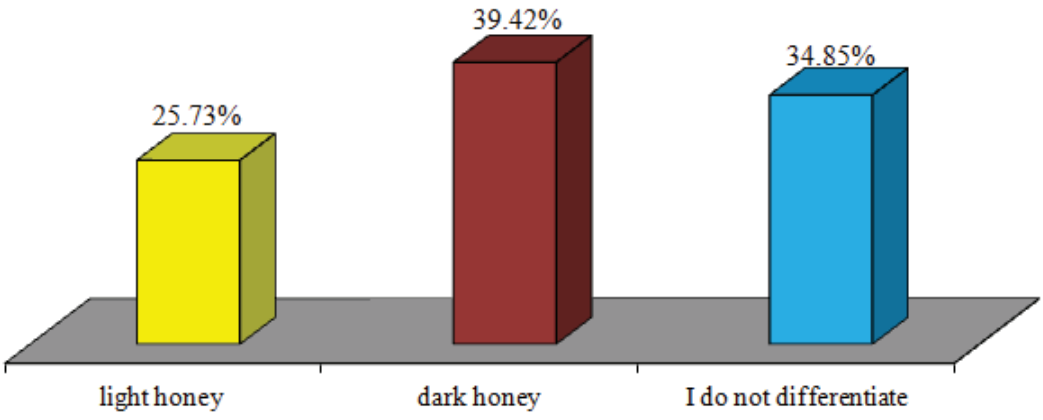
4.1.3 Questions for honey consumers – honey consumption

chart 7: question No. 2: **I prefer the following honey for my consumption:** (own processing).



This question (question No. 2) sets up an aim to identificate the preferred kind of honey. The results can be seen in the chart 7. **The majority, 38.17 % of cons., do not differentiate the kind of honey**. 19.92 % of cons. prefer flower honey, 31.54 % of cons. prefer honeydew honey and the remaining small share of cons. use creamed and mixed honey as a matter of priority.

chart 8: question No. 3: **I prefer the following honey for my consumption:** (own processing).



The next question No. 3 (see chart 8) seems to be the same as the previous one, but **it deals with color of honey** (not kind). 25.73 % of cons. prefer light honey, **39.42 % of cons. prefer dark honey**, 34.85 % do not differentiate.

Do honey consumers know the relation between color and kind of honey?

In the Czech Republic it is usual that honey consumers (or people generally) know the two basic kinds of honey, **flower honey** and **honeydew honey**. **The typical color for flower honey is light and for honeydew honey dark color** (Dupal, 2004) (the chapter 3.5.2). For usual external appearance (color) of flower honey and honeydew honey see the picture 1.

picture 1: **Usual external appearance (color) of flower and honeydew honey in the Czech Republic** (vcelky.cz, 2014).

The author´s objective was to find out if honey consumers know the mentioned connection between kind and color of honey. His own experience is that consumers know that the "forest" (in Czech: "lesní") honey (it is a colloquial expression for honeydew honey) has a dark color, but other items of knowledge about this issue are in many cases chaotic.

The main idea of this investigation was following: **If a consumer prefers e.g. flower honey, he/she should tick the preference of light honey**, if he/she knows the connection between kind and color of honey. Vice versa, **the one who prefers honeydew honey should tick the preference of dark honey**. Of course, who does not differentiate kind does not differentiate color of honey, as well.

For detecting this relation it was necessary to find out, if these two questions (No. 2 and No. 3) are dependent or not. For this purpose, contingency table was created and the Pearson chi-square statistic was used (see methodology – chapter 2.2.2)

Hypotheses:

H_0: question No. 2 and question No. 3 are independent

H_A: question No. 2 and question No. 3 are dependent

table 6: **Contingency table – kind (rows) and color (columns) of honey:** (own processing).

			I prefer the following kind of honey for my consumption color			
			light honey	dark honey	I do not differentiate	Total
I prefer the following kind of honey for my consumption kind	flower honey	Count	26	6	16	48
		Expected Count	12.3	18.9	16.7	48.0
	honeydew honey	Count	7	61	8	76
		Expected Count	19.6	30.0	26.5	76.0
	mixed honey	Count	1	4	3	8
		Expected Count	2.1	3.2	2.8	8.0
	creamed honey	Count	10	4	3	17
		Expected Count	4.4	6.7	5.9	17.0
	I do not differentiate	Count	18	20	54	92
		Expected Count	23.7	36.3	32.1	92.0
Total		Count	62	95	84	241
		Expected Count	62.0	95.0	84.0	241.0

table 7: **Chi-Square Tests:** (own processing).

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	111.289a	8	.000
Likelihood Ratio	108.572	8	.000
Linear-by-Linear Association	23.874	1	.000
N of Valid Cases	241		

a. 4 cells (26.7%) have expected count less than 5. The minimum expected count is 2.06.

Assumptions of Pearson chi-square statistic (described in detail in methodology – chapter 2.2.3):

According to the note below the table 7, the first two assumptions are fulfilled (asymptotic test and all expected frequencies > 1), but the **last assumption** (max 20 % of expected frequencies < 5) **is exceeded**. However, in relation to the size of sample (relatively high number of consuments), **it can be ignored** without a risk of significantly biased results (Nešetřilová, 2014).

$p < \alpha \rightarrow$ reject H_0 at the α level of significance

As seen in table 7, the p-value for Pearson Chi-Square = 0.000 < α = 0.05, which means that Ho is rejected and the kind of honey and the color of honey are dependent. **It can be said that honey consumers know the relation between kind and color of honey.**

Strength of association

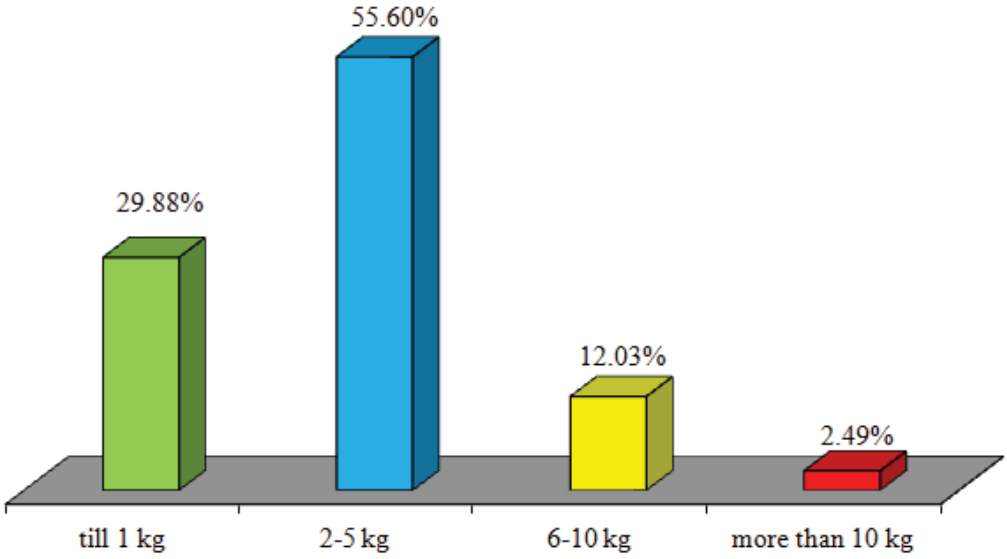
table 8**: Symmetric Measures:** (own processing).

		Value	Approx. Sig.
Nominal by Nominal	Phi	.680	.000
	Cramer's V	.481	.000
	Contingency Coefficient	.562	.000
N of Valid Cases		241	

According to the table 8, Cramer´s V is equal to 0.481. It can be said that the association (goodness of fit) is medium strong and that **honey consumers know RELATIVELY well the relation between kind and color of honey**.

For the record, 26 cons. ticked flower and light honey, 61 cons. ticked honeydew and dark honey and 54 cons. do not differentiate the kind as well as color of honey (table 6). In total, **58.5 % of cons. have chosen "the right combination" of kind and color of honey**.

chart 9: question No. 4: **My annual consumption of honey is:** (own processing).



The chart 9 introduces the annual consumption of honey. **Most of consumers ingest between 2 – 5 kg** (55.60 % of cons.), almost 30 % of cons. do not ingest more than 1 kg and only 2.49 % of cons. have consumption more than 10 kg.

table 9**: Categories of honey consumption** (own processing).

Category	Lower bound [kg]	Upper bound [kg]	Average value of category [kg]	Number of cons.
1	0	1	0.5	72
2	2	5	3.5	134
3	6	10	8	29
4	10	-	10[1]	6

* The number of all consumers is 241.

[1] The upper bound is not known, but 10 was taken as the average value. The number of consumers in this category is low, which means it will not influence the result significantly.

The table 9 shows average values and numbers of cons. belonging to individual categories. According to methodology (chapter 2.2.4), **the average value of annual honey consumption within this survey is 3.31 kg per one consumer**.

Is the honey consumption dependent on the income of household?

It is typical that people buy more products or buy higher volume of a product if they have higher income. This relation for honey will be measured below.

Hypotheses:

H_0: question No. 4 and question No. 31 are independent

H_A: question No. 4 and question No. 31 are dependent

table 10**: Contingency table – Income of household (rows) and annual consumption of honey (columns):** (own processing).

			Income_of_household				
			till 15,000 CZK	16,000 – 30,000 CZK	31,000 – 50,000 CZK	more than 51,000 CZK	Total
Cumula-ted_Annual_consumption_of_honey	till 1 kg	Count	12	24	25	5	66
		Expected Count	9.9	31.0	20.1	5.0	66.0
	2-5 kg	Count	18	60	28	10	116
		Expected Count	17.4	54.5	35.4	8.7	116.0
	6 kg and more	Count	2	16	12	1	31
		Expected Count	4.7	14.6	9.5	2.3	31.0
Total		Count	32	100	65	16	213
		Expected Count	32.0	100.0	65.0	16.0	213.0

* Consumers, who answered "I do not want to specify my income" were excluded from this testing (213 cons. were tested finally).

table 11: **Chi-Square Tests:** (own processing).

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.605[a]	6	.197
Likelihood Ratio	9.287	6	.158
Linear-by-Linear Association	.002	1	.967
N of Valid Cases	213		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 2.33.

Assumptions of Pearson chi-square statistic

The second assumption was not fulfilled (all expected frequencies > 1) firstly because of **categories** "6 – 10 kg" and "more than 10 kg" **had to be joined together** (table 10). The last assumption (max. 20 % of expected frequencies < 5) is exceeded. However, in relation to the size of sample (relatively high number of consuments), it can be ignored without a risk of significantly biased results (Nešetřilová, 2014).

$p > \alpha \rightarrow$ do not reject the H_0 at the α level of significance

According to the table 11, the p-value for Pearson Chi-Square = 0.197 > α = 0.05 (or even α = 0.10), and Ho is accepted, so there is no association between examined questions: **the honey consumption is not dependent on the income of household**.

The most frequent (60 cons.) is combination of 16,000 – 30,000 CZK and 2 – 5 kg and then combination of 31,000 – 50,000 CZK and 2 – 5 kg (28 cons.) (table 10).

Is the consumption of honey dependent on some other factors?

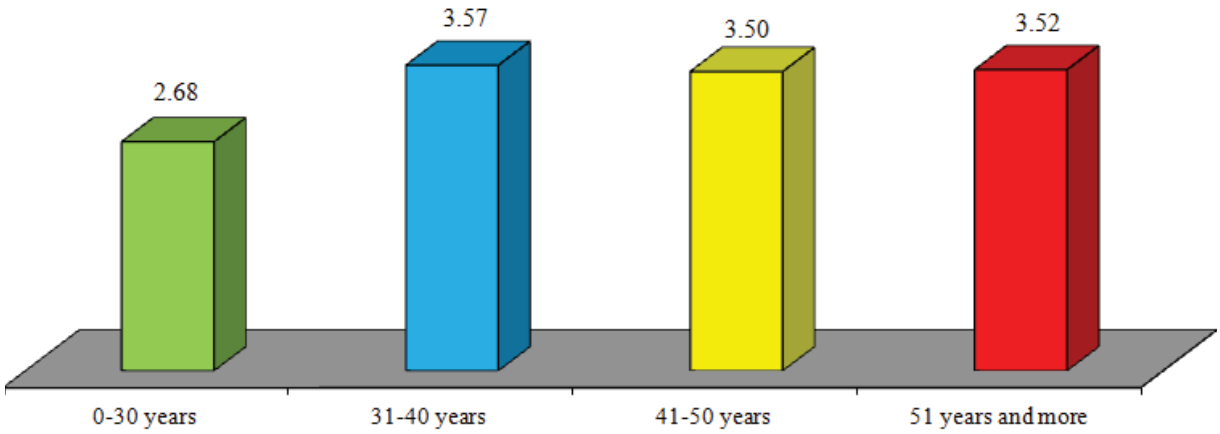
table 12: **Dependence of annual consumption of honey on:** (own processing).

Factor	p-value of Chi-Square	Dependence (α = 0.05)	Dependence (α = 0.1)
Gender	0.590	independent	independent
Age	0.044	Dependent (Cramer's V=0.164)	Dependent (Cramer's V=0.164)
Permanent residence	0.228	independent	independent

* All appropriate tables (outputs from SPSS) are attached to annex 2.

In the table 12 there are results of examinations of next three factors that could influence the honey consumption. **Age** is a factor that **influences the honey consumption**. So, there is an association between age and honey consumption even on the level of significance α = 0.05, but the **association is low** (Cramer's V = 0.164). Nevertheless, this phenomenon was more examined. The results (honey consumption according to age cathegories) are shown in the chart 10.

