COMPARATIVE STUDY OF ACACIA AND RAPE HONEY

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Abstract

Nowadays, due to the new, healthy nutrition habits, consuming honey is frequent again, because of the prebiotic, antioxidant, antibacterial and antimutagenic effect of honey. Some honey types collected in Hungary are mentioned as "Hungarycums" in number of countries of the World. Nevertheless, adulteration of honey can cause a considerable problem in the economy. To prevent, or detect adulteration it is important to know the exact characteristics of honey types. In our experiments two honey types – acacia and rape – were investigated. All the samples were collected in 2011 and originated from different counties of Hungary. Our aim was to study the sugar composition and pollen content of these honeys to establish and compare the mentioned parameters.

Key words: acacia honey, rape honey, sugar composition, pollen content

INTRODUCTION

Honey has been consumed from the beginning of the history of human being (Baráth, 2008). It is an important element in the modern dietetics so it is subject to many studies all around the Europe (Gomes et al., 2010, Mărghita et al, 2009 and 2010, Persano-Oddo, 1995, 2004, Devilliers et al.,2004, Golob and Plestenjak, 1999) and in others continents: Africa (Cherfour and al. 2009), Asia (Joshi et al. 2000), South America (Corbella and Cozzolino, 2006). Honey contains quickly absorbing simple sugars, this way it can provide energy immediately (Kerekes –Sitkei, 1996).

Being a natural product, its composition can be very variable (Cordella et al., 2004). Honey and rape honeys are produced in the biggest amount in Hungary. They are very popular, that is why it is important to know their composition and characteristics.

The composition of honey

Honey is a very complex product, it contain mainly sugars, amino acids, enzymes, vitamins and minerals (Manzanares et al, 2011). Monosaccharides (fructose and glucose) give the 85 w/w% of the total sugar content (Doner, 1977, White, 1979). The fructose/glucose ratio is determined by the botanical origin and it influences the inclination to crystallize (Szél, 2006, Persano-Oddo and Piro, 2004). Crystallization is prevented by fructose, but promoted by glucose (Kiss, 1983). The fructose/glucose ratio is a typical feature of honey types (Czipa, 2010). Ratio near to 1 shows the strong inclination to crystallize, while between

1.2- 1.3 the inclination is weaker, above 1.3 the honey is fluid for a long time. (Szél, 2006) Fructose and glucose content together must be at least 60 w/w% by the Codex Alimentarius Hungaricus (2002) and Council Directive 2001/110/Ec, for honeydew and flower honey-honeydew mixture the amount is 45 w/w % . By Cordella et al. (2004) there are 30.91 – 44.26 w/w % fructose and 22.89 - 40.75 w/w % glucose in most types of honey.

The determination of the amount of disaccharides (saccharose) is a good way to follow the origin of the honey or the processes that happen in the honeys during storage (Cotte et al., 2004; Sancho, 1992). Sugars profiles of different types of honey have been reported by many scientists using different chromatographic techniques (Cotte et al.2004, Devilliers et al.2004, Sanz, Sanz and Martınez-Castro, 2004)

Pollen content and types in honey shows the botanical origin. Classification of the honey types is possible only when the honey contains the pollen of the given plant in the amount determined by the standard (generally 45 w/w %). For acacia honey, which is poor in pollen, pollen content can be 20-30 w/w % (Maurizio, 1975).

MATERIAL AND METHOD

In our experiment acacia and rape honeys originated from six counties of Hungary in 2011, were analysed. The experiments were performed in 2011-2012, at the Central Laboratory of Centre for Agricultural and Applied Economic Sciences, faculty of Agricultural and Food Sciences and Environmental Sciences, Debrecen. Glucose, fructose, saccharose and pollen content were determined in five samples from both honey types. Analysis was carried out in duplicates, results are mean values. Samples were coded by the Table 1.

Table 1.

Codes of samples

	Codes	**Origin (county)**
Acacia honeys	A1	Csongrád
	A2	Fejér
	A3	Hajdú-Bihar
	A4	Jász-Nagykun-Szolnok
	A5	Somogy
Rape honeys	R1	Békés
	R2	Fejér
	R3	Hajdú-Bihar
	R4	Hajdú-Bihar
	R5	Somogy

The chromatographic separation of sugars was achieved in an amine bonded phase column (Luna 5µ NH_2 100A), using acetonitrile/water (80:20) as mobile phase, at a flow rate of 1,0 cm^3/min and refractive index detection, in a MERCK-HITACHI HPLC equipped with L-6200A Intelligent Pump, AS-4000 Intelligent Auto Sampler and D-7000 Chromatography Data Station Software.

