PHYSICO-CHEMICAL PROPERTIES AND AROMA PROFILE OF ACACIA HONEY PRODUCED IN ROMANIA

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INTRODUCTION

Currently, the globalization of food markets arise the interest of the beekeeping industry, researchers and consumers for the origin of honey and its quality. The quality control of honey is done in order to verify its authenticity regarding honey adulteration with cheaper substances and its authenticity regarding honey labelling. The labels on honey packaging attest its botanical or geographical origin and give a added value that promotes and protects authentic honey. In Europe, there are several labels such as PDO (Protected Denomination of Origin) and PGI (Protected Geographical Indication) that attest the link with the geographical area of honey production. Until 2013, 23 honeys have been registered as PDO and PGI honeys (DoorDatabase). Romania is the third European producer of honey, with a production of 24127 tons in 2011 (Faostat, 2011). Several types of honeys are produced in Transylvania, one of the most important regions of acacia honey production in Romania. The aim of our study was to characterize the chemical profile of acacia honey produced in Transylvania in order to be used for a future denomination of origin. Thirty honey samples came from three different regions of production over a period of three years. We determined electrical conductivity, water and sugar content. In addition to these traditional approaches, headspace-solid-phase microextraction (HS-SPME) coupled to gas chromatography-mass spectrometry (GC-MS) was used to describe the volatile organic compounds (VOCs) of acacia honey.

MATERIAL AND METHODS

Honey samples

Acacia honey samples were collected from the counties Alba, Cluj, Covasna, Harghita, Mureş, Satu Mare, Salaj and Timisoara and were stored at 4°C until analysis.

Determination of honey generic parameters

Selective physicochemical parameters were determined according to the Harmonized Methods of International Honey Commission. Water content (mg/100g) was detemined refractometrically. Electrical conductivity (µS/cm) was measured at 20°C in a 20% (w/v) honey solution in water with a Kit Consort conductometer (CONSORTnv, Belgium).

HPLC analysis of sugar profile

The method used for the determination of the honey samples' glucidic spectrum was described by Marghitas et al., (2010) and was determined on a HPLC Shimadzu system. The carbohydrates contained in honey are identified and quantified by comparing retention times and the peak surface

of honey with that of standard carbohydrates. The results for each sugar have been conveyed in g/100g of honey.

HS-SPME-GC-MS analysis of volatile profile

Until now, different methods of extraction have been used to study the volatile composition of honeys. In our study 3,5-4 g of honey were introduced into a 30 ml septum-sealed glass vial. Then, the honey samples were homogenized and heated to 40°C for 30 minutes. After balancing, the fiber was introduced into the vial's headspace through the septum and exposed to the sample for 30 minutes. The VOC were extracted with a 50/30 µm DVB/CAR/PDMS fibre (Supelco), according to the following conditions: extraction time 30 min at 40°C; desorption time 5 min at 250°C. The fibers were inserted in an Agilent 7890A GC coupled to an Agilent 5975C Inert XLEI/CI MSD and a DB5 capillary column (30m × 0,25mm i.d.× 0,25µm). The identification of volatile compounds was done by comparison of their spectra with those contained in the Pal600 Electronic Library. In addition, the retention indices(RIs) were experimentally determined using series of C1–C20 n-alkanes and compared with those reported in the literature.

RESULTS

The results of this study constituting the base of a scientific paper submitted elsewhere, they cannot be explained in details herein.

In accordance with the motivation and the objectives proposed, the quality indices and the biomarkers specific to acacia honey were established. The values obtained for the water content of the acacia honey produced in Romania fall between 14.8-20.4%. For this parameter we identified two extreme values, S15 and S25, considering the fact that the standards claim a maximum of 20% water content for acacia honey. Analysis shows that all honey samples had an electric conductivity value ranging between 0.07-0.18mS/cm. In the descriptive files of different monofloral (Persanno et al., 2004), mention a mean value of electrical conductivity of 0.15±0.04mS/cm for acacia honey.

Sugar profile

Carbohydrates are one of the main components of honey, mainly used to determine its counterfeiting by means of syrup, but also as biomarkers indicating botanical origin. The sugar profile of acacia honey identified in this study showed the following carbohydrates: fructose, glucose, sucrose, maltose, isomaltose, turanose and erlose. Table 1 shows the means and ranges of sugars of acacia honey samples.

Table 1. Sugars values (g/100g) of Romanian acacia honey samples

Sugar (%)	Range	Mean Z1	Mean Z2	Mean Z3
Fructose	37.97-48.16	43.55	43.58	43.15
Glucose	22.32 - 38.09	30.56	30.40	30.36
Sucrose	0.2- 2.37	1.27	0.72	0.87
Maltose	1.81- 4.16	3.33	2.89	2.69
Isomaltose	0.9 - 0.11	0.48	0.33	0.31
Turanose	0.38 - 2.7	2.25	1.96	1.96
Erlose	0.45 - 3.19	1.92	1.66	1.69

The results confirm that the fructose and glucose are the most important sugars quantitatively in all samples, followed by maltose, sucrose, turanose, isomaltose and erlose. Fructose is a very important parameter in analysing acacia honey, because the fluid state of this type of honey is due to a high content of fructose. Similar values were obtained in the case of other acacia honey samples from Romania (Marghitas et al., 2010).

Volatile profile of acacia honey

In the volatile profile of Romanian acacia honey, 79 compounds were identified and classified in different chemical classes (alcohols, organic acids, aldehydes, sulphur compounds). From a qualitative point of view, the chromatographic profiles of honey samples were quite similar. The most abundant compounds identified in honey headspace were acetic acid, ethanol, 2-propanone, linalool oxide, furfural, benzaldehyde. However, from a quantitative point of view significant differences were observed for these compounds depending upon the production area. For example, acetic acid was found in samples from all three zones, but in different quantities (12.26% for zone 3, 16.64% for zone 1 and 24.73% for zone 2). We can also observe a higher benzaldehyde content especially in Transylvanian honey (7,23%) as compared to the one in Oltenia (3,89%) and Moldova (4,68%).

CONCLUSION

The honey samples from Romania meets the requirements of the national standard and EU Honey Directives (Council Directive 2001/110/EC) for the parameters analysed in this study. Sugar profiles show that acacia honey samples are not adulterated and are genuine nectar honeys. Considering the volatile profile, there are aromatic differences between honeys produced in different regions. The results of this study indicate that authenticity of honey can be determined on the basis of selected parameters and can be used as quality markers of authentic Romanian acacia honey.

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