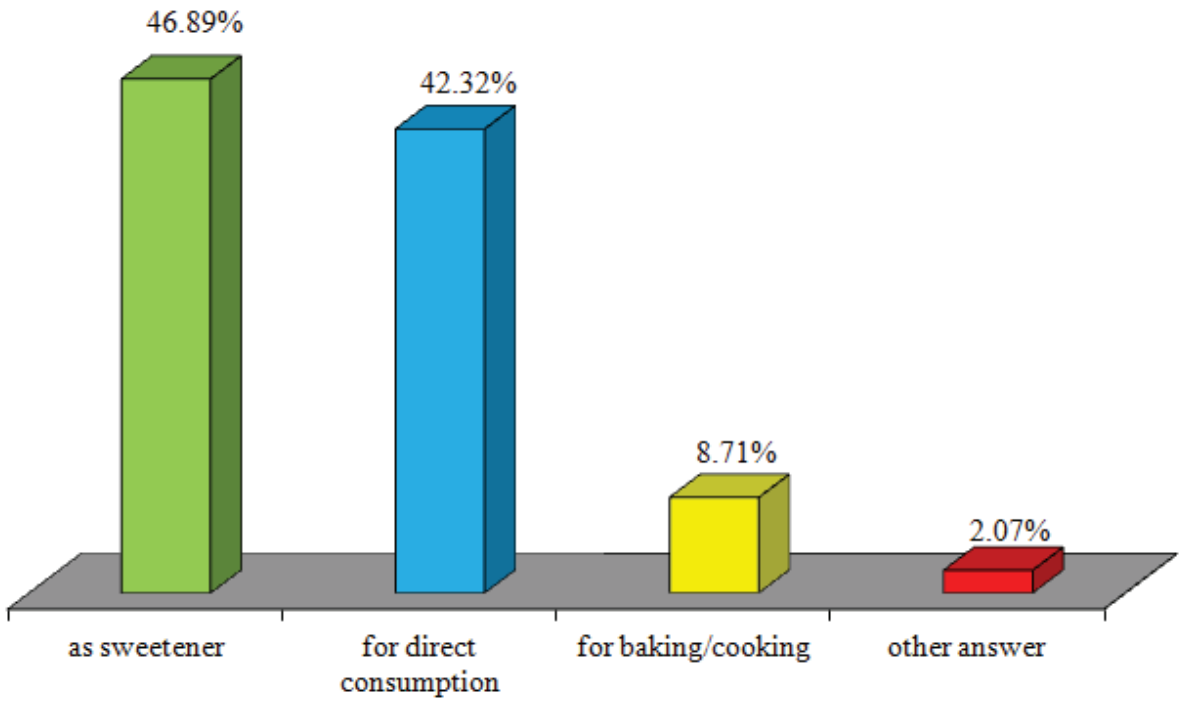
chart 10: question No. 4: **Annual consumption of honey according to age (kg):** (own processing).



The honey consumption of individual age categories was calculated according to methodology - chapter 2.2.4. **Consumers in the age between 0 – 30 years are those having the lowest**

consumption. Consumers older than 30 years have averagely similar consumption, which is nearly by 1 kg higher than in the case of the first age group.

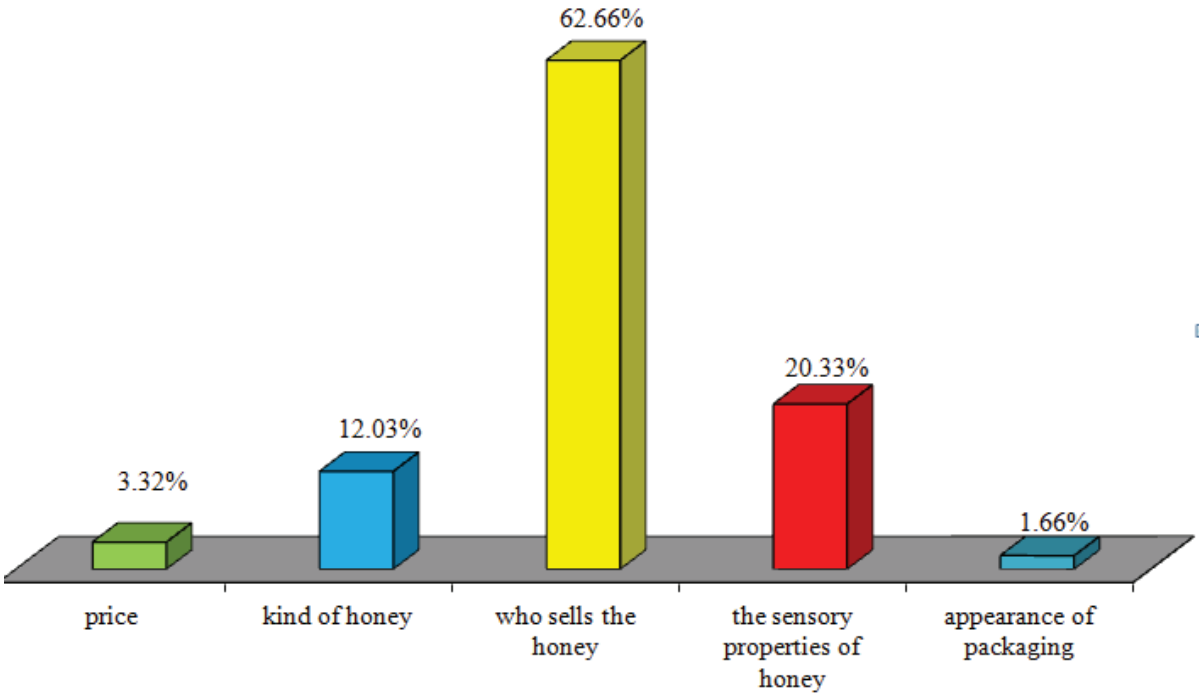
chart 11: question No. 5: **I use honey especially for:** (own processing).



Honey is used primarily as a sweetener (46.89 % of cons.) and for direct consumption (42.32 % of cons.), only 8.71 % of cons. use it for baking or cooking. One of the "other answers" used honey as a medication for children in the case of common cold. The reminder (of "other answers") use honey for all mentioned possibilities.

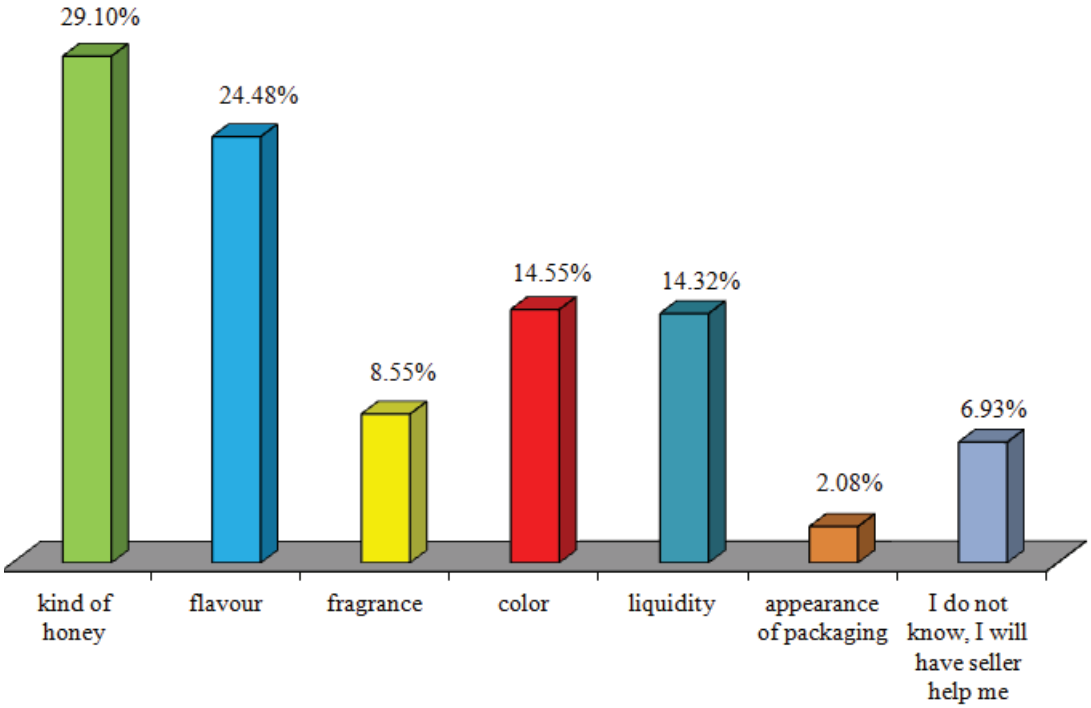
4.1.4 Questions for honey consumers – purchase of honey

chart 12: question No. 6: **In the case of a choice of honey for my consumption I prefer:** (own processing).



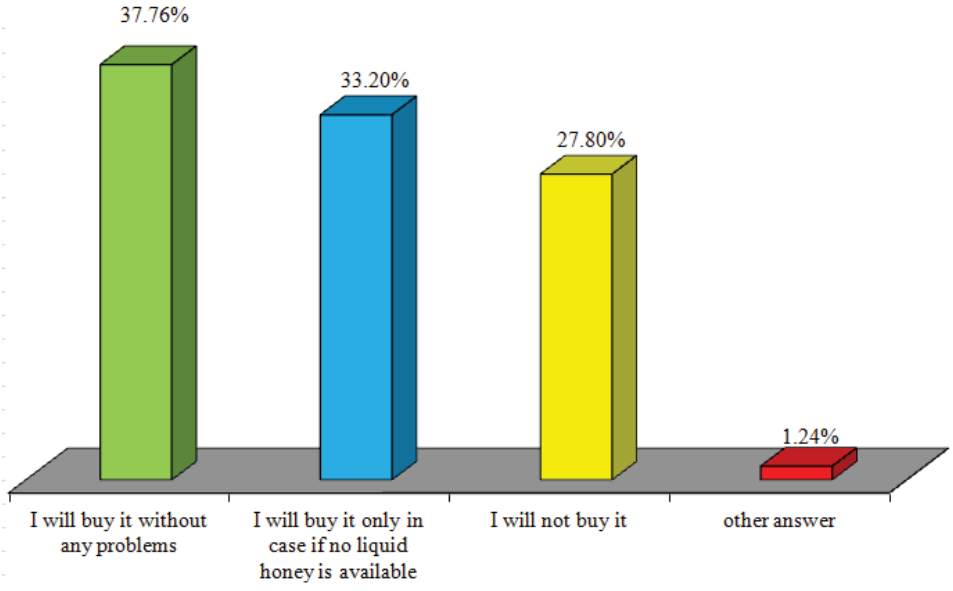
The absolute majority (62.66 % of cons. - chart 12) **answered, that the most important factor for buying a honey is the person who sells them the honey**. Then the most frequently chosen possibilities were "the sensory properties" (20.33 % of cons.) and "the kind of honey" (12.03 % of cons.). Only 8 cons. (3.32 % of cons.) ticked price of honey as the most priority factor.

chart 13: question No. 7: **If a seller offers some honeys to me (prices of all honeys are equal), I will choose honey for my consumption preferentially according to:** (own processing).



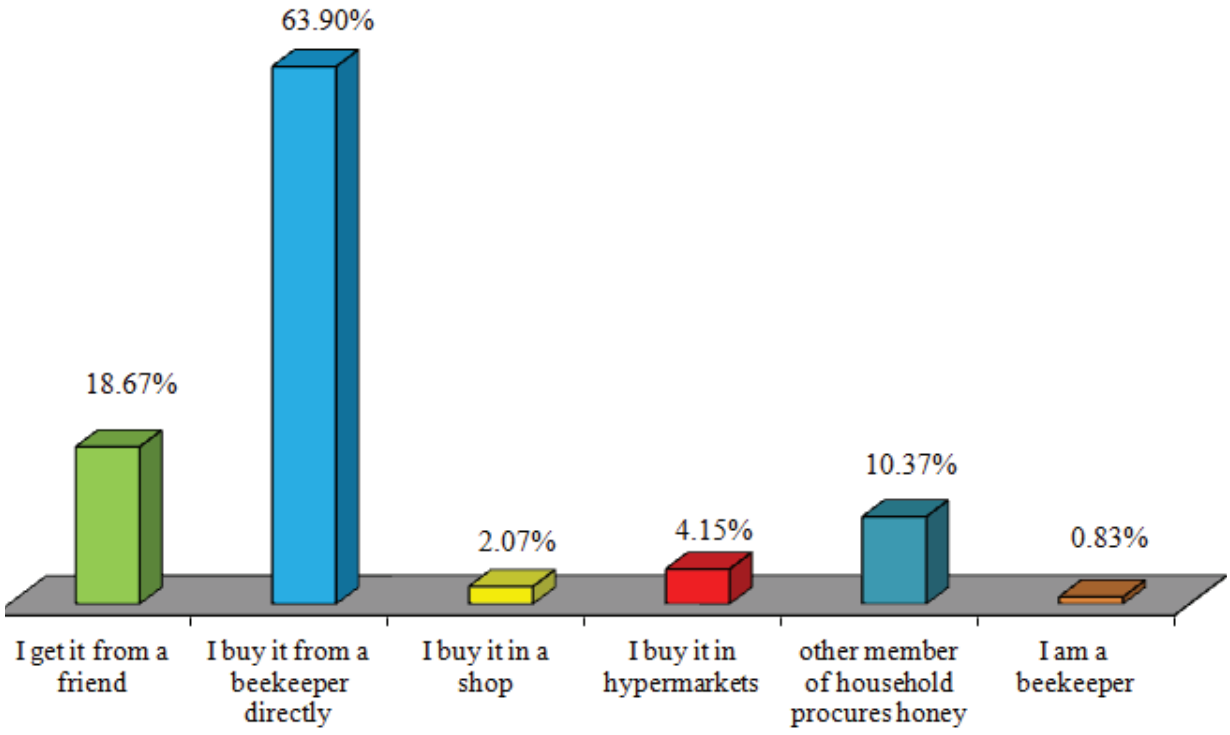
In the chart 13 it can be seen, that **29.10 % of answers** were according to "**kind of honey**", the next positions take up flavour and then color and liquidity of honey. Only 9 cons. (2.08 % of answers) concentrate on appearance of packaging of honey and 30 cons. (6.93 %) need a help or more information about honey/s.

chart 14: question No. 8: **If a seller offers granulated honey to me:** (own processing).



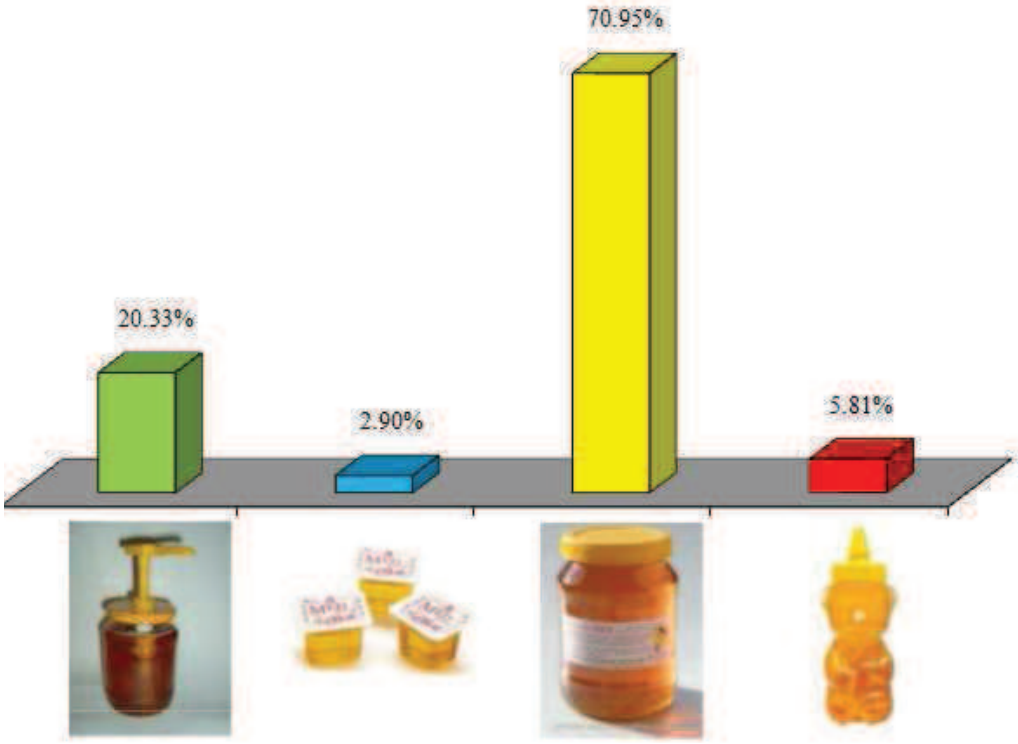
The chart 14 deals with the importance of liquidity of purchased honey for consumers. Only 37.76 % of cons. do not differentiate between liquid and granulated honey. 33.20 % of con. are ready to buy granulated honey provided no liquid honey/s is/are available. 27.80 % stated that they will not buy granulated honey. Among the "other answers" there was written e.g. **"If it is explained that the granulation is not unsafe for me, I will buy it."** or "I have never met this phenomenon."

chart 15: question No. 9: **I acquire honey mainly by:** (own processing).