Pollen grains were microscopically observed and identified.

RESULTS AND DISSCUSIONS

Fructose content of the examined honeys is presented in Fig.1. This value varied between 35 w/w % and 41 w/w % in acacia honeys. All the measured values meet the requirements. Among the acacia honeys the lower fructose content was detected in the honey sample from Csongrád county (A1), while the highest was measured in a sample originated from Fejér county (A2).

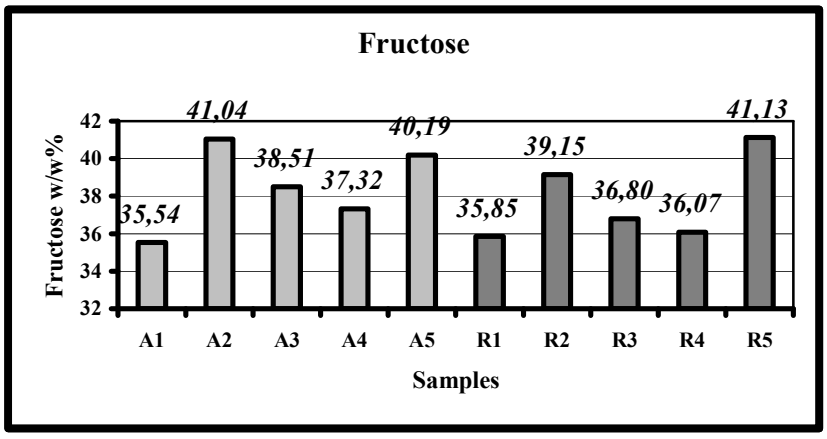

Fig. 1. Fructose content of acacia and rape honey samples

The studies on Acacia honey in different European countries shown for fructose content values between 41,12 - 44,45w/w % respectively 33,23-45,79 w/w% in Romania (Mărghita et al, 2008 and 2010), 39,01-47,17 w/w% in Slovenia (Golob and Plestenjak, 1999), 34,2 - 39.6 w/w% in France (Devilliers et al., 2004), in Italy 36.9 – 48.5w/w in Italy (Persano Oddo et al, 1995). Apidologie published in 2004 a very important work carried out by the IHC members, from which it was possible to outline the descriptive sheets of the main European unifloral honey (Persano Oddo and Piro, 2004). For Acacia honey the main fructose content was 42,7±2.3 w/w% , ranging from 38.1 to 47.3 w/w% (455 samples).

Regarding rape honeys the values ranges from 35.85 w/w% to 41.13 w/w% , the sample from Békés county contained the less (R1), while the sample from Somogy (R5) contained the highest amount of fructose. For rape honey the studies are less extended so in France the determined values range between 38.2 – 42.9 w/w% (Devilliers et al., 2004).

As it can be seen in Fig. 2, the glucose content did not vary in the same way. Both acacia (A5) and rape (R5) honeys originated from Somogy county contained the least amount of glucose. The obtained values range from 23.15 w/w% to 31.19 in Acacia and from 24.36 w/w% to 37.85 w/w% in rape honey.

For acacia honey, the European studies present values between 26.0 – 31.41 w/w% respectively 25.26-37.05 w/w% in Romania (Mărghita□ et al, 2008 and 2010), 26.92-31.62 w/w% in Slovenia (Golob and Plestenjak, 1999), 35.2- 42.4 w/w% in France (Devilliers et al., 2004), in Italy 21.0-28.8 w/w% in Italy (Persano Oddo et al, 1995). The values in the European Sheet for Acacia are 23.1-29.9 w/w% (456 samples). For rape honey Devilliers et al. in 2004 found in France values between 24.2 – 28.95 w/w% much lower then ours, excepted those from Somogy.

