STUDY REGARDING THE DETECTED LEAD RESIDUES IN HONEY IN CORELATION WITH THE SAMPLING AREA

CODREANU IULIANA, CODREANU M.D.
Faculty of Veterinary Medicine Bucharest, Splaiul Independentei, No. 105
email : iulianacod@yahoo.com

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ABSTRACT

It is well – known the fact that the honey is a very important product, obtained from the bees. In literature there are many publications that highlight the high level of lead contamination of the vegetation located in the close proximity of roads with intense car traffic, which sometimes reach several tens of mg/kg of product.
The main sources of the honey's contamination are the residuum resulted from non – ferrous industry, but also from the industry that uses or transforms lead and its derivatives. But the widest contamination is the result of the utilization of auto vehicles.
In order to reduce the detonating effect into the explosion engine and to increase the efficiency of the combustible, it is used to add lead tetraethyl to gas. After such a "useful" action, this chemical compound of lead and exhaust gases are simultaneously eliminated, contaminating the entire area and, inherently, the honey.

INTRODUCTION

The honey and the secondary products from the apiarian productions obtained from the bees are permanently exposed to different pollutants (Leita et al, 1996, Raes et al 1998).

It is known that pastoral beekeeping constitutes the primary means that ensure an increased honey production. In order to this, the beehives must be transported in the respective bee garden areas, those that require proper access roads. That is why the location of the beehives is usually near of roads with intense car traffic. In these conditions, the pollution of vegetation in that area, and also of the flora and honey, can reach a high level.

Sunflower honey obtained from the beehives located in the close proximity of roads with intense car traffic, can have a high level of contamination with lead, that exceeds even the maximum limits set out in the official standards of health, being in discordance with the European Community´s regulations.

The level of different contaminants is generally in correlation with the distance from the pollutant sources (Raes et al, 1992). Many studies showed that the average value of lead residues in honey is proportional with the increased number of auto vehicles and with the traffic intensification in the last years, an alarming aspect for all the apiarists from the world (Chauzat et al, 2006 Eissa et al 2014)**.**

MATERIALS AND METHODS

In order to verify the lead contamination value of honey obtained in the above mentioned conditions, we conducted a research on two types of honey: acacia honey and sunflower honey.

The honey was harvested from beehives located right by the side of the main road that crosses different counties of our country, and also from beehives placed on auxiliary roads (observing this way the level of pollution of the vegetation in the area, and also of the melliferous flora). Also were collected samples of honey annually, during 4 consecutive years - depending on the season and the flowering period: from spring - when it is

generally less traffic and summer - when the traffic intensifies along with the holidays traveling.

The analyze of the heavy metals residues, was made using the most sensitive and accurate analyze method: atomic absorption spectrophotometer (Żaneta et al 2014).
In this context, we have taken samples of honey from many counties. There were tested three beehives for each type of honey.

RESULTS AND DISCUSSIONS

The results regarding the distribution of the lead residues (in fact of the lead tetraethyl), resulting from exhaust gases of the auto vehicles – into the samples of acacia honey and sunflower honey (by atomic absorption spectrophotometer method) – are presented in the following tables and graphics.
A comparative analysis regarding the lead contamination of the two types of honey helped us establish some statistically significant differences (Tables 1-2):

Table 1

The average values of the lead residues of acacia honey for those four years of study, according with the location of the bee garden area (apiary)

Year of study	The entire quantity from which the average values were selected *(kg)*	Bee garden (apiary) area	LEAD *ppm*
1st	44.950	main road	0,69**
		secondary road	0,22
2nd	33.230	main road	0,70**
		secondary road	0,20
3rd	28.040	main road	0,83**
		secondary road	0,25
4th	29.200	main road	1,05***
		secondary road	0,20

*** p<0,05 - significant differences*
**** p<0,01 – highly significant differences*

Table 2

The average values of the lead residues of sunflower honey according with the location of the bee garden (apiary)

Year of study	The entire quantity from which the average values were selected *(kg)*	Bee garden (apiary) area	LEAD *ppm*
1st	31.430	main road	0,6***
		secondary road	0,20
2nd	35.150	main road	0,73**
		secondary road	0,22
3rd	39.640	main road	0,90**
		secondary road	0,24
4th	43.550	main road	1,10***
		secondary road	0,20

*** p<0,05 - significant differences*
**** p<0,01 – highly significant differences*

Thus, on both samples of acacia honey and sunflower honey originating from beehives placed on auxiliary roads (side roads or secondary roads), the average value of the quantity of lead detected in them, was 0.21 ppm in both cases (Table 3), value which is situated on the sensitivity level limit of the method we used - atomic absorption spectrophotometry (Jin at al, 2006).