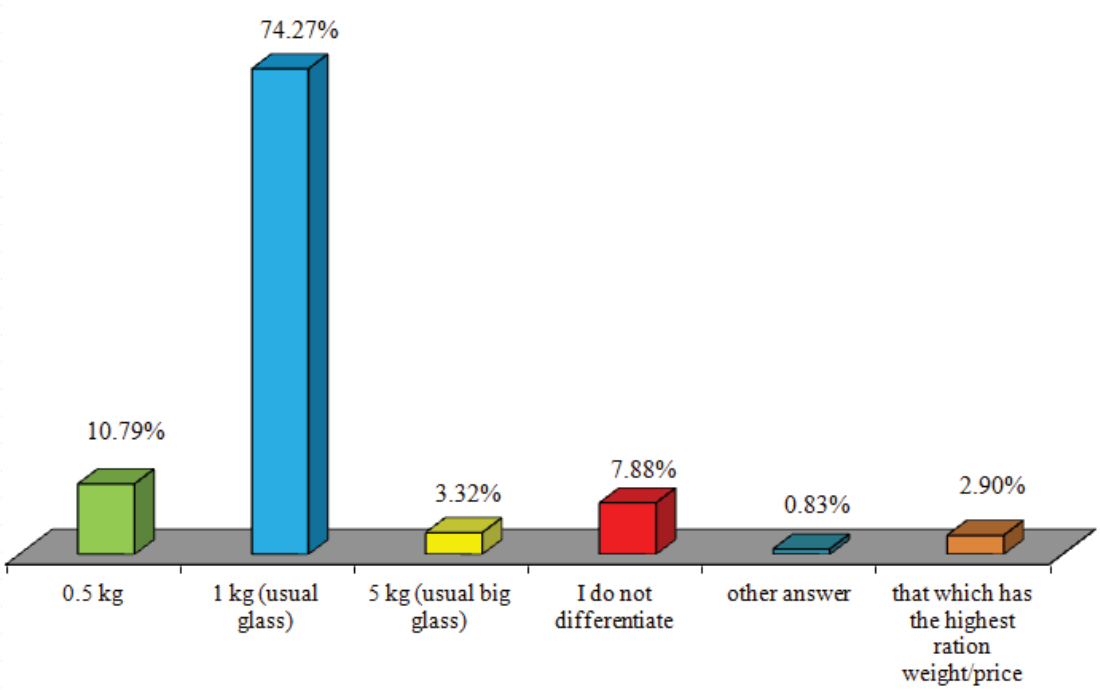
The question No. 9 (chart 15) was about the way of acquiring honey. **The majority of cons. (63.90 % of cons.) buy honey from beekeeper directly**. 18.67 % of cons. get it from their friends and only a small amount of cons. buy honey in shops/hypermarkets.

chart 16: question No. 10: **I prefer following packaging of honey:** (own processing).



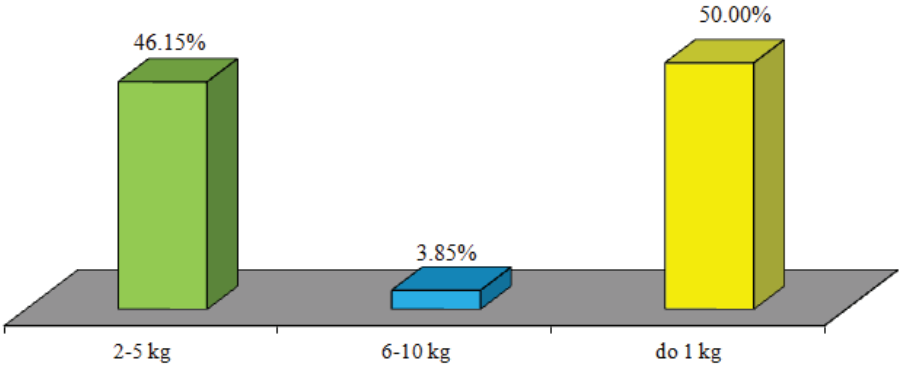
According to chart 16 **the most favourite is the typical packaging in the glass**. 20.30 % of cons. prefer the "glass with a pump".

chart 17: question No. 11: **I prefer following size of packaging of honey:** (own processing).



The typical packaging 1 kg is the most preferred, interesting being a fact that a **relatively high number of consumers want to buy 0.5 kg packagings**. This result was a motivation for the author to separate consumers requiring 0.5 kg packagings from the others and try to look at the annual consumption of these consumers - chart 18.

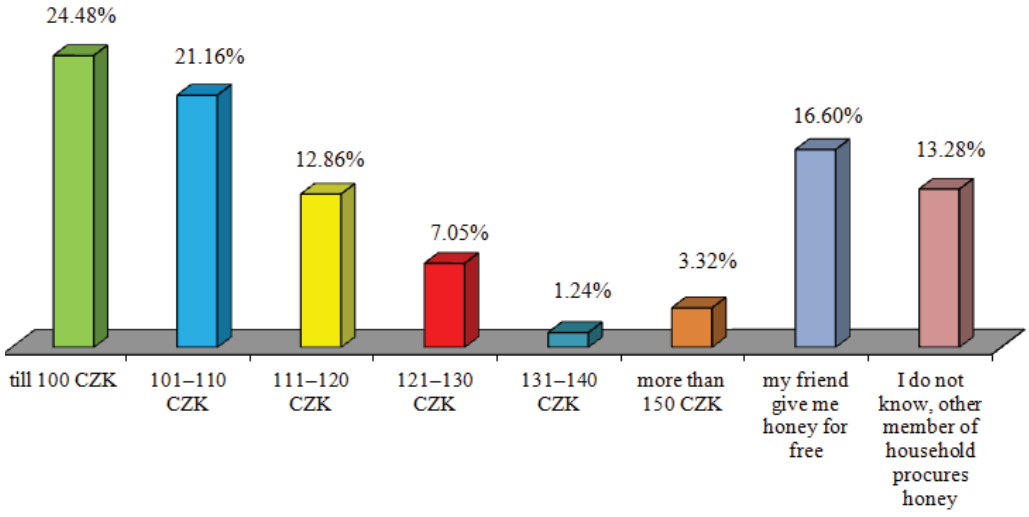
chart 18: **Annual honey consumption of consumers, who prefer 0.5 kg packaging:** (own processing).



Author´s explanation of small sized-glasses was a low annual consumption of corresponding consumers. This was confirmed in the end, because **these consumers belong to groups with the lowest annual consumption**, one half of them consume only 1 kg yearly, at maximum.

4.1.5 Questions for honey consumers – purchase of honey: current purchase price

chart 19: question No. 12: **I pay for 1 kg of honey currently:** (own processing).



The chart 19 and the chart 20 (below) pursue prices of honey. The chart 19 presents prices that consumers pay for 1 kg currently. **24.48 % of cons. pay not more than 100 CZK**. 21.16 % pay between 101 – 110 CZK and 12.86 % in the price range 111 – 120 CZK. None of cons. pays between 141 – 150 CZK. Only 3.32 % of cons. (8 cons.) buy honey for more than 150 CZK. 16.60 % of cons. get it for free from their friends or do not buy honey because another family member procures it.

table 13**: Categories of prices of honey, that are paid for 1 kg of honey currently** (own processing).

Category	Lower bound [kg]	Upper bound [kg]	Average value of category [kg]	Number of cons.
1	80 or 90[1]	100	90 or 95	59
2	100	110	105	51
3	110	120	115	31
4	120	130	125	17
5	130	140	135	3
6	140	150	145	0
7	150	-	150[2]	8

* consumers, who answered "my friend give me honey for free" and "I do not know, other member of household procures honey" were excluded from this testing (169 cons. were tested, 72 cons. were excluded).

[1] Read the text below the table.

[2] The upper bound is not known, but 150 was taken as the average value. The number of consuments in this category is low, that means, it will not influence the result significantly.

The table 13 shows average values and numbers of cons. belonging to individual categories. There is a problem to set the lower bound of the first category "till 100 CZK" higher, since it influences the result significantly (because of a high number of this category). To set the middle value at 50 CZK is out of reality because this price was paid for 1 kg of honey maybe 15 year ago. According to author´s experience the minimum price for which are some beekeepers ready to sell their honey (to their closed friends usually) is 80 CZK. If the author takes 80 CZK as the lower bound, the **average price** will be **106.3 CZK**. If 90 CZK is taken as the lower bound, the average price that consumers pay currently for 1 kg of honey will be **108.0 CZK**. The prices were calculated according to methodology - chapter 2.2.4.

Is the (current purchase) price of honey dependent on some other factors?

The price of honey depends on many factors and varies in wide range (Kurtin, 2010). The author wanted to use achieved data and find out if there is a factor that may influence the price of honey in general.

The procedure of testing with contingency tables is the same as was described in the case of examination of dependency of the kind on color of honey as well as honey consumption on income of household (see also methodology – chapter 2.2.3). Thus, only the results will be mentioned, appropriate table are attached to annex 2.

table 14: **Dependence of current price of honey on:** (own processing).

Factor	p-value of Chi-Square	Dependence ($\alpha = 0.05$)	Dependence ($\alpha = 0.1$)
Gender	0.700	independent	independent
Age	0.461	independent	independent
Permanent residence	0.522	independent	independent
Income of household[1]	0.196	independent	independent

* All appropriate tables (outputs from SPSS) are attached to annex 2.

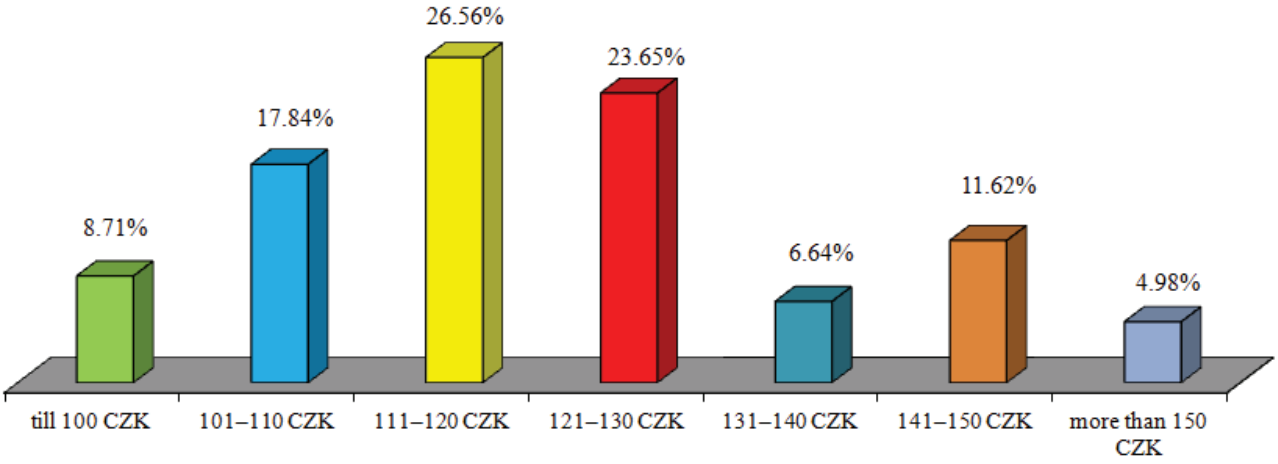
* Consumers, who answered "my friend gives me honey for free" and "I do not know, another member of household procures honey" were excluded from this testing (169 cons. were tested, 72 cons. were excluded).

[1] Customers, who answered "I do not want to specify my income" were excluded from this testing (next 20 cons. were excluded, 149 cons. were tested finally).

In the table 14 there are the results of examinations of four factors that could influence the price, for which the consumers buy honey at present. **None of them has any statistical relation to the current price of honey**.

4.1.6 Questions for honey consumers – purchase of honey: the maximum purchase price

chart 20: question No. 13: **I am ready to pay for 1 kg of honey no more than (maintenance of the same purchased quantity):** (own processing).



The chart 19 has brought findings about consumer´s current honey expenses. The chart 20 takes a look at preparedness of consumers to pay a higher price for honey without any change of purchased quantity. **The majority of cons.** (26.56 % of cons.) **answered price between 111 - 120 CZK**, the next most frequent answers were 121 – 130 CZK and 101 – 110 CZK.

table 15**: Categories of prices of honey, that are consumers willing to pay for 1 kg of honey maximally** (own processing).

Category	Lower bound [kg]	Upper bound [kg]	Average value of category [kg]	Number of cons.
1	80 or 90[1]	100	90 or 95	21
2	100	110	105	43
3	110	120	115	64
4	120	130	125	57
5	130	140	135	16
6	140	150	145	28
7	150	-	150[2]	12

* All honey consumers were included (241 cons.).

[1] Read the text below the table.

[2] The upper bound is not known, but 150 was taken as the average value. The number of consuments in this category is low, which means it will not influence the result significantly.

The table 15 shows average values and numbers of cons. belonging to individual categories. There is the same problem, which has been solved below the table 13 (the first category – setting of the lower bound), and thus it will not be solved again. If the author takes 80 CZK as the lower bound, the **average price** will be **120.0 CZK**. If 90 CZK is taken as the lower bound, the average price, which consumers are ready to pay maximally for 1 kg of honey will be **120.3 CZK**. The prices were calculated according to methodology - chapter 2.2.4.