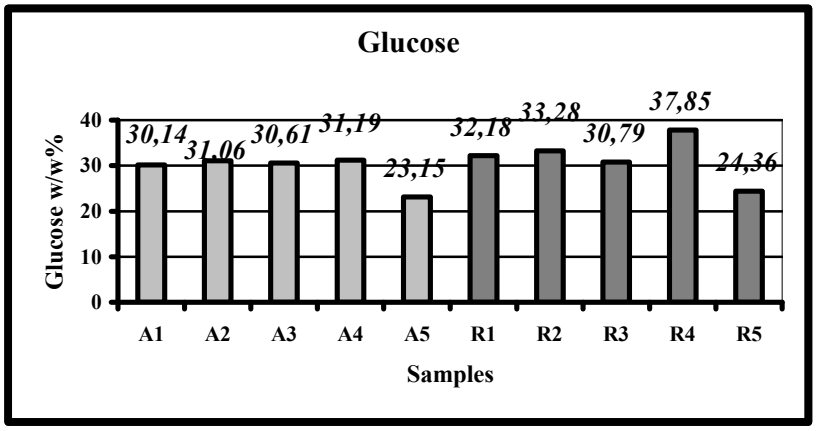

Fig. 2. Glucose content of acacia and rape honey samples

The calculated fructose/ glucose ratios are presented in Figure 3. The values are above 1,0 (1.69-1.82) with one exception. The ratios for acacia honeys are characteristic for the honey type, the values from the descriptive sheet being 1.61±0.11 (1.39-1.83). But the ratios that were calculated for rape honey show that most of the samples are mixed with acacia honey.

The fructose and glucose content and their ratio show an interesting fact: these values are very similar in both types of honeys originated from the same region. The values are shown in Figure 4.

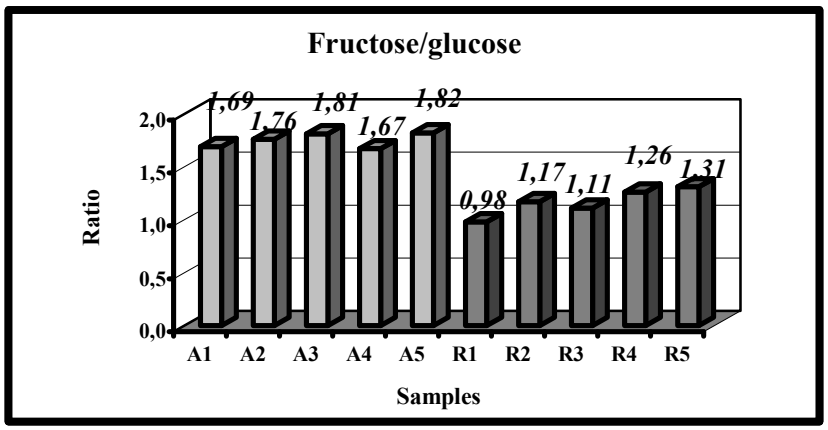

Fig. 3. Fructose/glucose ratio in acacia and honey samples

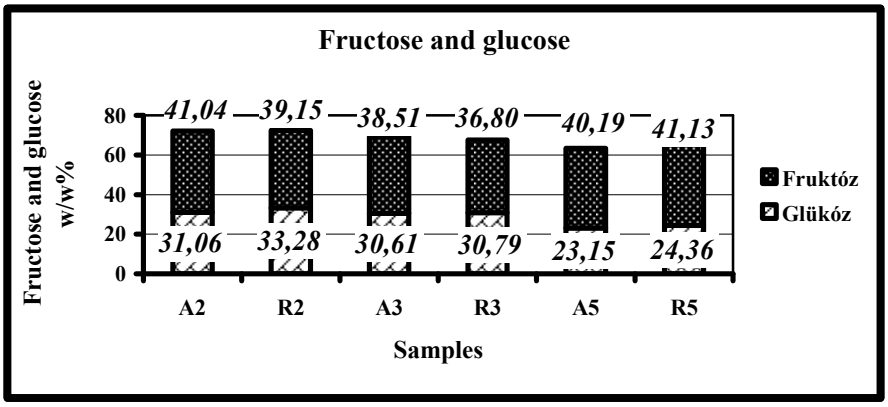

Fig. 4. Fructose and glucose content and their ratio in honeys originated from the same region

The saccharose content of the honey samples was also determined. Results are presented in Figure 5. The licensed limit for the amount of saccharose is 10 w/w% for acacia honeys while 5 w/w% for rape honeys. Only one acacia sample shows higher saccharose content than the limit.

