MONITORING OF HEAVY METALS RESIDUES IN HONEY

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Abstract: *Honey and bee products have the image of being natural, healthy and clean. However, today bee products are produced in an environment polluted by different sources of contamination. The main sources for contamination of honey with heavy metals are represented by placing hives near urban areas with heavy car traffic, or industrialized areas and the use on the entire circuit of production, objects or containers made of materials unsuitable (unacceptable). The research from the topic announced was conducted in research laboratory of the Agrochemistry Department from the Faculty of Agriculture. The purpose of the paper is to observe specific variations in the containt of heavy metals of honey, following differentiated location of the hives. We consider 2015 the year when hives were placed in areas with differentiated impact of pollution, making it possible to identify the influence of the pollution sources mentioned on the quality of honey, by identifying residues of heavy metals.*

Keywords: *monitoring, heavy metal, honey, residues.*

INTRODUCTION

Honey is the sweeteast product of the nature, made by processing the nectar of flowers or plants blight. The chemical composition of honey consists of: water, glucose, fructose, sucrose, dextrin, vitamins of group B, C, provitamin A, P, K, pantothenic acid, folic mineral salts of Ca, Na, P, Al, Fe, Si , Mg and some trace minerals: Ni, Ag, Vd, Cr.

The presence of heavy metals in honey has not to be regarded like a simple accumulation, their concentration could be linked with beehives location or entire circuit of production. Air and soil contain heavy metals, mainly from industry and traffic which can also contaminate the bee colony and its products. Lead (Pb) and cadmium (Cd) are considered the principle toxic heavy metals and are thus most frequently studied. Lead, contained in the air and originating mainly from motor traffic can contaminate air and then directly nectar and honeydew. Generally, Pb is not transported by plants. On the other hand, Cd originating from metal industry and incinerators, is transported from the soil to plants and can then contaminate nectar and honeydew.

Any heavy metals present in honey above the admitted levels by pollution standards, are threats to human body through the possible negative effect of the contaminants. Even though a lot of research focuses on pollution in general, not a lot of work has been related to pollution with heavy metals.

Heavy metals present in the atmosphere can deposit on the hairy bodies of bees and be brought back to the hive with pollen, or they may be absorbed together with the nectar of the flowers, or through the water or the honeydew. (PORRINI AND COLAB., 2003)

A number of variables have to be considered when using bees, or beehive products such as honey, to monitor heavy metals in the environment: the weather (rain and wind can clean the atmosphere or transfer heavy metals to other environmental sectors), the season (the nectar flow, which is usually greater in spring than in summer and autumn, could dilute the

pollutant), the botanical origin of the honey (the nectar of flowers with an open morphology and the honeydew are much more exposed to pollutants).

Research motivation derives from the need to extend the scope of knowledge and assessment of the impact exercidet by an contaminated environment on the quality and safety of honey. The honey used in this study was harvested from beehives situated in Timiș County.

The aim of the study was to determine the contamination level of heavy metals like Chromium (Cr), Nikel (Ni), Zinc (Zn), Cooper (Cu), Manganese (mn), Cadmium (Cd) and Iron (Fe) in unifloral and multifloral honey samples collected directly from bee colonies of several places in Timis County and also to find a link between the amount of heavy metals found in the samples from the possibly contaminated area and the samples from the pollution free areas.

MATERIALS AND METHOD

The honey samples analyzed are from own apiary and from private beekepers. The studied areas are: Timisoara, Cheveresu-Mare, Sacosu Mare, Otvești, Pișchia. The sampled named P1 are close to the polluting source (Mixed Flowers P1 and Linden Tree honey P1). The hives from the areas mentioned above were kept in the same position during this study. The samples of honey were examined in the same conditions and using the same procedures.

The sample analysis have followed standard methods for detecting heavy metals approved by STAS 784/2-2009, in Romania. Atomic absorption spectrophotometry (AAS) was used for heavy metal detection.

RESULTS AND DISCUSSIONS

The results obtained from honeys produced in Timis county showed the presence of metals residual levels in all samples analyzed. Residual levels of metals found in honey samples are reported in Table 1.

Table 1.

Heavy metals residues in honey [ppm]

Sample	Cr	Ni	Zn	Cu	Mn	Cd	Fe
Mixed Flowers P1	-	-	0,987	18,89	0,512	-	10,49
Mixed Flowers P0	-	-	-	39,55	0,044	-	17
Linden P1	10,34	7,64	0,992	35,543	2,526	-	80,38
Linden P0	6,875	0,664	0,1477	75,5	4,803	-	67,89
Rape	-	-	0,336	48,17	1,284	-	47,24
Acacia	-	-	1.48	10,73	6,31	-	23,18

As seen in the tabel above, in the samples analyzed was not detected **cadmium**. **Cr and Ni** were detected only in Linden Tree honey.

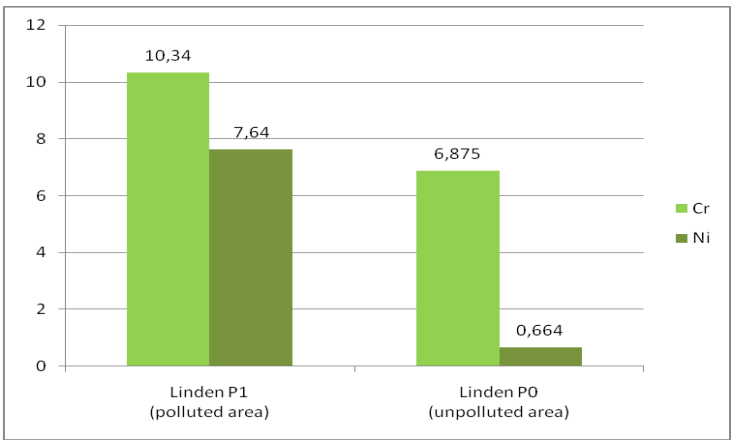

Figure 1. Cr and Ni content in Linden Tree honey samples, from Timis county [ppm]

Sample of Linden Tree honey harvested from polluted area contains chromium and nickel at higher concentrations than the sample obtained from unpolluted area.