Is the preparedness of consumer to pay more than current purchase price dependent on some other factors?

table 16: **Dependence of preparedness of consumer to pay a higher price for honey without any change of purchased quantity on:** (own processing).

Factor	p-value of Chi-Square	Dependence (α = 0.05)	Dependence (α = 0.10)
Gender	0.071	independent	dependent (Cramer's V=0.220)
Age	0.149	independent	independent
Permanent residence	0.062	independent	dependent (Cramer's V=0.223)
Income of household[1]	0.594	independent	independent

* All appropriate tables (outputs from SPSS) are attached to annex 2.

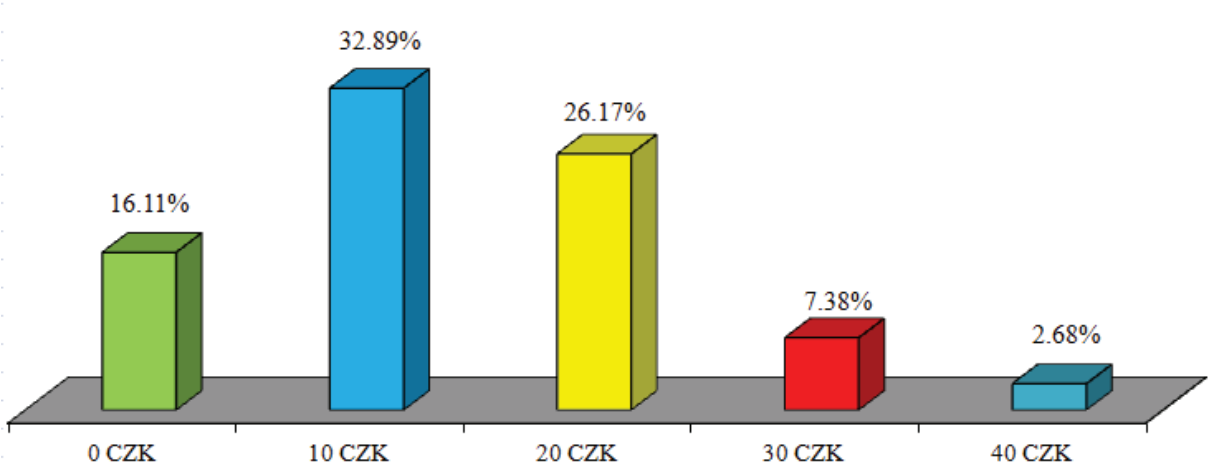
[1] Customers, who answered "I do not want to specify my income" were excluded from this testing (28 cons. were excluded, 213 cons. were tested finally).

In the table 16 there are the results of examinations of four factors that could influence the maximum price, for which consumers are ready to buy honey. **Gender and permanent residence** seem to be factors that **influence the preparedness of a consumer to pay a higher price for honey without any change of purchased quantity, but both dependences are week** (low Cramer's V). The dependences were a motivation for author to compare average values together.

Gender: Women are willing to pay 119.73 CZK and men 122.54 CZK for one kg of honey, if 90 CZK is taken as the lower bound.

Permanent residence: Consumers living in the country are ready to pay 119.10 CZK and consumers living in cities 121.00 CZK for one kg of honey, if 90 CZK is taken as the lower bound.

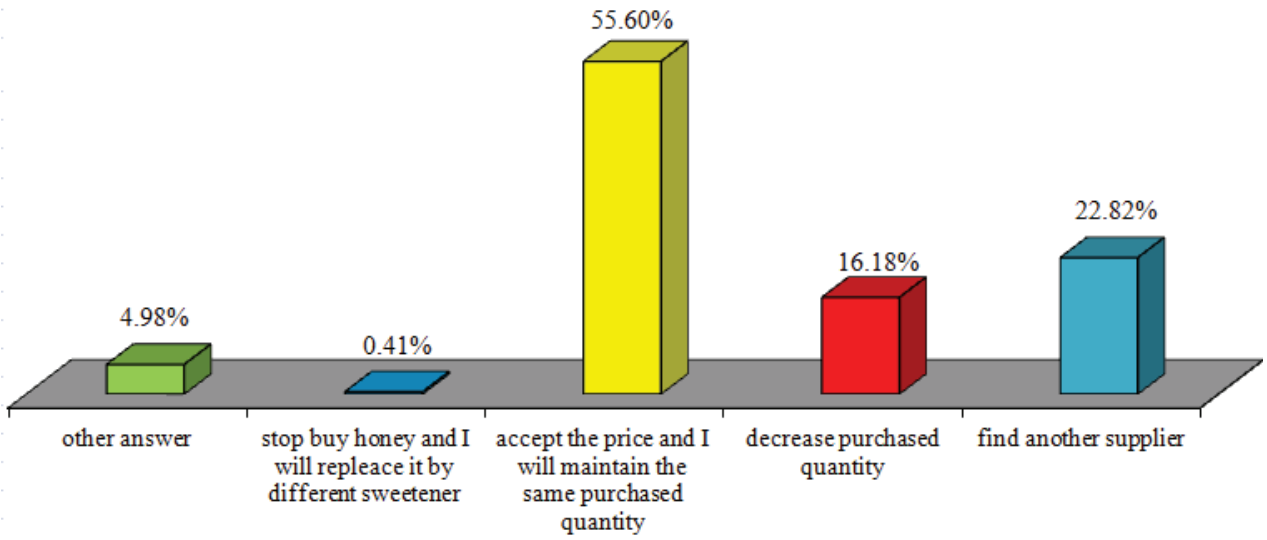
chart 21: **Consumer is ready to pay the following amount of money more:** (own processing).



* consumers, who answered "my friend gives me honey for free" and "I do not know, other member of household procures honey" were excluded from this testing (169 cons. were tested, 72 cons. were excluded).

The chart 21 was derived from the two previous charts (chart 19 and chart 20) and presents price differences between the highest price which a consumer is ready to pay and the price which he/she pays currently for 1 kg of honey. 16.11 % of cons. pay the maximum price for honey at present and they are not ready to pay more. **32.89 % of cons. are ready to pay 10 CZK more, 26.17 % of cons. 20 CZK more**, etc. **None of consumers answered that he/she is ready to pay less than he/she pays currently**.

chart 22: question No. 14: **If a seller increases price of honey over the limit that I stated within the previous question, I will:** (own processing).

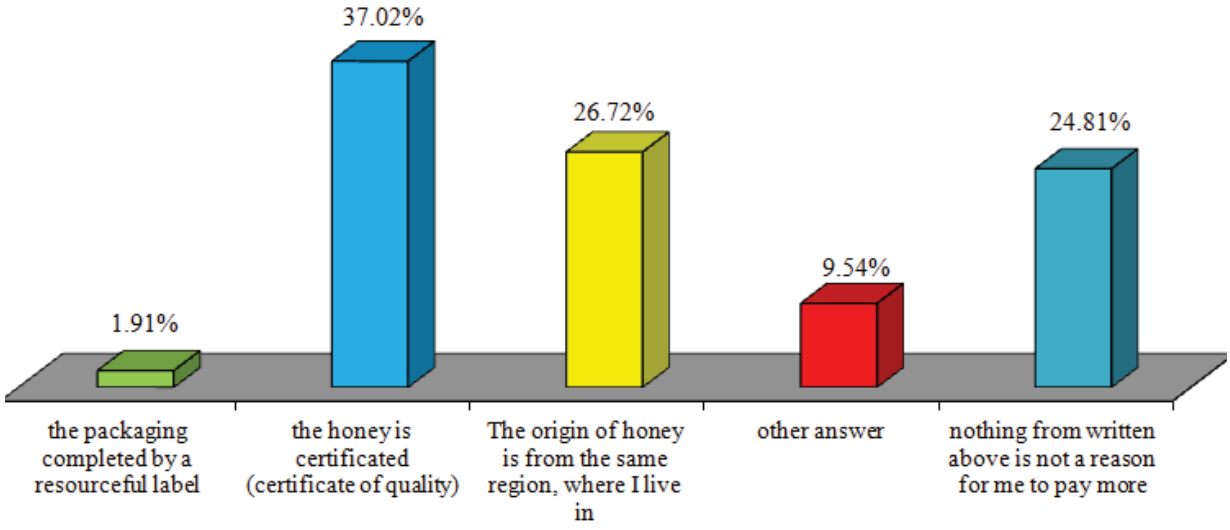


Within the previous question the maximum price for 1 kg of honey which a consumer is ready to pay was dealt with. The question No. 14 looks at the consumer´s behaviour if the price of honey would increase above the maximum level that he/she is ready to pay. The results can be seen in chart 22.

More than half of cons. (55.60 % of cons.) are ready to accept even higher price than the stated maximum price within previous question **and are disposed to maintain the same purchased quantity**. 22.82 % of cons. would find another suplier, 16.18 % of cons. would decrease purchased quantity and 0.41 % of cons. (1 cons.) would replace honey by a different sweetener (by a substitute of honey).

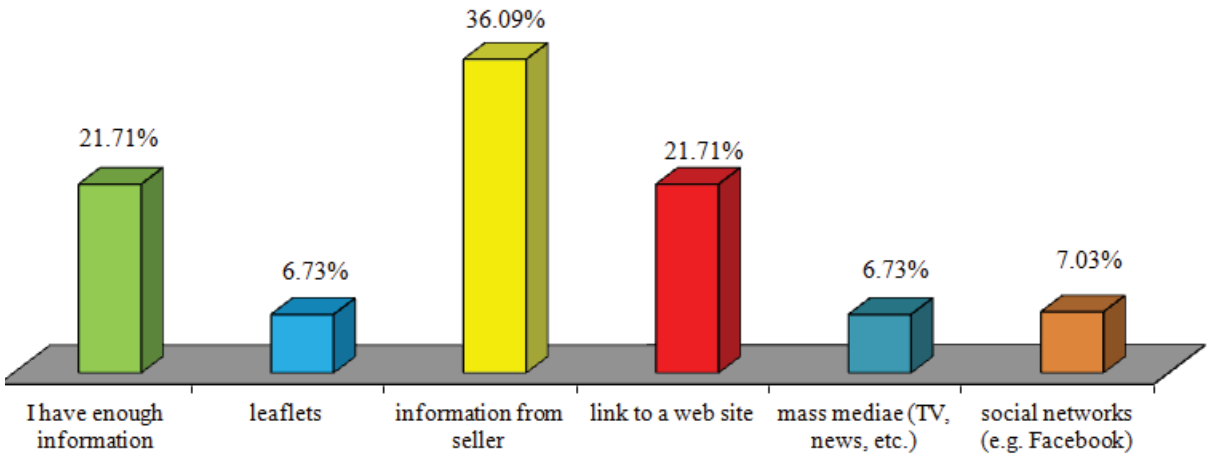
The most of the "other answers" were a sort of: "If the quality of honey is appropriately high to its price, I will accept the higher price." One consumer wrote that she would compare the price and the quality with other suppliers firstly and after that she will decide. Another woman mentioned that she would start to keep bees.

chart 23: question No. 15: **I am willing to pay for honey more, if:** (own processing).



Other possibilites of increasing attractiveness of honey and make consumers disposed to pay more for honey were examined by the question No. 15 (see chart 23). **37.02 % of cons. will pay more, if the quality of honey is guaranteed by a certificate. 26.72 % of cons. is prepared to pay more for a honey that come from the region, where they live in.** For 24.81 % of cons. is nothing of mentioned possibilities a motivation to pay more for honey. Only 1.91 % of cons. take a look at the label. Among "other answers" predominate statements: "I am ready to pay more if the honey is high quality or I buy it from my friend or time-tested beekeeper".

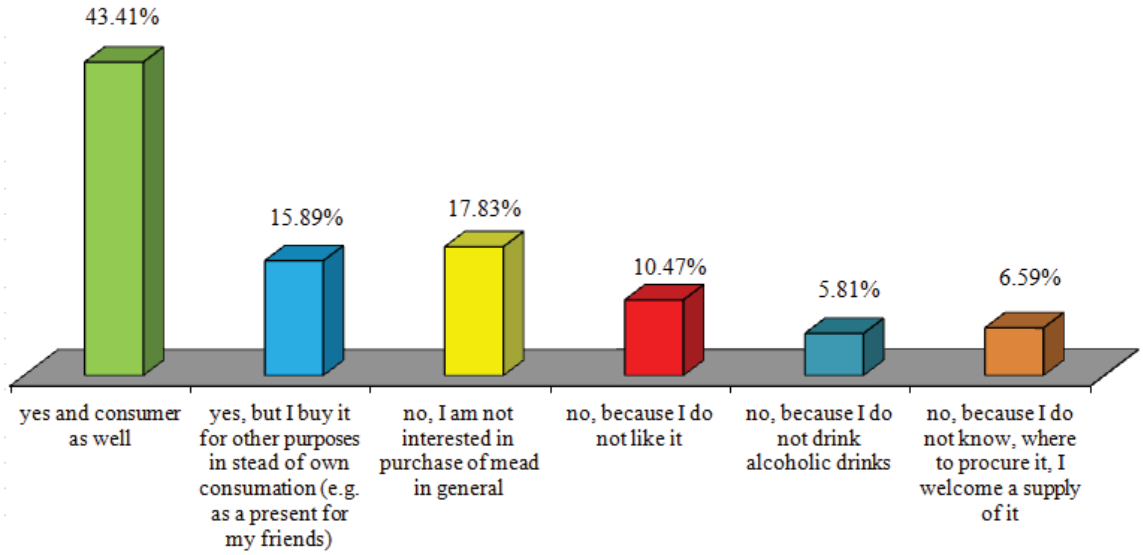
chart 24: question No. 16: **I welcome more information about honey properties and utilization of honey by:** (own processing).



A part of cons. (21.71 %) do not need or do not want more information (chart 24). The reminder of **cons. require or welcome more information about honey and its use** mainly from the seller (36.09 % of cons.), 21.71 % of cons. acquire information by a link to a web site applying to honey. Possibilities "social networks", "laeflets" and "mass media" achieved similar percentages (about 7 % of cons.).

4.1.7 The second filter question – separation of mead customers from the remainder of respondents

chart 25: question No. 17: **I am a mead customer:** (own processing).