In all the mentioned studies, the sucrose content of acacia honey was lower that in our study. The maximum reported values are 4.83 w/w% (Mărghita et al, 2010) and 5.30 w/w% (Devilliers et al. 2004)w/w % . For rape honey Devilliers reported 0 content of sucrose, Popek in Poland (2002) 0.99±0.47 w/w% and Tucak (2009) in Croatia 2.29 w/w% ±2.17. The higher concentrations founded in the present work in rape honeys indicate that these samples are not real rape honeys, but they are mixed with acacia honey which has higher saccharose content.

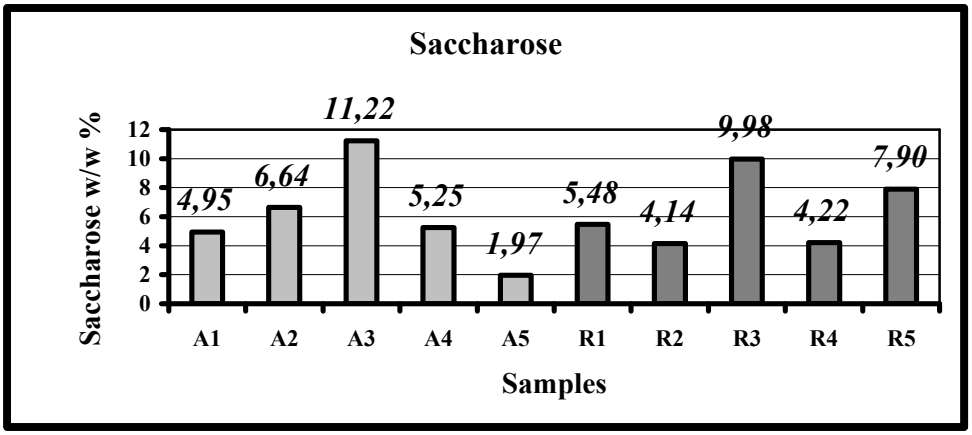

Fig. 5. Saccharose content of acacia and rape honeys

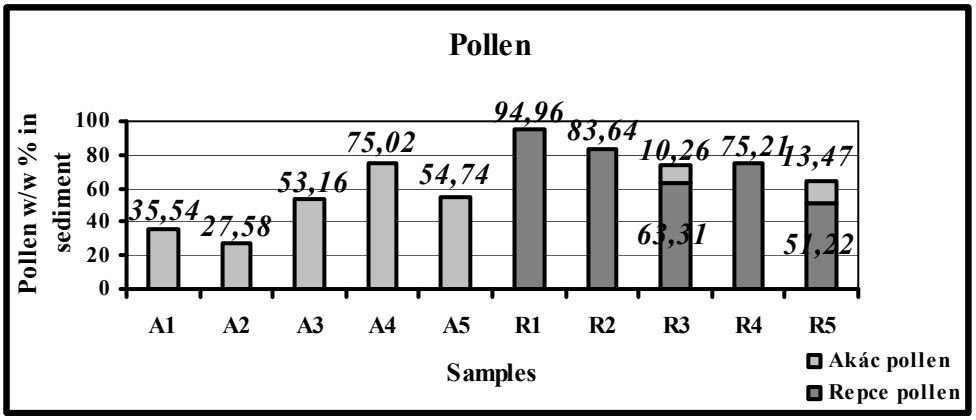

Fig. 6. Pollen content of acacia and rape honeys

As data of Figure 6 show, pollen content of acacia honeys varied between 27-75 w/w% . Acacia flowers give very little amount of pollen, that is why pollen content of rape honeys are higher. R3 and R5 rape honey samples contained quite a high amount of acacia pollen. This data corresponds to the higher amount of saccharose in these samples and prove the statement that these are mixed honeys.

CONCLUSIONS

The variation of fructose content determined in acacia honey frame in the same area as in other European countries. Some of the rape honeys contained similarly high amount of fructose. Variation in glucose content was moderate for acacia but bigger for rape honey in accord with the European studies, excepted Devilliers who reported higher values. All the studies samples meet the criteria for a fructose-glucose content over 60

w/w% (EU, 2002) but they are lower than the ones from the studies mentioned above. The calculated fructose/glucose ratios were above 1,0. The ratios for acacia honeys are characteristic for the honey type, but the ratios that were calculated for rape honeys show that most of the samples are mixed with acacia honey. Only one acacia sample shows higher saccharose content than the limit. The higher concentrations in rape honeys indicate that these samples are not real rape honey, they are mixed with acacia honey with higher saccharose content. These findings were confirmed by the result of pollen analysis.

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