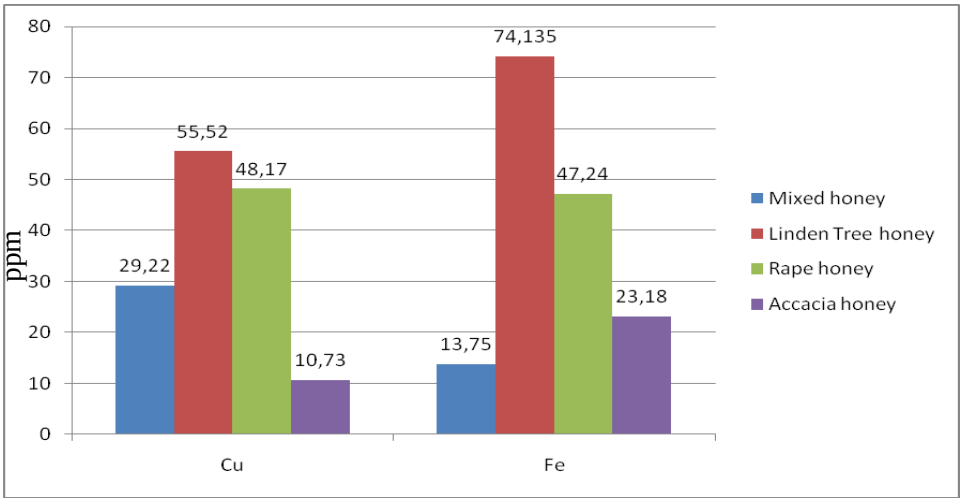

Figure 2. Cu and Fe content in honey samples from Timis county

The levels of Cu (10,73 ± 55,52 ppm) and Fe (13,75 ± 74,14 ppm) are presented in the figure above. Linden Tree honey contain higher levels of **Fe** than the other honey types. The opposite is mixed honey; it have the lowest concentration of **Fe**. Regarding the **copper's level**, in linden tree honey was found the highest concentration. Analyzing the situation

presented, the highest concentrations of Cu and Fe are found in the lime honey (linded tree) and in the rape honey.

A higher content of Cu and Fe in honey lime can be used to assess qualitative changes induced by pollution honey. This might be due to the fact that perennial plants store heavy metals differently in comparison with trees.

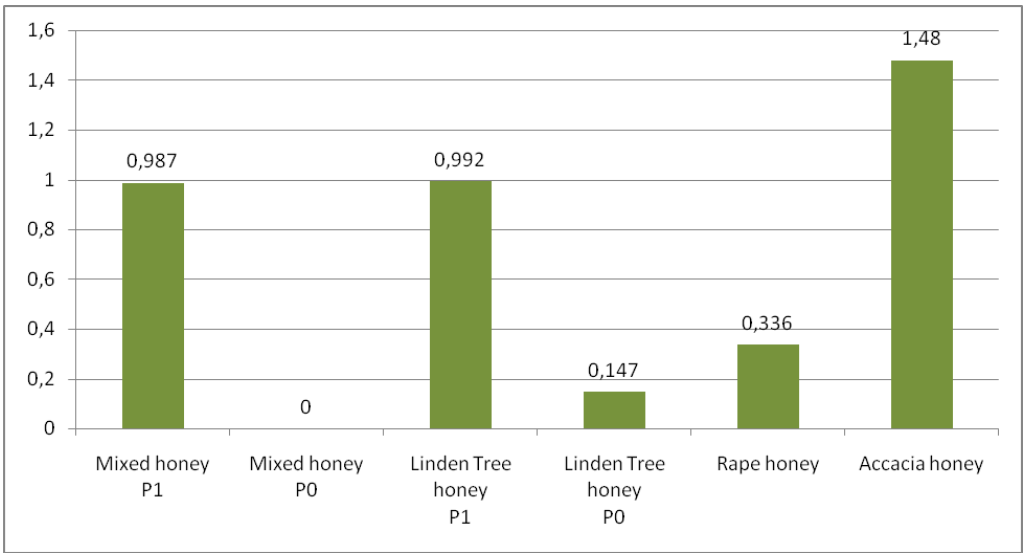

Figure 3. Zn content in honey samples from Timis county

The concentration of Zn in honeys was found to be within 0–1,48 ppm.The presence of Zn in the biota is beneficial, being one of its micronutrients.

CONCLUSIONS

Regarding the study on the monitoring of heavy metals residues in honey, we can draw the following conclusions:

The analysis revealed the presence of Zinc (0-1,48 ppm), Chromium (6,88-10,35ppm), Nikel (0,664-7,64 ppm), Copper (10,73 ± 55,52 ppm) and Iron (13,75 ± 74,14 ppm) in the collected samples.

Contamination by Cadmiunm was found to be below detection level.

The presence of these toxic metals in bee honey is an evidence of micropolluting agents in the environment. Honey produced in different regions of Timis County do not completely lack heavy metals but they are at satisfactory level and good quality for human consumption.

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