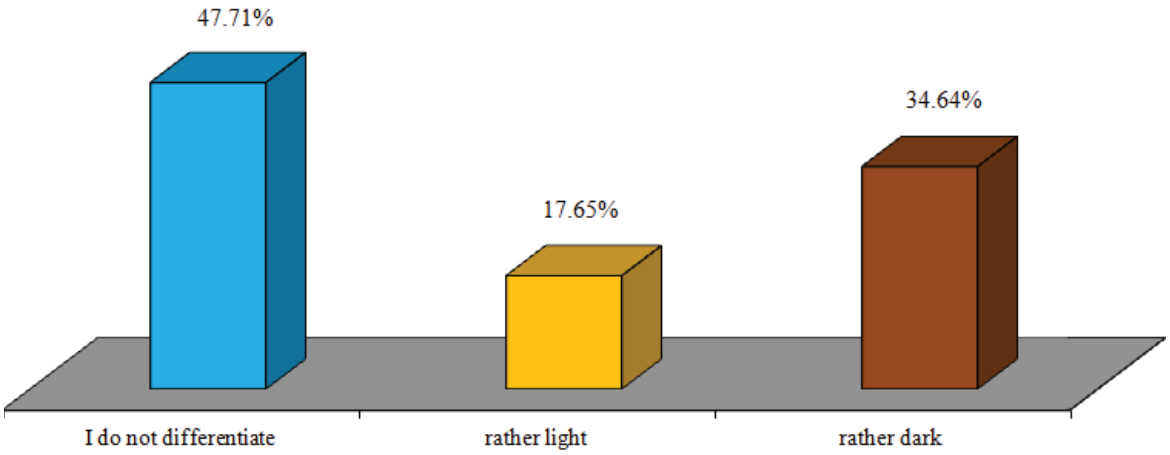


The next part of the questionnaire, which is based on mead customers, begins with the question No. 17. This filter question should separate mead customers from the others. The expression "customer" is used deliberately, because it includes consumers of mead (43.41 % of resp.) as well as "only buyers" of mead (15.89 % of resp.), who do not consume it but they buy it for other purposes, e.g. as a gift for their friends. It means, that **59.3 % of resp. (153 resp.) are mead customers**. 17.83 % of resp. are not interested in purchase of mead in general, 10.47 % of resp. do not like mead, 5.81 % of resp. are teetotalers and 6.59 % of resp. would like to buy or consume mead, but they do not know where to procure it.

Note: For purposes of following questions related only to mead, 105 resp. who do not buy mead were not included. That is why 153 customers are included.

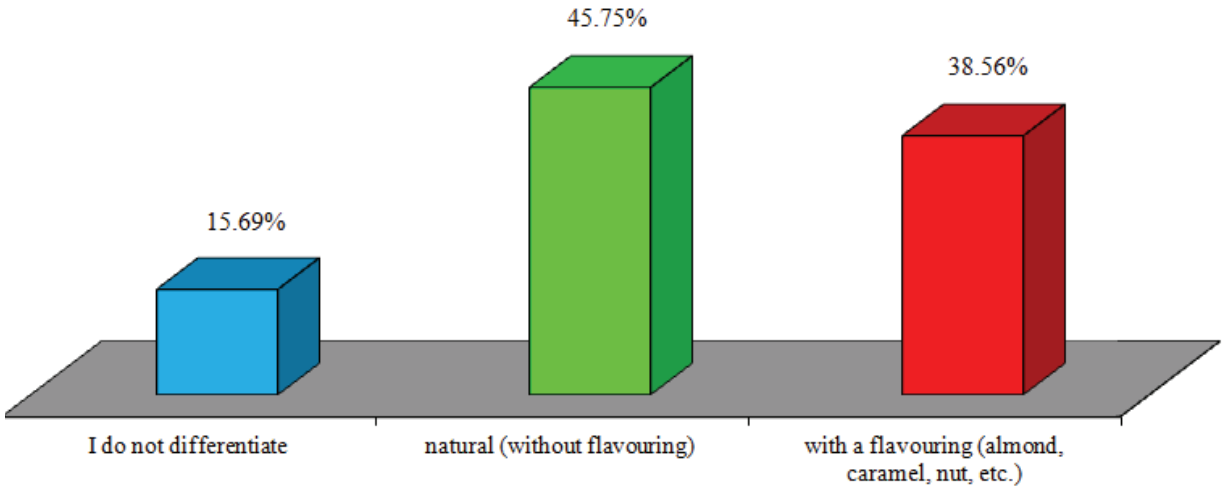
4.1.8 Questions for mead customers – mead consumption

chart 26: question No. 18: **The most attractive color of mead for me is:** (own processing).



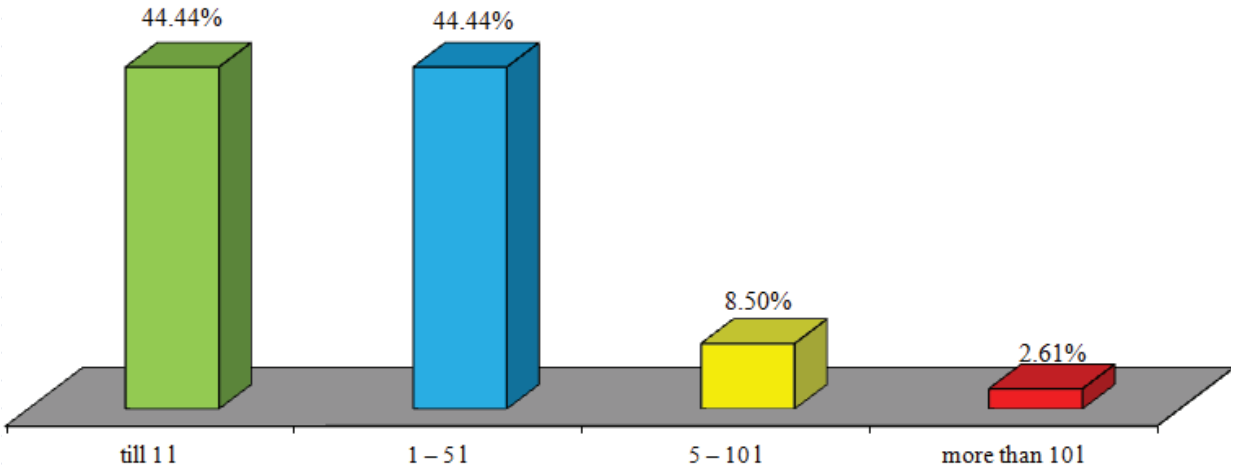
The chart 26 provide information about customer´s preferences of color of meads. **Most of cust.** (47.71 % of cust.) **do not differentiate the color**. According to author´s experience more customers perceive dark mead as more attractive (34.64 % of cust.) while 17.65 % of cust. prefer light mead.

chart 27: question No. 19: **I prefer following mead:** (own processing).



The most favourite mead seems to be natural mead without flavouring (45.75 % of cust.) – chart 27. Mead with flavouring prefer 38.56 % of cust. and 15.69 % of cust. do not differentiate.

chart 28: question No. 20: **My annual purchased quantity of mead is:** (own processing).



The chart 28 is about annual purchased quantity of mead. The same number of customers ticked, that their purchased quantity is 1 l or 1 – 5 l each year (44.44 % of cust.). 8.50 % of cust. buy annualy between 5 – 10 l and 2.61 % of cust. more than 10 l of mead. **The annual average purchased quantity of mead is 2.65 l.**

Is the annual purchased quantity of mead dependent on some factors?

table 17: **Dependence of annual purchased quantity of mead on:** (own processing).

Factor	p-value of Chi-Square	Dependence (α = 0.05)	Dependence (α = 0.1)
Gender	0.414	independent	independent
Age	0.049	dependent (Cramer's V=0.203)	dependent (Cramer's V=0.203)
Permanent residence	0.165	independent	independent
Income of household[1]	0.739	independent	independent

* All appropriate tables (outputs from SPSS) are attached to annex 2

[1] Customers, who answered "I do not want to specify my income" were excluded from this testing (23 cust. were excluded, 130 cust. were tested).

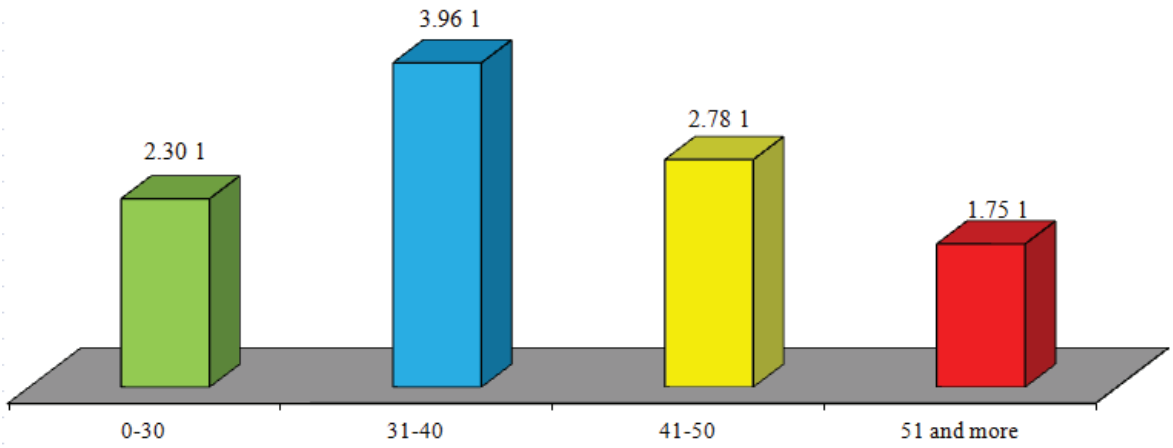
In the table 17 there are the results of examinations of four factors that could influence the annual consumption of mead. **The quantity seems to be dependent on age** even for level of significance $\alpha = 0.05$. This fact will be examined more in the next table.

table 18: **Dependence of annual purchased quantity of mead on age:** (own processing).

		Age (years)				
		0-30	31-40	41-50	51 and more	Total
annual purchased quantity of mead	till 1 l	55	1	5	7	68
	1 - 5 l	42	10	9	7	68
	5 l and more	12	3	2	0	17
Total		109	14	16	14	153

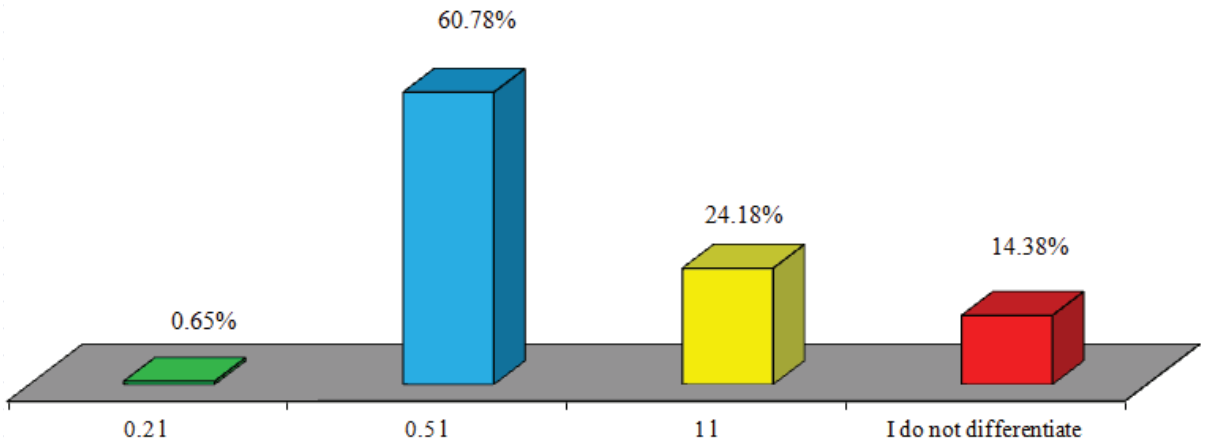
It is not simply possible to estimate how annual purchased quantity of mead is high within individual age cathegories so author deciced to create an additional chart, where the average quantity of purchased mead related to age groups will be shown.

chart 29: **Average annual purchased quantity (per one customer) according to age groups:** (own processing).



In the chart 29, average annual buying of mead is pictured. **The biggest mead customer is the age group between 31 – 40 years** with the purchase 3.96 l of mead each year. The second is age group 41 – 50 with 2.78 l per year, etc.

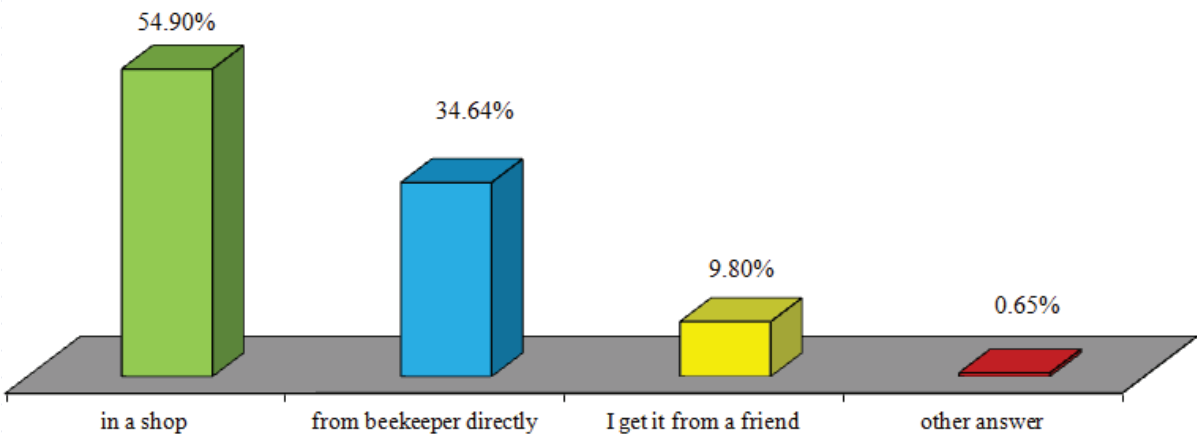
chart 30: question No. 22: **I prefer the following volume of the bottle of mead:** (own processing).



Within the question No. 22 customers were asked about preferred volume of bottles of mead. **The most favourite is bottle of 0.5 l** (60.78 % of cust.), than 1 l bottle (24.18 % of cust.) and 14.38 % of cust. do not differentiate.

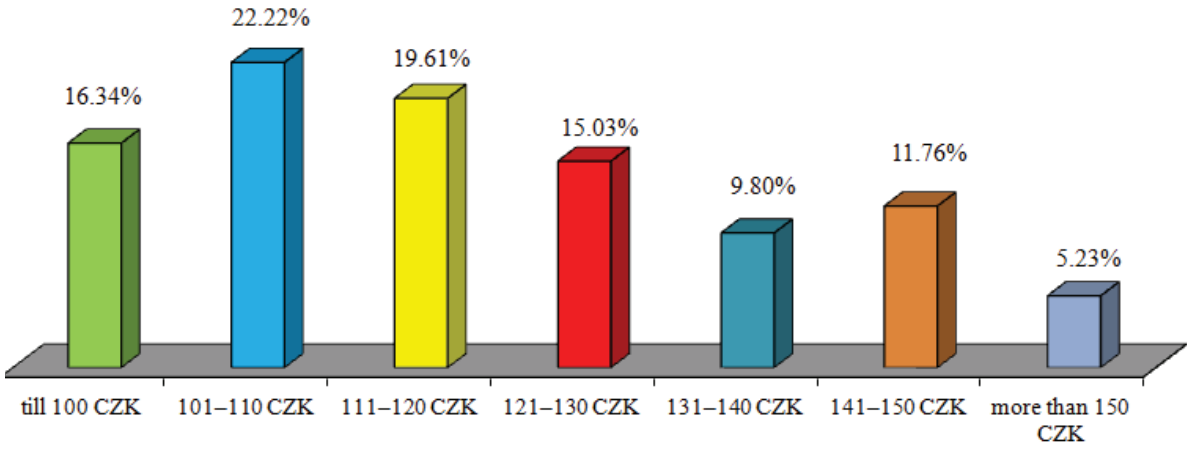
4.1.9 Questions for mead customers – purchase of mead

chart 31: question No. 21: **I buy mead usually:** (own processing).