In return, on the samples of acacia honey and sunflower honey originating from beehives located close to major roads with intense car traffic (European roads, national roads, highways, etc.), the mean values of the detected lead residues, in a statistic point of view are significantly higher - P>0.05 (0.81 ppm on acacia honey and 0.88 ppm on sunflower honey) than those obtained in the samples of honey harvested from beehives located on auxiliary roads, (Table 3 and Figure 1).

Table 3

The average values of lead residues in acacia and sunflower honey for the determination period, according to the auto traffic intensity in the bee garden area

No	HONEY TYPE	The entire quantity from which the average values were selected *(kg)*	Bee garden area	LEAD *ppm*
1	ACACIA	135.420	main road	0,81**
			secondary road	0,21
2	SUNFLOWER	149.770	main road	0,89**
			secondary road	0,21

*** p<0,05 - significant differences*

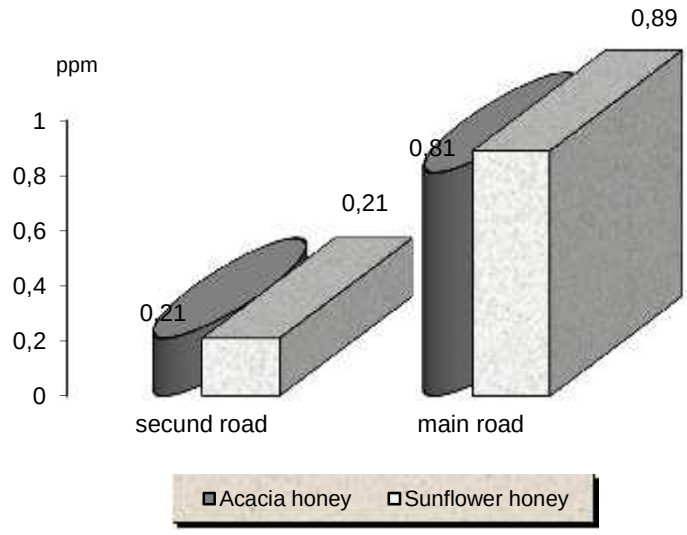

Figure 1. The dynamic of the average values of the lead residues (ppm) in acacia and sunflower honey, according to the auto traffic intensity in the bee garden (apiary) area

CONCLUSIONS

Regarding the distribution of the lead residues into the samples of acacia honey and sunflower honey, samples from apiaries (from many counties) located near main roads but also secondary roads, it was revealed there are statistically some significant differences, as mentioned below:

- ✓ During those 4 years of study, the average values of lead residues in honey (selected from an entire quantity of 135.420 kg) obtained from apiaries located near main roads (with intense traffic) was 0,81 ppm in acacia honey, respectively 0,89 ppm in sunflower honey. These values are much higher ($P<0.05$) than the legal maximum value indicated by the official quality regulations (0,45 ppm).
- ✓ By comparison, in the most samples of acacia honey, but also of sunflower honey produced in those apiaries located near secondary roads (where the traffic intensity is very low), there was not revealed lead over the threshold level of that analyze method applied (0,2 ppm).
- ✓ After the distribution of lead residues in honey, it notice that the average value of lead residues in honey is proportional with the increase number of auto vehicles and with the traffic intensification in the last years, an alarming aspect for all the apiarists from our country.

From the above mentioned conclusion, we are entitled to make two practical recommendations: a. in order to avoid the lead contamination of honey, it is highly recommended that the apiarists locate their beehives to a minimum 3 km distance (approximately the bees‘ fly area) from the roads with intense traffic; b. taking into consideration that the insalubrious products are not in compliance with the UE Regulations, it also recommended, depending on the apiary location, to carry out some tests from suspicious honey and, depending on results, to decide the product destination.

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