As seen in the chart 31, **more than half of buyers** (54.90 % of cust.) **buy mead in a shop**, 34.64 % of cust. from beekeeper directly and 9.80 % of cust. get it from their friends.

chart 32: question No. 23: **I am willing to pay for 1 bottle of mead (0.5 l) no more than:** (own processing).



The chart 32 takes a look at preparedness of consumers to pay a price for one bottle of mead (0.5 l). The most frequent was answer **101 - 110 CZK** (22.22 % of cust.), than 111 – 120 CZK (19.61 % of cust.), till 100 CZK (16.34 % of cust.) and 121 – 130 CZK (15.03 % of cust.). The reminder of cust. is disposed to pay more than 130 CZK, 5.23 % of cust. even more than 150 CZK.

table 19**: Categories of prices of mead, that are consumers willing to pay for 1 bottle of mead (0.5 l) maximally** (own processing).

Category	Lower bound [kg]	Upper bound [kg]	Average value of category [kg]	Number of cons.
1	80 or 90[1]	100	90 or 95	25
2	100	110	105	34
3	110	120	115	30
4	120	130	125	23
5	130	140	135	15
6	140	150	145	18
7	150	-	150[2]	8

* Only customers were included (153 cust.).

[1] Read the text below the table.

[2] The upper bound is not known, but 150 was taken as the average value. The number of consuments in this category is low, which means it will not influence the result significantly.

The table 19 shows average values and numbers of cust. belonging to individual categories. There is the same problem, which has been solved below the table 13 (the first category – setting of the lower bound) and so it will not be solved again. If author takes 80 CZK as the lower bound, the **average price** will be **117.52 CZK**. If 90 CZK is taken as the lower bound, the average price, which consumers are ready to pay maximally for 1 bottle of mead will be **118.3 CZK**. The prices were calculated according to methodology - chapter 2.2.4.

Is the preparedness of a customer to pay the above mentioned purchase price dependent on some factors?

table 20: **Dependence of preparedness of consumer to pay above ticked purchase price of one bottle of mead (0.5 l) on:** (own processing).

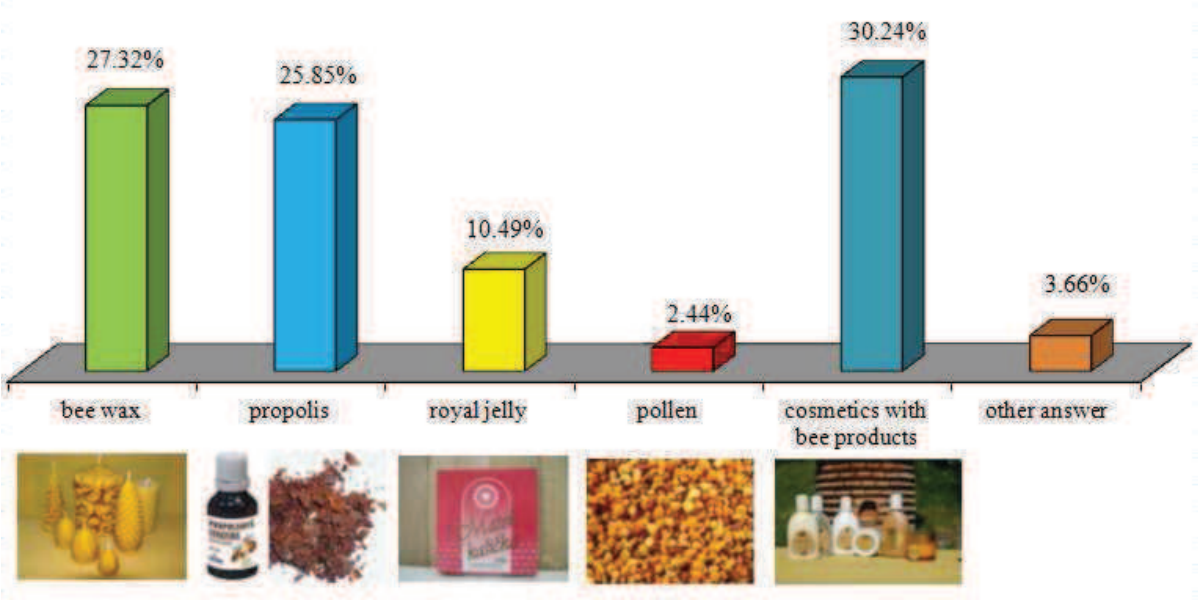
Factor	p-value of Chi-Square	Dependence ($\alpha = 0.05$)	Dependence ($\alpha = 0.1$)
Gender	0.528	independent	independent
Permanent residence	0.472	independent	independent
Income of household[1]	0.294	independent	independent

* All appropriate tables (outputs from SPSS) are attached to annex 2

[1] Customers, who answered "I do not want to specify my income" were excluded from this testing (23 cust. were excluded, 130 cust. were tested).

In the table 20 there are the results of examinations of three factors that could influence the maximum accepted price for which consumers are ready to buy one bottle of mead (0.5 l). It was proved that there is **no dependence of the price on tested factors**.

chart 33: question No. 25: **I am interested in following bee products:** (own processing).



The last question was aimed at other bee products (chart 33) and was answered by all respondents. Cosmetics with bee products (30.24 % of resp.) seem to be very favourite. 25.85 % of resp. are interested in propolis, 27.32 % of resp. in bee wax, 10.49 % of resp. in royal jelly and 2.44 % of resp. in pollen. The "other answers" in most cases express disinterest in any other bee products.

4.2 Discussion

First of all, the structure of all respondents should be repeated again. The questionnaire was answered by 258 respondents, 195 women and 63 men. The dominant majority are women between 21 - 30 years of, then men in the same group of age. 69 % of resp. live in cities, remaining 31 % of resp. live permanently in the country. 51.55 % of resp. have university education, then the most frequent level of education is secondary education with GCSE (36.82 % of resp.).

4.2.1 Honey Consumption

Very pleasant findings for all beekeepers have already brought the first question. **93.41 % of respondents** stated that they **are honey consumers**. This finding is much better than it seems to be because in comparison with author´s bachelor thesis the proportion of honey consumers in population has increased (anyway it has to be mentioned that the size of samples was not too large for making general conclusions for the whole population in the Czech Republic). The percentage of honey consumers among all respondents was "only" 91.7 % (Nový, 2012) and author was surprised in the thesis how the amount is unexpectedly high.

Only **17 respondents** said that they **do not eat honey** because they do not like it, two respondents suffers from allergies to honey, for 2 resp. honey is too expensive and one resp. stated that honey is not available for him.

The question No. 2 dealt with a kind of honey. According to conclusions of author´s bachelor thesis, the honeydew honey was supposed to be the most favourite. Surprisingly, **the biggest proportion of consumers do not differentiate the honey kind**. It could be caused by better consumer´s knowledge of honey and its properties than it was in 2012 (Nový, 2012). So, the expectations were not confirmed, honeydew honey was not the most frequent answer, but **honeydew honey is still more preferred to flower honey**.

This finding confirmed information from various sources that **in the Czech Republic honeydew honey is more popular than other kinds of honey**. The author has the same experi-

ence. Explanations of the reasons are different, e.g. **higher resistance to granulation** (according to the author it is the main reason), more precious, more aromatic flavor, etc. The third highest frequency obtained flower honey. 7.05 % of consumers prefer creamed honey, so the popularity of creamed honey still increases, because just 5.8 % of cons. preferred this kind of honey in 2012 (Nový, 2012).

The question No. 3 is focused on color of honey. Dark color honey seems to be the most favourite , which confirmed author´s expectations again. **The dark honey is more preferred than light honey**. A surprise, how many consumers do not differentiate the color of honey, was appeared in the case of kind of honey, too.

As written above, in the Czech Republic it is usual that the typical color for flower honey is light and for honeydew honey dark (Dupal, 2004). This relation was tested by with the result Pearson Chi-Square = 0.000 and Cramer´s V = 0.481. That means there is an association between kind and color of honey (even for $\alpha = 0.01$), but the association is medium strong and honey consumers know relatively the relation between kind and color of honey. Another tool of measurement of consumer´s knowledge can be the summary of well connected answers (flower honey-light color, honeydew honey-dark, I do not differentiate-I do not differentiate), in total, 58.5 % of cons. chosen "the right combination". In conclusion, **consumers still do not have enough information about typical colors of honeys**. Because of that, it should be given more appropriate information to consumers, especially about typical properties of both basic kinds of honey, their differences and specifications, mainly about a fast beginning of granulation of flower honeys and possibilities of liquefying them back into liquid consistency.

Most consumers ingest between 2 – 5 kg (55.60 % of cons.), the same result was found out in author´s bachelor thesis. The **average value of annual honey consumption** within this survey is **3.31 kg** per one consumer, in survey 2012 it was "only" 2.65 kg per one consumer.

It is typical that people with higher income buy more products or buy higher volume of a product. According to Pearson Chi-Square = 0.197 it is obvious that **there is no association between the honey consumption and the income of household** - not even for the level of significance $\alpha = 0.10$. A possible reason could be that honey is not a typical good with the

typical economic behaviour – **people with higher income do not buy more quantity of honey.**

By testing other three factors that could have an association with honey consumption, it has been founded out that **honey consumption is not dependent on factor gender and permanent residence**. Just the **factor of age has an association** with it, even for the level of significance $\alpha = 0.05$. After better examining this phenomenon it was ascertained that **young consumers till 30 years of age have the lowest honey consumption.** Consumers older than 30 years have averagely similar consumption, which is nearly by 1 kg higher than in the case of the first age group. Thanks to the age composition (the sample include more young people), **it can be given weight to this finding**. The author is not surprised because his experience is the same and wanted to try to find out, whether this phenomenom is prevalent among young population in general. **It should be recommended to focus on the youngest age group to increase its honey consumption**. In author´s opinion, young people do not consume honey because they do not have "their own" beekeeper and they do not want to buy it in hypermarkets. Moreover, they usually know that the honey from hypermarkets is not of high-quality and is overpriced. So, honey should become more available for these young people mainly through new channels enabling them to buy it.

The most appropriate way could be to offer honey (and other bee products) by using web sites, because internet purchases are very popular not only among the youngest group of age. Nowadays, **farmers´ markets** become popular since many natural high-quality goods can be bought there and such a way arise new distribution ways. Another reason could be that young people are not habituated to consume honey. **The possibilities of using honey should be taught** by parents since children's age; of course, also by lectures on bees and bee products within elementary or secondary education. This information and facts about properties of bee products generally should be mentioned often on the internet, in mass media etc.

The next question (No. 5) was focused on the use of honey. Honey is consumed primarily as a sweetener and for direct consumption, only 8.71 % of cons. use it for baking or cooking.

4.2.2 Purchase of Honey

In the case of more than 60 % of cons. there was the main aspect - from whom honey is bought rather than sensory properties and kind of honey. Price and appearance of a packaging achieved really low percentage and it can be thought interesting to find a view that honey consumers do not attach weight to price and the appearance of a packaging of honey, but rather to a label by which honey is labeled.

The following question No. 7, eliminated from the decision factors, affect the price of honey and the site honey comes from. In this situation, 29.1 % of **consumers focus** primarily **on the kind of honey, the next positions took flavour, color, liquidity and fragrance**. Flavour is the basic property of honey. During purchase a consumer buy glass/es of honey, but it is not so usual to taste the honey from the content of glass/es. This could be considered unacceptable in the market. In the case of direct purchase beekeeper – consumer/customer such a possibility exists, but is not used so often. The author receives similar requirements only several times a year. According to these results, beekeepers should offer to their customers to open the glass and taste the honey.

The relatively high number of consumers answered: "I do not know since I will have a seller to help me". This implies that **there is a significant number of consumers who require a seller to give additional information about the product**. Therefore it is necessary to appeal to the beekeeper to be able to inform and recommend appropriate honey.

Whether granulation of honey is an obstacle for consumers regarding honey purchase, it was investigated within questions No. 8. Although it is a sort of unwritten rules among beekeepers, to provide honey in liquid form as well as liquid honey is preferred by consumers. **27.8 % of consumers said that they should never buy granulated honey**. Among the "other answers" there was written e.g. "If it is explained, that the granulation is not unsafe for me, I will buy it." or "I have never met this phenomenon". The remaining majority of cons. has no problem with buying granulated honey, or they buy it, if liquid honey is not available. In this regard, **beekeepers, distributors, sellers, etc. should give more information about granulation to cons.** and instruct them about honey properties – **granulation is a natural property**

of each honey and it is one of the features of authentic honey. Some basic methods how to liquefy honey should be attached.

The majority of resp. (63.90 % of cons.) buy honey from beekeeper directly. 18.67 % of cons. get it from their friends and only a small amount of cons. buy honey in shops/hypermarkets. Although the proportion of cons., who buy honey directly from beekeepers, decreased compared to year 2012 (68.30 % of cons.) (Nový, 2012), the number of these "direct" purchasers is satisfying. Nevertheless **it is still necessary to support direct purchase** between a producer of bee products and a final customer.

Some possibilities of different packagings are compared within the next question. **The typical glasses of honey are still the most favourite.** The popularity of "glass with a pump", which prefer more than 20 % of cons. could be seen as an interesting finding. Nearly three quarters of cons. want to buy 1 kg packagings, 5 kg packagings got really low preferences, while 0.5 kg packagings are favourite by more than 10 % of cons. It is also interesting that these "0.5 kg consumers" lie in the two lowest categories of honey consumption. It is obvious, that people with low honey consumption prefer smaller size of packagings of honey. Sellers should take this conclusion into account and market smaller size packagings, as well.

The biggest part of cons. pays for honey till 120 CZK. Cons. pay **currently** for 1 kg of honey in **average 106.3 CZK** (if 80 CZK is taken as the lower bound) and **108.0 CZK** (if 90 CZK is taken as the lower bound). All tested factors (gender, age, permanent residence, income of household) seem to be with no association with current price of honey.

The next question dealt with consumer´s **readiness to pay maximally** for 1 kg of honey. The majority of cons. lie between 101 – 130 CZK. So, cons. are prepared to pay for 1 kg of honey in **average 120.0 CZK** (if 80 CZK is taken as the lower bound) and **120.3 CZK** (if 90 CZK is taken as the lower bound).

It was discussed how much extra are cons. disposed to pay in comparison to current price. 16.11 % of cons. pay the maximum price for honey at present and they are not ready to pay more. 32.89 % of cons. are ready to pay 10 CZK more, 26.17 % of cons. 20 CZK more. **None of consumers** answered that he/she **is prepared to pay less than he/she pays currently**. The

author is a bit surprised by this finding because he thought that consumers will choose lower price (than they stated as current price) as an expression that honey is expensive and should be cheaper.

Factors like gender and permanent residence have an association with the maximal price, which cons. are ready to pay for honey (for $\alpha = 0.10$). However both strengths of associations are weak. **Women** are ready to pay **119.73 CZK** and **men 122.54 CZK** for one kg of honey (if 90 CZK is taken as the lower bound) and cons. living in the **country** are ready to pay **119.10 CZK** and cons. living in **cites 121.00 CZK** for one kg of honey (if 90 CZK is taken as the lower bound).

More than half of cons. (55.60 % of cons.) **are disposed to accept even higher price than the stated maximum price within previous question and are ready to maintain the same purchased quantity.** 22.82 % of cons. would find another supplier, 16.18 % of cons. would decrease purchased quantity if the seller increased the price of honey over their stated level. The main motivation for cons. to pay higher price is a **certificate of quality** of honey and **origin of honey** from the same region where the cons. live in.

In conclusion, **beekeepers would not be afraid of raising prices of honey, but should try to increase attractiveness of their honey with a quality certificate** and target people living in the same region where beekeeper hives their bee colonies. According to the author, the lowest acceptable price of 1 kg of honey is 120 CZK. In comparison with the market price 150 CZK / kg in 2013 (CZSO, 2013; CUB $_1$, 2014; MA, 2013), the quoted price is still very low, but the author has experience, that it is a bit problem to sell honey for more than 120 CZK / kg (especially in the country), because some beekeepers sell their honey under 100 CZK / kg, and so 120 CZK / kg seems to be expensive. It should be noticed one thing at the moment. The repurchase (výkupní) price was 87 CZK / kg in August 2013. It is very simple to sell honey to a repurchase organization in big containers. If a beekeeper wants to sell a honey to consumers, he has to distribute honey from big containers to small glasses, close them by lids, equip the glass with a label and wait for consumers. If he/she does not sell all honey in a short time, it will granulate and beekeeper should liquefy it again before sale. All these operations are expensive and time demanding, so **it is not possible to sell honey under 120 CZK / kg**. Economy of beekeeping would be enough for another diploma thesis.

The importance of giving new and suitable information to consumers/customers was mentioned many times. Some of them (21.71 % of cons.) think that they have enough information and do not need anymore. The author is a bit sceptical about this meaning since the reminder of cons. requires **more information about bee products from the seller, mainly via web sites, social networks, leaflets and mass mediae.** It should be appeal to sellers again - to give relevant information about bee products and present them on the internet.

4.2.3 Mead Consumption

59.3 % of resp. (153 resp.) answered that they are mead customers (consume or just buy mead for somebody else). 6.59 % of resp. would like to buy or consume mead, but they do not know where to procure it. That means mead should be better presented and offered by similar way as honey.

According to author´s experience, **more customers perceive dark mead as more attractive** (34.64 % of cust.). 17.65 % of cust. prefer light mead and the reminder do not differentiate color of mead. **The most favourite mead seems to be natural mead** (45.75 % of cust.) without flavouring and flavoured mead (38.56 % of cust.).

Annual purchased quantity of mead was 1 l or 2 – 5 l per one customer mostly. The annual average quantity of mead is 2.65 l. Some factors (gender, age, permanent residence, income of household), which could have an association with mead consumption, were tested again. Only age is associated with mead consumption ($\alpha = 0.05$), but the association is weak and this phenomenon had to be tested more deeply. **The biggest mead customer is the age group between 31 – 40 years** with the purchase 3.96 l of mead each year. The second is age group 41 – 50 with 2.78 l per year. The author thought that the "winner" will be the age group till 30 years of age, but this group buys annually only 2.30 l of mead. These results were a bit surprising and can be caused by the fact that mead belongs to specific beverages and young people prefer typical alcoholic drinks, which are available more simply. **The advertising of mead should be focused on young people** and it should be raised their general awareness of it.

4.2.4 Purchase of Mead

The majority of customers prefer 0.5 l, one quarter prefer 1 litre bottles. More than half of buyers (54.90 % of cust.) buy mead in a shop, 34.64 % of cust. from beekeeper directly. It is not so simple to recommend to beekeepers to offer mead directly to final consumers because not all beekeepers make mead. However, mead would extend their range of products and support sales of honey this way.

The customer´s preparedness to pay maximally for 0.5 l of mead is various, but most of them are ready to pay 101 – 110 CZK/1 l. The average maximum price is **117.52 CZK** (if 80 CZK is taken as the lower bound) and **118.3 CZK** (if 90 CZK is taken as the lower bound). **All tested factors** (gender, permanent residence, income of household) **seem to be with no association with the price of mead**.

4.2.5 Other Bee Products

The last question was aimed at other bee products and was answered by all respondents. Cosmetics with bee products (30.24 % of resp.) seem to be very favourite. 25.85 % of resp. are interested in propolis, 27.32 % of resp. in bee wax, 10.49 % of resp. in royal jelly and 2.44 % in pollen. According to the author, **many people do not know where to buy and how to use other bee products**, so they should be offered information about them together with honey and mead facts, because the interest in other bee products is not insignificant.

CONCLUSION

Last but not least, **the results and conclusions should identify some weaknesses in bee products trade,** mainly some recommendations for beekeepers and sellers of bee products, how to improve customer service, increase sales, and thus their profits.

The main aim of the thesis was to identify the **honey consumer´s purchasing behaviour** and to formulate recommendations for beekeepers and honey sellers. For the purpose of this work it was focused on the main bee products – honey and mead.

Factors that can influence the most significantly consumer´s choice of honey and mead (package size, price, etc.), **were analyzed in the questionnaire survey**. In addition to prices the author tested other parameters that could affect the purchasing behavior of consumers (age, gender, etc.).

The main conclusions should be mentioned shortly again. **Cons. still prefer dark honeydew honey to light flower honey**, but many cons. do not differentiate kind or color of honey. For increasing honey (and mead) consumption it should be **recommended to focus on the youngest age group** of people mainly (thanks to higher number of young people in the sample it can be given higher importance to findings and recommendations regarding this group of age), which should become the target group (through advertising), because they represent a big opportunity for sales of honey. Young people should be habituated to consume honey. The possibilities of using honey should be taught by parents since children's age, by lectures on bees and bee products within elementary or secondary schools.

Honey, mead and the other bee products should become more available, e.g. **by offering bee products on the internet** (and mass mediae) and should be more advertised by the same ways. Internet (and mass media) give to beekeepers a great possibility of informing appropriately consumers about typical properties of both basic kinds of honey, their differences and specifications, mainly about a fast beginning of granulation of flower honeys and possibilities how to liquefy them back into liquid consistency. Sellers have to be able to give this information for each sale case. **Finally, it is necessary to support direct purchase between a**

producer of bee products and a final customer and producers should try to improve atractiveness of their products, e.g. by certificate of quality.

Obtained data provide an overview of consumer preferences, such as what is the popularity of some kinds of honeys or popularity of some colors of honeys, how high is honey consumption in households, how the price of bee products and other factors influence purchase of them, etc. **Finally, it gives an idea of the level of knowledge of respondents about honey and its properties and many recommendations for beekeepers/sellers/distributors of bee products, how to increase their sales and profits.**

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ANNEXES

ANNEX 1 ..... Questionnaire "Honey Consumer´s Purchasing Behaviour "

ANNEX 2 ..... Contingency tables, Chi-Square Tests, strengths of associations of tested questions

ANNEX 1

Kupní chování konzumentů medu

Vážení respondenti, tento dotazník poskytne vstupní data pro statistické zhodnocení kupního chování konzumentů včelích produktů, které budou shrnuty a prezentovány v autorově diplomové práci. Dále by měl posloužit jako inspirace ke zkvalitnění prodeje a přístupu včelaře (autora) k zákazníkovi, proto prosím o pečlivé a pravdivé vyplnění. **Dotazník je anonymní**. Máte-li zájem o prezentaci výsledků, uveďte Váš email.

Vždy zaškrtněte pouze jednu odpověď, pokud není u otázky uvedeno jinak.

1. **Jsem konzumentem včelího medu**:

☐ ano ☐ ne, protože
- ☐ mi nechutná
- ☐ je příliš drahý
- ☐ je příliš nedostupný
- ☐ jsem na něj alergický
- ☐ jiný důvod:

Je-li odpovědí „NE, PROTOŽE...“, pokračujte otázkou 16.

2. **Pro svojí spotřebu preferuji med:**

- ☐ květový (tj. nektarový)
- ☐ medovicový (tj. lesní)
- ☐ smíšený
- ☐ pastovaný
- ☐ jiný, uveďte jaký:
- ☐ nerozlišuji (je mi to jedno)

3. **Pro svou spotřebu preferuji med:**

- ☐ světlý med
- ☐ tmavý med

☐ jiný, uveďte jaký:
☐ nerozlišuji (je mi to jedno)

4. Ročně spotřebuji medu:

☐ do 1 kg ☐ 2-5 kg ☐ 6-10 kg ☐ více jak 10 kg

5. Med převážně používám:

☐ k přímé konzumaci
☐ jako sladidlo
☐ na vaření/pečení
☐ jiné využití:

6. V případě výběru medu pro svou spotřebu je pro mne prioritní:

☐ cena
☐ druh medu (květový, medovicový, smíšený, pastovaný, atd.)
☐ senzorické vlastnosti (chuť, vůně, barva, tekutost, atd.)
☐ od koho med kupuji
☐ vzhled obalu (etiketa, sklenice, apod.)
☐ reklama

7. Pokud by mi stejným prodejcem a při stejné ceně bylo nabízeno více různých druhů medů, orientuji se podle (zaškrtněte jednu nebo více odpovědí):

☐ druhu (květový, medovicový, smíšený, pastovaný, atd.)
☐ chuti
☐ vůně
☐ barvy
☐ tekutosti
☐ vzhledu obalu (etiketa, sklenice, apod.)
☐ nevím, nechám si od prodejce poradit

8. Pokud je mi nabízen zkrystalizovaný med:

☐ klidně si ho koupím
☐ koupím si ho jen, pokud není dostupný tekutý med
☐ nekoupím si ho
☐ jiná odpověď:

9. Med převážně získávám:

☐ kupuji ho přímo od včelaře
☐ kupuji ho v maloobchodní síti
☐ kupuji ho v síti hypermarketů
☐ dostávám ho od známého
☐ med obstarává jiný člen domácnosti
☐ sám jsem včelařem

10. Uvítám balení medu:

☐

☐

☐

☐

11. Při koupi medu preferuji velikost balení (hmotnost obsahu):

☐ 0,5 kg
☐ 1 kg (běžná zavařovací sklenice)
☐ 5 kg (velká zavařovací sklenice)
☐ jiné, uveďte jaké:
☐ to, které má nejvyšší poměr hmotnost obsahu / cena
☐ je mi to jedno

12. V současnosti za 1 kg medu platím:

☐ do 100 CZK
☐ 101 – 110 CZK
☐ 111 – 120 CZK
☐ 121 – 130 CZK
☐ 131 – 140 CZK
☐ 141 – 150 CZK
☐ více než 150 CZK
☐ med dostávám od známého zdarma
☐ nevím, med zajišťuje jiný člen domácnosti

13. Za 1 kg medu (při zachování nákupu stejného množství) jsem ochoten/na zaplatit maximálně (uveďte cenu, která podle Vás odpovídá 1 kg kvalitního medu):

☐ maximálně do 100 CZK
☐ 101 – 110 CZK
☐ 111 – 120 CZK
☐ 121 – 130 CZK
☐ 131 – 140 CZK
☐ 141 – 150 CZK
☐ vice než 150 CZK

14. Pokud by můj dodavatel zvýšil cenu medu nad hodnotu, kterou jsem uvedl v předešlé otázce:

☐ vyhledám jiného dodavatele
☐ snížím odebírané množství
☐ přesto cenu akceptuji při zachování odebíraného množství
☐ med přestanu odebírat / nahradím ho jinými sladidly
☐ jiná odpověď:

15. Vyšší cenu za med jsem ochoten zaplatit, pokud (zaškrtněte jednu nebo více odpovědí):

☐ je balení opatřeno nápaditou etiketou
☐ je med certifikován (opatřen pečetí kvality)
☐ med pochází ze stejné oblasti, ve které působím
☐ med splňuje následující předpoklady / jiná odpověď:

☐ nic z výše uvedeného pro mě není motivací k tomu platit za med více

16. Další informace o vlastnostech a využití medu uvítám formou:

☐ mám dostatek informací
☐ letáků
☐ informací od prodejce
☐ odkazem na internetové stránky
☐ sdělovacích médií (TV, tisk, aj.)
☐ sociálních sítí (např. Facebook)

☐ jiná odpověď:

17. Jsem odběratelem medoviny:

☐ ano, i konzumentem
☐ ano, ale obstarávám ji spíše za jiným účelem než pro vlastní konzumaci, např. jako dar pro příbuzné / známé

☐ ne, protože:
- ☐ mi nechutná
- ☐ nepiji alkoholické nápoje
- ☐ nevím, kde ji obstarat, ale uvítám její nabídku
- ☐ celkově o odběr medoviny nejevím zájem

Pokud medovinu neobstaráváte nebo nemáte zájem o její nabídku (ani pro příbuzné / známé), pokračujte otázkou 25.

18. Nejatraktivnější je pro mě medovina, která má barvu:

☐ spíše světlou
☐ spíše tmavou
☐ nerozlišuji (je mi to jedno)

19. Dávám přednost medovině:

☐ přírodní (bez příchutě)
☐ s příchutí (např. mandlová, karamelová, bylinná, oříšková, apod.)
☐ nerozlišuji (je mi to jedno)

20. Ročně koupím medoviny:

☐ do 1 l
☐ 1 – 5 l
☐ 5 – 10 l
☐ více než 10 l

21. Medovinu převážně:

☐ kupuji přímo od včelaře

☐ kupuji v obchodě / na trhu, apod.
☐ dostávám od známého
☐ jiná odpověď:

22. Při koupi medoviny preferuji objem lahve (při stejném poměru objem / cena) :

☐ 0,2 l (malá placatka)
☐ 0,5 l
☐ 1 l
☐ jiné, uveďte jaké:
☐ je mi to jedno

23. Za láhev kvalitní medoviny 0,5 l jsem ochoten/na zaplatit maximálně:

☐ maximálně do 100 CZK
☐ 101 – 110 CZK
☐ 111 – 120 CZK
☐ 121 – 130 CZK
☐ 131 – 140 CZK
☐ 141 – 150 CZK
☐ více než 150 CZK

24. U medoviny podle mě:

☐ hrozí otrava methylalkoholem
☐ nehrozí otrava methylalkoholem
☐ jiná odpověď:
☐ nevím

25. Mám zájem o následující včelí produkty (zaškrtněte jednu nebo více odpovědí):

☐ včelí vosk

☐ propolis

☐ mateří kašičku

☐ pyl

☐ kosmetické přípravky obsahující včelí produkty

☐ jiné produkty:

26. Jsem: ☐ muž ☐ žena

27. Je mi:

☐ 0-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 60 a více

28. Děti: ☐ nemám ☐ mám, prosím uveďte počet a věk:

29. Trvale žiji:

☐ ve městě
☐ na venkově

30. Nejvyšší dosažené vzdělání:

☐ základní
☐ střední odborné bez maturity
☐ vyšší odborné
☐ jiné
☐ vyučen v oboru
☐ střední s maturitou
☐ vysokoškolské
☐ nechci uvádět

31. Příjem domácnosti činí (připomenutí – dotazník je anonymní):

☐ do 15 tis. CZK ☐ 16 – 30 tis. CZK ☐ 31 – 50 tis. CZK ☐ 51 tis. CZK a více
☐ nechci uvádět

Tímto bych Vám velmi chtěl poděkovat za Váš čas strávený nad vyplňováním tohoto dotazníku a vyjádřit velký vděk za data, které se mi díky Vám podařilo získat. Děkuji.

Jindřich Nový
ina.novy@seznam.cz

ANNEX 2

Dependence of annual consumption of honey on gender

			gender		
			woman	man	Total
Cumulated_Annual_consumption_of_honey	till 1 kg	Count	52	20	72
		Expected Count	55.0	17.0	72.0
	2-5 kg	Count	104	30	134
		Expected Count	102.3	31.7	134.0
	6 kg and more	Count	28	7	35
		Expected Count	26.7	8.3	35.0
Total		Count	184	57	241
		Expected Count	184.0	57.0	241.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.056[a]	2	.590
Likelihood Ratio	1.043	2	.594
Linear-by-Linear Association	.983	1	.322
N of Valid Cases	241		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.28.

Dependence of annual consumption of honey on age

		age				
		0-30	31-40	41-50	51 and more	Total
Cumulated_Annual_consumption_of_honey	till 1 kg	58	5	5	4	72
	2-5 kg	85	22	12	15	134
	6 kg and more	17	7	6	5	35
Total		160	34	23	24	241

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.955[a]	6	.044
Likelihood Ratio	13.303	6	.038
Linear-by-Linear Association	8.857	1	.003
N of Valid Cases	241		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 3.34.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.232	.044
	Cramer's V	.164	.044
N of Valid Cases		241	

Dependence of annual consumption of honey on permanent residence

		permanent residence		
		country	city	Total
Annual_consumption_of_honey	till 1 kg	21	51	72
	2-5 kg	39	95	134
	6-10 kg	14	15	29
	more than 10 kg	2	4	6
Total		76	165	241

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.327[a]	3	.228
Likelihood Ratio	4.082	3	.253
N of Valid Cases	241		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.89.

Dependence of current price of honey on gender

		gender		
		woman	man	Total
current_price_joined	till 100 CZK	46	13	59
	101–110 CZK	37	14	51
	111–120 CZK	25	6	31
	121–130 CZK	11	6	17
	more than 130	9	2	11
Total		128	41	169

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.195[a]	4	.700
Likelihood Ratio	2.135	4	.711
Linear-by-Linear Association	.052	1	.820
N of Valid Cases	169		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 2.67.

Dependence of current price of honey on age

		age_joined			
		0-30	31-40	41 and more	Total
current_price_joined	till 100 CZK	35	13	11	59
	101–110 CZK	30	15	6	51
	111–120 CZK	22	8	1	31
	121–130 CZK	10	5	2	17
	more than 130 CZK	9	2	0	11
Total		106	43	20	169

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.724[a]	8	.461
Likelihood Ratio	9.428	8	.307
Linear-by-Linear Association	4.003	1	.045
N of Valid Cases	169		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is 1.30.

Dependence of current price of honey on permanent residence

		Perm. residence		
		country	city	Total
current_price	till 100 CZK	23	36	59
	101–110 CZK	14	37	51
	111–120 CZK	8	23	31
	121–130 CZK	4	13	17
	131–140 CZK	1	2	3
	more than 150 CZK	1	7	8
Total		51	118	169

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.189[a]	5	.522
Likelihood Ratio	4.329	5	.503
N of Valid Cases	169		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is .91.

Dependence of current price of honey on income of household

		Income of household		
		till 30 ths. CZK	more than 31 ths. CZK	Total
current_price	till 100 CZK	37	14	51
	101–110 CZK	27	19	46
	111–120 CZK	18	7	25
	121–130 CZK	12	4	16
	131–140 CZK	1	2	3
	more than 150 CZK	3	5	8
Total		98	51	149

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.342[a]	5	.196
Likelihood Ratio	7.114	5	.212
Linear-by-Linear Association	2.209	1	.137
N of Valid Cases	149		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 1.03.

Dependence of willingness of consumers to pay a higher price for honey without any change of purchased quantity on gender

		gender		
		woman	man	Total
I_am_willing_to_pay_for_1_kg_of_honey_no_more_than	101 – 110 CZK	35	8	43
	111 – 120 CZK	55	9	64
	121 – 130 CZK	41	16	57
	131 – 140 CZK	8	8	16
	141 – 150 CZK	20	8	28
	till 100 CZK	15	6	21
	More than 150 CZK	10	2	12
Total		184	57	241

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.614[a]	6	.071
Likelihood Ratio	11.073	6	.086
N of Valid Cases	241		

a. 3 cells (21.4%) have expected count less than 5. The minimum expected count is 2.84.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.220	.071
	Cramer's V	.220	.071
N of Valid Cases		241	

Dependence of willingness of consumers to pay a higher price for honey without any change of purchased quantity on age

		age			
		0-30	31-40	41 and more	Total
I_am_willing_to_pay_for_1_kg_of_honey_no_more_than	till 100 CZK	12	7	2	21
	101–110 CZK	26	10	7	43
	111–120 CZK	37	18	9	64
	121–130 CZK	43	9	5	57
	more than 130 CZK	42	13	1	56
Total		160	57	24	241

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.054[a]	8	.149
Likelihood Ratio	13.685	8	.090
Linear-by-Linear Association	6.564	1	.010
N of Valid Cases	241		

a. 3 cells (20.0%) have expected count less than 5. The minimum expected count is 2.09.

Dependence of willingness of consumers to pay a higher price for honey without any change of purchased quantity on permanent residence

		permanent residence		
		country	city	Total
I_am_willing_to_pay_for_1_kg_of_honey_no_more_than	101 – 110 CZK	19	24	43
	111 – 120 CZK	16	48	64
	121 – 130 CZK	16	41	57
	131 – 140 CZK	2	14	16
	141 – 150 CZK	13	15	28
	till 100 CZK	8	13	21
	More than 150 CZK	2	10	12
Total		76	165	241

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.980[a]	6	.062
Likelihood Ratio	12.306	6	.055
N of Valid Cases	241		

a. 1 cells (7.1%) have expected count less than 5. The minimum expected count is 3.78.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.223	.062
	Cramer's V	.223	.062
N of Valid Cases		241	

Dependence of willingness of consumers to pay a higher price for honey without any change of purchased quantity on income of household

		income of household			
		till 15000 CZK	16000 - 30000 CZK	more than 31000 CZK	Total
more_than_140_CZK	till 100 CZK	3	10	6	19
	101–110 CZK	7	19	11	37
	111–120 CZK	11	26	17	54
	121–130 CZK	7	19	24	50
	131–140 CZK	2	7	6	15
	more than 140 CZK	2	19	17	38
Total		32	100	81	213

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.369[a]	10	.593
Likelihood Ratio	9.080	10	.525
Linear-by-Linear Association	4.449	1	.035
N of Valid Cases	213		

a. 2 cells (11.1%) have expected count less than 5. The minimum expected count is 2.25.

Dependence of annual purchased quantity of mead on gender

			gender		
			woman	man	Total
consumption	till 1 l	Count	51	17	68
		Expected Count	48.4	19.6	68.0
	1 - 5 l	Count	48	20	68
		Expected Count	48.4	19.6	68.0
	5 l and more	Count	10	7	17
		Expected Count	12.1	4.9	17.0
Total		Count	109	44	153
		Expected Count	109.0	44.0	153.0

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.763[a]	2	.414
Likelihood Ratio	1.691	2	.429
Linear-by-Linear Association	1.553	1	.213
N of Valid Cases	153		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 4.89.

Dependence of annual purchased quantity of mead on age

			age_joined				
			0-30	31-40	41-50	51 and more	Total
annual consumption of mead	till 1 l	Count	55	1	5	7	68
		Expected Count	48.4	6.2	7.1	6.2	68.0
	1 - 5 l	Count	42	10	9	7	68
		Expected Count	48.4	6.2	7.1	6.2	68.0
	5 l and more	Count	12	3	2	0	17
		Expected Count	12.1	1.6	1.8	1.6	17.0
Total		Count	109	14	16	14	153
		Expected Count	109.0	14.0	16.0	14.0	153.0

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.670[a]	6	.049
Likelihood Ratio	16.009	6	.014
Linear-by-Linear Association	.274	1	.601
N of Valid Cases	153		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 1.56.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.288	.049
	Cramer's V	.203	.049
N of Valid Cases		153	

Dependence of annual purchased quantity of mead on permanent residence

			residence		
			country	city	Total
consumption	till 1 l	Count	21	47	68
		Expected Count	22.2	45.8	68.0
	1 - 5 l	Count	20	48	68
		Expected Count	22.2	45.8	68.0
	5 l and more	Count	9	8	17
		Expected Count	5.6	11.4	17.0
Total		Count	50	103	153
		Expected Count	50.0	103.0	153.0

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.602[a]	2	.165
Likelihood Ratio	3.392	2	.183
N of Valid Cases	153		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.56.

Dependence of annual purchased quantity of mead on income of household

			Income_of_household				
			till 15000 CZK	16000 - 30000 CZK	31000 - 50000 CZK	more than 51000 CZK	Total
consumption	till 1 l	Count	7	26	15	8	56
		Expected Count	8.2	25.4	16.8	5.6	56.0
	1 - 5 l	Count	9	28	18	4	59
		Expected Count	8.6	26.8	17.7	5.9	59.0
	5 l and more	Count	3	5	6	1	15
		Expected Count	2.2	6.8	4.5	1.5	15.0
Total		Count	19	59	39	13	130
		Expected Count	19.0	59.0	39.0	13.0	130.0

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.540[a]	6	.739
Likelihood Ratio	3.505	6	.743
Linear-by-Linear Association	.478	1	.489
N of Valid Cases	130		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 1.50.

Dependence of willingness of consumer to pay ticked purchase price of one bottle of mead (0.5 l) on gender

			gender		
			woman	man	Total
price of one bottle of mead	101 – 110 CZK	Count	25	9	34
		Expected Count	24.2	9.8	34.0
	111 – 120 CZK	Count	23	7	30
		Expected Count	21.4	8.6	30.0
	121 – 130 CZK	Count	18	5	23
		Expected Count	16.4	6.6	23.0
	131 – 140 CZK	Count	12	3	15
		Expected Count	10.7	4.3	15.0
	141 – 150 CZK	Count	12	6	18
		Expected Count	12.8	5.2	18.0
	till 100 CZK	Count	15	10	25
		Expected Count	17.8	7.2	25.0
	more than 150 CZK	Count	4	4	8
		Expected Count	5.7	2.3	8.0
Total		Count	109	44	153
		Expected Count	109.0	44.0	153.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.120[a]	6	.528
Likelihood Ratio	4.944	6	.551
N of Valid Cases	153		

a. 2 cells (14.3%) have expected count less than 5. The minimum expected count is 2.30.

Dependence of willingness of consumer to pay ticked purchase price of one bottle of mead (0.5 l) on permanent residence

			residence		
			country	city	Total
price of one bottle of mead	101 – 110 CZK	Count	9	25	34
		Expected Count	11.1	22.9	34.0
	111 – 120 CZK	Count	8	22	30
		Expected Count	9.8	20.2	30.0
	121 – 130 CZK	Count	7	16	23
		Expected Count	7.5	15.5	23.0
	131 – 140 CZK	Count	6	9	15
		Expected Count	4.9	10.1	15.0
	141 – 150 CZK	Count	8	10	18
		Expected Count	5.9	12.1	18.0
	till 100 CZK	Count	11	14	25
		Expected Count	8.2	16.8	25.0
	more than 150 CZK	Count	1	7	8
		Expected Count	2.6	5.4	8.0
Total		Count	50	103	153
		Expected Count	50.0	103.0	153.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.576[a]	6	.472
Likelihood Ratio	5.751	6	.452
N of Valid Cases	153		

a. 2 cells (14.3%) have expected count less than 5. The minimum expected count is 2.61.

Dependence of willingness of consumer to pay ticked purchase price of one bottle of mead (0.5 l) on income of household

			Income of household		
			till 30 ths. CZK	more than 31 ths. CZK	Total
price of one bottle of mead	101 – 110 CZK	Count	17	11	28
		Expected Count	16.8	11.2	28.0
	111 – 120 CZK	Count	20	7	27
		Expected Count	16.2	10.8	27.0
	121 – 130 CZK	Count	14	7	21
		Expected Count	12.6	8.4	21.0
	131 – 140 CZK	Count	5	5	10
		Expected Count	6.0	4.0	10.0
	141 – 150 CZK	Count	10	6	16
		Expected Count	9.6	6.4	16.0
	till 100 CZK	Count	10	11	21
		Expected Count	12.6	8.4	21.0
	more than 150 CZK	Count	2	5	7
		Expected Count	4.2	2.8	7.0
Total		Count	78	52	130
		Expected Count	78.0	52.0	130.0

Some categories had to be joined for fulfilments of assumptions for Chi-Square Test.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.304[a]	6	.294
Likelihood Ratio	7.352	6	.289
N of Valid Cases	130		

a. 3 cells (21.4%) have expected count less than 5. The minimum expected count is 2.80.